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Development of modern payment methods in Poland as an example of technological leapfrogging

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Abstract: In the Polish economy consumers can choose from various payment methods. Every method has its advantages and disadvantages. The literature on the subject includes numerous studies proving the higher cost-effectiveness of electronic payments, e.g. using payment cards. Poland is in the group of countries where people rather pay in cash than by payment cards. However, payment innovations are quickly adopted. In the second half of 2018 Poland was the first country in the world in which all payment terminals accepted contactless payments. This was possible thanks to top-down activities (e.g. Cash Support Program) but also thanks to the quick adaptation of these new payment methods by a large part of our society. This could be associated with a relatively shorter period of operation of non-cash payments, which made adaptation of the innovation easier than in other countries already using non-cash payments for some time. The concept of implementing the latest technologically advanced stage without the previous stages is called leapfrogging. The implementation and dynamic development of the latest payment technologies on the Polish market make use of the characteristic of this process, although it is not literal. Interestingly, after the implementation of modern payment methods the processes of further development of payment methods (BLIK system) began in our country, which gained the interest of the global payments giant (Mastercard). Therefore, we are not only adopting technology but also entering the group of technological leaders in the sphere of payments.

Keywords: leapfrogging, payment methods, contactless payments, mobile payments

1. Introduction

The article will first analyze the costs of individual types of payments, divided into cash and non-cash payments. The proven positive impact of non-cash payments on development confirms that promoting shopping using transfers, payment and credit cards as well as mobile payments is justified.

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Next, the concept of leapfrogging will be presented based on a literature review and on the example of the Polish payment market. Poland did not only even out the gap separating it from technology leaders. By quickly modernizing the payment infrastructure and Poles' openness to contactless payments, we managed to get into the group of leading countries using these technologies. What's more, thanks to the creative initiative, the BLIK payment system has been developed, which situates Poland among technological leaders of the payment system.

According to the research hypothesis, the development of the payment system in Poland has the character of leapfrogging combined with the endogenous innovative impulse.

The purpose of this work is to locate these processes in the theory of development and to indicate that in the case of the Polish payment system, the technology was not simply imitated. It absorbed and developed the system with internal resources. At the end of the work, conclusions were formulated regarding the further development of the national payment system.

2. Costs of payment habits

Money has a number of functions in the economy. It can store value (thesurization), value goods, but above all it serves exchange. Cash is still very popular in Poland, but then again, contactless and mobile payments are dynamically developing. A further increase in the share of non-cash payments may have a potentially beneficial effect on reducing the costs of operating payment systems. In Poland, the total private payment costs in 2015 were estimated at 31.2 billion PLN. The largest cost was generated by cash (21.1 billion PLN), but this is due to the largest share of cash in the number of transactions (11.8 billion cash transactions out of 17.0 billion of the total number of payments). Private costs for debit cards amounted to 6.1 billion PLN, while transfers generated 2.4 costs (NBP, 2019a, p. 8).

According to a survey conducted in 2009–2012 by the European Central Bank, the lowest social costs of operating the payment system were recorded in countries such as Denmark, Sweden and Finland (around 0.8% of GDP). Poland was among countries such as Bulgaria, the Czech Republic, Lithuania, Latvia, Romania, Slovakia and Hungary. For this group, the estimated social costs amounted to 1.01% of GDP (Schmiedel, Kostova and Ruttenberg, 2012; NBP, 2019a, p. 33). Countries with the lowest cost of servicing the payment system excel in cashless payment methods.

In 2015, the most expensive payment method per transaction was mobile payments (up to 94 PLN per transaction). However, this was due to the fact that at that time these systems were intensively developed and generated significant costs, while customers used this method to make even a smaller number of payments. Payments/ cash services were also relatively expensive (about 19 PLN). Direct debits (0.46 PLN) and transfer orders (0.48 PLN) were definitely less costly for banks. Payments by credit cards cost banks around 1.8 PLN (NBP, 2019a, pp. 57–58). However, taking into account the total amount of private costs of banks divided into payment instruments/ services, it should be noted that the largest costs are generated by cash of, which is about 9.5 billion PLN, and payment cards are cheaper (less than 2 billion PLN). The internal costs of cash-handling banks alone absorb 0.49% of GDP (NBP, 2019a, pp. 54–55).

In literature you can find a lot of research that shows that the spread of non-cash forms of payment is beneficial for the economy, because it is cheaper in servicing, therefore it does not generate such high costs. In addition to direct financial costs, cash payments take more time by deducting amounts and giving the change. According to the calculations of Humphrey et al. (2006), a country which switches from the cash-only payment system to an electronic system is able to save at least 1% of GDP. Gresvik and Øwre (2002) demonstrated how in Norway in 1988–2001, thanks to the spread of non-cash transactions, transaction costs of banks were reduced by 62%. Researchers have come to similar conclusions, e.g. in Spain (Carbo et al., 2002). Hasan et al. also showed a positive impact of the spread of electronic payments on economic development (2013). The research covered 27 EU member states in the period from 1995 to 2009. The increase in consumption and trade stimulated economic growth. In this context, the possibility of taking loans thanks to cards turned out to be beneficial, which resulted in consumption smoothing. Research on an even wider group of countries was conducted by Zandi et al. (2013). The research group included as many as 56 countries responsible for 93% of global GDP. The research period covered the years 2008–2012. The positive impact on GDP dynamics resulted from increased transaction efficiency and easier access to loans. In the years covered by the survey, the increase in the number of card payments generated an additional GDP growth of 0.3% in developed countries and 0.8% in developing countries. In another report of Moody led by Zandi et al. (2016), it was also found on the basis of surveys from 70 countries in the period 2011–2015 that the growing use of payment cards generated an additional 0.1% of the cumulative GDP growth in that period.

There are many factors that determine the type of payment. They may have a demographic character, i.e. refer to age, gender, income, etc. (Borzekowski and Kiser, 2008; Klee, 2008). The nature of the payment, the place where it is made (Bolt and Chakravorti, 2010) and the type of goods purchased (Von Kalckreuth et al., 2009) may be of great importance. Additional financial incentives and fees are also significant (Ching and Hayashi, 2010; Carbó-Valverde and Linares-Zegra, 2011). The role of payments in cash can have a cultural and social dimension. In countries such as Germany, Italy, Spain, Austria and Ireland the share of cash in transactions is relatively high. Alternatively, the Benelux and Nordic countries rarely use cash as a method of payment (De Meijer, 2010).

The share of cash payments, which is still high, may be due to the false belief that payments in cash are free. However, from the social point of view, the costs of money in cash are high because of the costs of: production, storage, distribution and protection. The grey economy can also be a social cost, which is more likely to exist due to cash (De Meijer, 2010). Currently in Poland, the society is quite dynamically and consistently increasing the share of non-cash payments. One of the factors of the development of non-cash payments was the constant reduction of "intercharge" fees (Oleńkiewicz, 2015).

Cashless turnover is one of the dimensions of the financial market development. There is a well-established link in the literature between indicators of financial development and economic growth (Beck et al., 2018).

3. Leapfrogging—a review of literature

In literature, the idea that poorer countries or regions are developing faster thanks to already developed technologies is known as convergence (Barro et al., 1991; Barro and Sala-i-Martin, 1997). Brezis, Krugman and Tsiddon (1993) noted that technological progress does not always have to strengthen technologically advanced nations, as assumed by the theory of endogenous growth. In the case of technological changes, leading nations have extensive experience and are strongly rooted in previous generation technologies. Poor countries with low labor costs can then adopt the latest solutions bypassing previous stages. Thus, they can gain a relatively better competitive position. This scheme is called leapfrogging. Leapfrogging, e.g. in the field of technology, consists in adopting a recently developed technology without using its previous versions (Davison et al., 2000). However, other authors indicate that leapfrogging may also refer to such areas as politics or organizational structures (Perkins, 2003; Steinmueller, 2001).

Many researchers consider leapfrogging to be possible and necessary. Global institutions supporting the development of emerging markets are of the opinion that thanks to the digital revolution, leapfrogging, i.e. "skipping" particular stages of development and determining new growth paths", has become not only possible but necessary (World Bank Group and China Development Bank, 2017, p. 11). Then again, one can also notice skepticism towards the concept of leapfrogging, indicating that technological changes are more of a gradual than "skipping" character (Ho, 2005; Rock et al., 2009). Hobday (1994) while conducting researching within the electronics industry in Singapore questioned the idea of leapfrogging, emphasizing the role of gradual accumulation of technology.

International institutions such as World Bank or China Development Bank are keenly interested in implementing this type of development strategy in Africa. According to the report (World Bank Group and China Development Bank, 2017), the potential lies in the following areas of the economy: (a) agriculture, (b) education, (c) energy, (d) finance, (e) governance, and (f) information as well as in communications technologies.

The concept of leapfrogging can also be applied in the context of the adoption by the developing countries of technologies that are environment-friendly. It is about skipping the development path followed by developed countries, which largely contributed to the degradation of the natural environment (Schroeder and Anantharaman, 2016). The idea of using leapfrogging to protect the environment is not a new idea. This topic was discussed, among others, by Perkins (2003) or Sauter and Watson (2008). Work on these type of issues is carried out all over the world, e.g. China (Binz et al., 2012) or generally in the "Global South" (Evans, Browne and Gortemaker, 2018).

Leapfrogging can also be analyzed in the context of the consumer market. An ecological solution in the field of automotive can be applied bypassing the previous stages (Moon et al., 2021), as well as the Energy Internet (Akhil and Patil, 2021).

Schroeder and Anantharaman (2016) indicate that, in literature, much attention has been paid to technological solutions in the context of leapfrogging, while "soft" factors such as lifestyle, consumption patterns and consumer behavior in general were neglected.

In the financial sphere, leapfroginng has great potential. Thanks to telephones and the Internet, a rapid increase in the availability of financial services for the population has become

possible, e.g. in African countries (World Bank Group and China Development Bank, 2017, p. 35). The phenomenon of leapfrogging in finance, consisting in the amplication of mobile payments bypassing the previous stages (traditional banking and internet banking), was empirically demonstrated by Gevaudan and Lederman (2020). For example, in Kenya in 2007 financial services provided via a mobile phone enabled consumers to operate their accounts, pay bills, etc. by the use of a smartphone. Thanks to this, a technological leap was made (World Bank Group and China Development Bank, 2017, p. 36). The lack of financial services has been replaced by widespread and cheap access to them due to the use of existing technical infrastructure, in this case mobile phone networks. The development of services was dynamic, which resulted in new services (e.g. withdrawals from ATMs, the possibility of buying mobile tickets for events, company accounts, etc.).

In Kenya the proportion of financially excluded people fell by 25 percentage points over 10 years (2006–2016) (Ndung'u, Morales and Ndirangu, 2016). The improvement of the situation resulted in the reduction of transaction costs and faster economic growth. Most importantly, a better allocation of resources directed funds to people who had entrepreneurial potential that was hampered by the lack of funds (Dabla-Norris, Ji and Townsend, 2015). The example of Kenya is not the only one. Significant progress can also be noted in Tanzania and Uganda (Ndung'u, Morales and Ndirangu, 2016). In 2016, as much as 89% of the population in Rwanda had access of some kind to financial services due to the development of digitized financial services and government support (Rwanda FinScope, 2016).

It is a paradox that some developed economies, e.g. the USA, are lagging behind when it comes to adopting payments by telephone (Han and Wang, 2021).

Most importantly, the rapid improvement in technology can take place not only due to market factors, but also through infrastructure modernization policy that will allow entering a new technological level. Leapfrogging initiated by infrastructure development has taken place in many countries with economic success (e.g. South Korea, Taiwan and Singapore) (Mody and Sherman, 1990).

In the context of leapfrogging technology, there can be numerous barriers (Watson and Sauter, 2008): "absorptive capacity, technological capabilities, knowledge, institutions, the accumulative nature of knowledge, and the international technology market". Absorption capacity is the biggest barrier when it comes to the development of developing countries (World Bank, 2008). On the enterprise level, the possibility of absorption can be defined as the ability to recognize the value of new information and use it in the production of commercial goods (Cohen and Levinthal, 1990). The nation's technology absorption capacity depends on technological capabilities, knowledge and institutions. Lack of appropriate knowledge can even lead to regression and a return to technologies of previous generations (Gallagher, 2006). It is important to build knowledge within the organization but also to have access to other knowledge, outside the organization (Lewis, 2007). Another factor are institutions, which can be defined as a set of procedures, laws, principles or habits that determine the interaction between individuals and groups (Edquist, 1997, p. 46). In this context, it is worth bearing in mind the cultural factors that determine the form of the institution. For example, the barrier may be the risk-averse culture, where failure is considered unacceptable, therefore it can be an obstacle when it comes to technology absorption (Gray and Sanzogni, 2004). The accumulative nature of building tech-

nology absorption possibilities is somehow contrary to the idea of leapfrogging. However, the ability to build and maintain technological knowledge often depends on earlier stages of development of these technologies (Hausmann and Klinger, 2007). Given the international technology market, there may be some barriers to leapfrogging, e.g. when only a few companies dominate technologically (Watson and Sauter, 2008). Another barrier in this context may be the reluctance of global companies to transfer clean technologies to developing countries, beyond the state imposed by their legal regulations (Gallagher, 2006). Global technology leaders are naturally interested in maintaining their advantage by outlays for research and development or limiting technology transfer at its advanced stages. However, it is not always easy to protect yourself against the spread of technology. Finished products are the technology carriers. Thus, some customers can use reverse engineering to learn about imported technology and use it to produce modified and even improved versions of products. An example of such activities are Korean companies (Lee and Lim, 2001).

4. Leapfrogging on the example of the Polish contactless payment market

Analyzing the absorption of new technologies in banking in Poland, one can come to the conclusion that there has been a kind of a leapfrogging phenomenon. The share of payment cards in a classic form (read in the terminal) or the number of bank accounts stood out from the EU average, while in terms of contactless payments, we are the leader. This topic will be expanded further in the article.

Considering the number of bank accounts per person in the years 2001–2017, it should be noted that at the beginning of this period, the EU average value was then 1.2 bank accounts per person. At that time in Poland it was only 0.4, three times less. In 2014, Poland managed to catch up and exceed the EU average. In 2017, there were as many as 1.9 bank accounts per person in Poland, while the EU average was 1.7 (NBP, 2018, p. 8). Analyzing the indicator of devices accepting electronic payment instruments (POS terminals and imprinters) per 1 million inhabitants, it should be noted that the number of these devices in Poland has been systematically increasing but the EU average remains out of reach. In Poland, in 2017 there were 16,252 such devices per 1 million inhabitants, while the EU average was 26,436 (NBP, 2018, p. 14). Therefore, when it comes to infrastructure for non-cash payments, Poland is still in some sense a chasing country. Alternatively, when analyzing the number of non-cash transactions made with payment cards per person, the situation looks better for Poles. In 2001, an average of 2.3 card transactions per year were made in Poland, while for the EU average this value was 37.3. In 2017, the EU average was still higher (135), but the gap was almost evened out (100.6). In Poland this proces was very dynamic (NBP, 2018, p. 19). Taking into account another indicator: the number of transactions carried out with a single payment card, an interesting phenomenon can be noted. At first, Poland was left behind, but in 2015 Poland was ahead of the EU average in this respect, increasing its advantage over the years. In 2017, an average of 95.2 transactions were made in Poland with one card, while in the EU average it was 70.1. Similar relationships can be observed taking into account the number of non-cash transactions at individual POS terminals (NBP, 2018, p. 22). This shows that despite the pay-

ment infrastructure not being very well developed, Poland is catching up with the number of transactions by the intensive use of terminals and cards.

The issue of payment infrastructure looks different if we look at it from the point of view not of quality but quantity. In the second half of 2018, Poland became the first country in the world in which 100% of POS terminals installed accepted contactless payments (NBP, 2019b, p. 7). This fact shows that Poland is a global leader when it comes to contactless payments. Changes and development of the payment network is taking place not only thanks to Poles' openness to new, more innovative payment methods, but also thanks to institutional support. As part of the Non-Cash Turnover Support Program, retail and service outlets can count on annual funding for the costs of installing and using payment terminals. The program applies to facilities/ services where payments by the use of a terminal were not possible (NBP, 2019b, p. 7).

Taking into account the share of contactless payments in the total number of transactions in POS (point of sale), the leaders are the Czech Republic (93%), Georgia (89%) and Poland (83%). We are ahead of countries such as Spain (57%), Austria (50%), the UK (46%), France (25%), Germany (14%) or Belgium (4%). Paradoxically, established payment habits with traditional cards can be an obstacle for countries with a long tradition of non-cash payments when switching to newer technology.

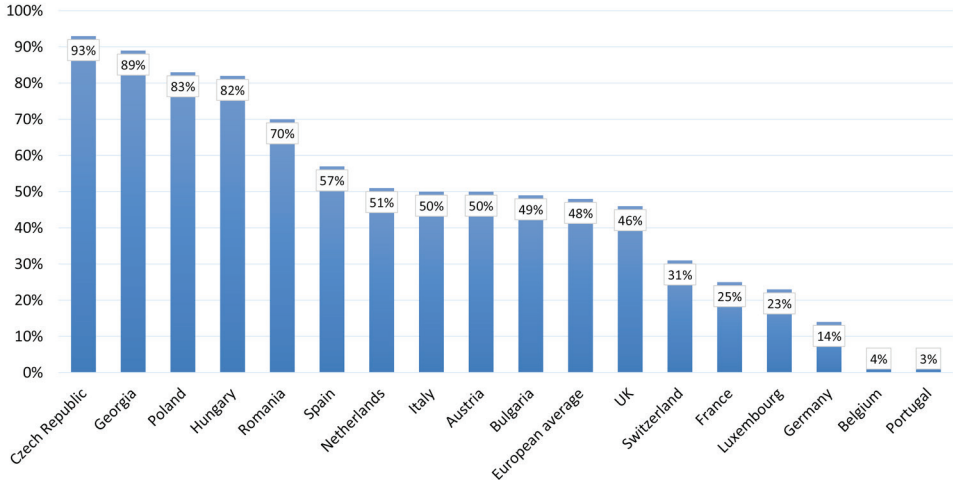

Figure 1. Share of contactless payments in total payments made at POS

S o u r c e: statista.com.

5. Development of mobile payments

The BLIK system is an innovation in the field of mobile payments. It was created by Polski Standard Płatności sp. z o.o (eng. Polish Payment Standard, limited liability company). It allows for online payments and payments in traditional stores, offices or public transport. What's more, BLIK also allows to send money between users (P2P). Thanks to this, it is possible to immediately send funds to another person, based only on their phone number. To use

BLIK all you have to do is connect your phone number and bank account number using the application (NBP, 2019b, pp. 46–47).

The BLIK system is very convenient for online transactions. Unlike payment cards, you do not need to provide card details. When paying with BLIK, transactions are authorized by entering the code from a mobile phone or tablet. A given store or browser of a trusted device can be remembered, thanks to which it is possible to authorize payments just by one touch, even without entering the code. Thanks to this, the payment requires almost no effort and minimizes procedures to a minimum, while maintaining high transaction security.

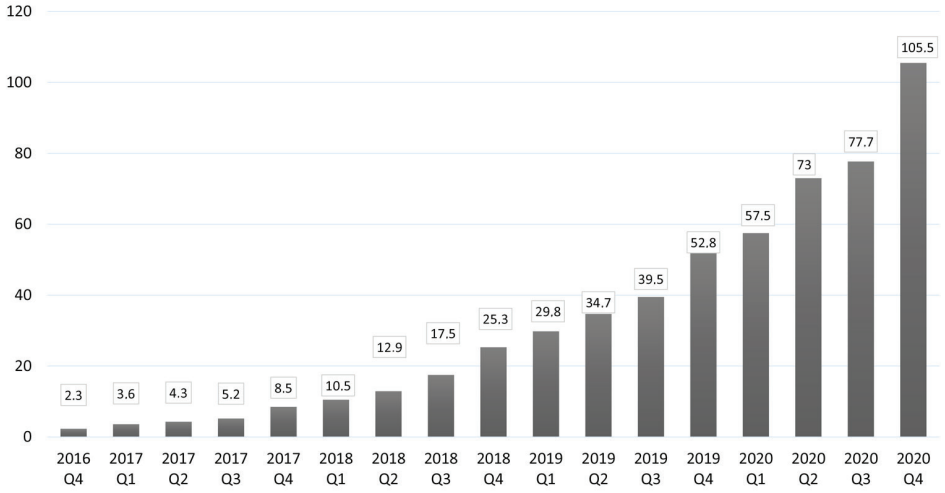

Figure 2. The increase in the number of online transactions using the BLIK R/R system, data in millions

S o u r c e: Polish Payment Standard.

Figure 2 presents a dynamic increase in the number of online transactions paid with BLIK. In the fourth quarter of 2016, 2.3 million transactions were made with BLIK, but four years after it was almost 46 times more (105,5 milion). Therefore, one can observe a systematic increase in the number of payments using the modern Polish Payment System.

The BLIK system is not the only payment method via smartphone. There are also Google Pay and Apple Pay technologies. As part of the service, you can store data about payment cards and their use in the payment process on your phone. Card data are encrypted, each card is tokenized and receives a VAN (Virtual Account Number). Thanks to this, the card details are not known to third parties, e.g. stores. Google does not authorize or process transactions. Thanks to this wallet you can pay by phone, which is equipped with the NFC module and Android. The application works in the background, so payment is possible at any time. Just unlock the phone and bring it closer to the terminal. Payments up to 100 PLN do not require authorization, as in the case of contactless cards. A similar payment method is also offered by the iOS operating system, which is the Apple operating system (NBP, 2019b, p. 103).

6. Conclusion

The phenomenon of leapfrogging is characterized in the article. It involves the adaptation of technology at an advanced stage, bypassing the previous stages. The development of individual payment methods in Poland has some characteristics of this phenomenon, although it is not in a literal sense. Individual payment methods, for example transfers or cards have been adapted in Poland, but the newest methods such as contactless payments or mobile payments have been adapted extremely quickly, thanks to which we have outrun the technological leaders in this respect. The diagram of this process is illustrated in Figure 3.

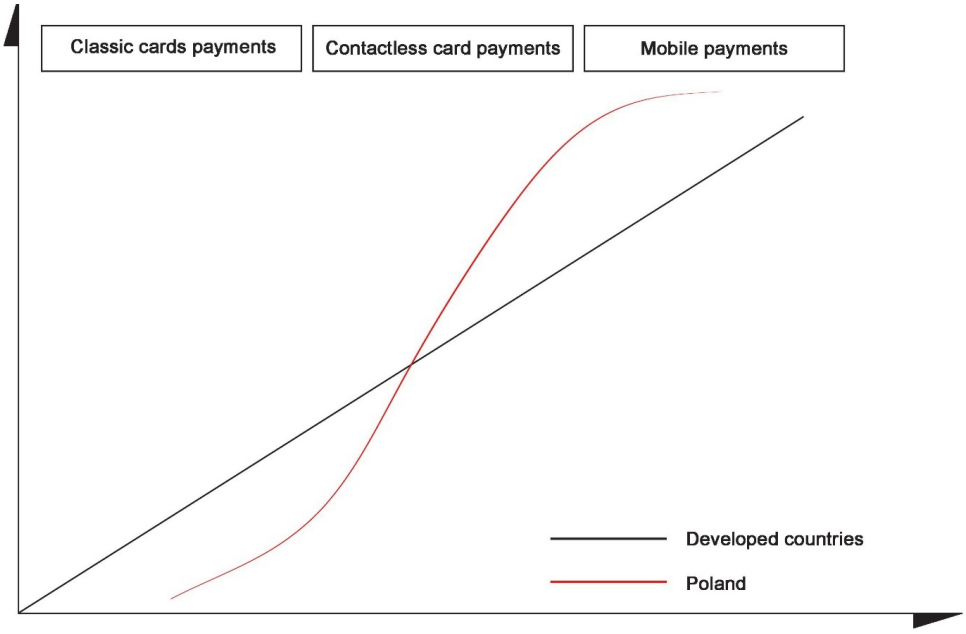

Figure 3. Schematic approach of the relationship between the state of payment technologies in Poland and in developed countries

S o u r c e: Author's own elaboration.

Bearing in mind the presented phenomenon, the hypothesis according to which the development of the payment system in Poland has the character of leapfrogging combined with the endogenous innovative impulse has been positively verified.

The widespread acceptance of contactless and mobile payments by the Polish society means that Poland currently has one of the most modern payment systems in the world, which does not change the fact that a large part of Polish society, for example the elderly, still use cash as the main payment method. The growing acceptance for non-cash payment methods may contribute to an increase in the GDP growth rate in Poland, and a decrease in the social costs of operating the payment system.

According to the opinion expressed in the report of the National Bank of Poland (NBP, 2019a), Poles should have access to various payment methods, thanks to which it is possible to properly use the advantages of all of them. You can promote cashless trading, which, with a sufficiently large share of the transaction, is cheaper and more efficient, but cash should not be banned. Arguments for maintaining cash include, among others, its resistance to lack of electricity supply or infrastructure enabling non-cash payments. What's more, some people only pay in cash and changing the payment method could be associated with stress and a high degree of uncertainty. Among this group, the largest share is elderly people. The grey market is one of the reasons against cash. Cash payments remain largely excluded from state control, which is why it is understandable to impose restrictions in this respect for entrepreneurs and for very large cash payments of individuals. However, daily cash payments should be enabled. Too radical moves in this field may lead to the turn to a poorly regulated or unregulated market of cryptocurrencies and other online payments, and ultimately to full-bodied money (gold or silver), or more broadly: to commodity money.

As part of a healthy diversification of payment methods, there is also a need to take advantage of the technological momentum and opportunity faced by the BLIK payment system. Further development is possible, and further increasing the volume of transactions in the system is a step towards easier payments for the benefit of economic growth. Looking ahead, the development of the stablecoin market should be monitored. Stablecoins are crypto-assets with a stable value in relation to mainly fiat currencies (Ante et al., 2020). Experiments with these types of projects are carried out by various central banks, working on the so-called CBDC (central bank digital currency) (EBC, 2020). It will probably be an opportunity to support the endogenous technological momentum within the Polish payment environment and maintain achievements of the BLIK system in placing Poland among the leaders of payment innovations in the world.

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Rozwój nowoczesnych metod płatności w Polsce przykładem przeskoku technologicznego

Abstrakt: W polskiej gospodarce konsumenci mogą wybierać spośród różnych metod płatności. Każda na swoje wady i zalety. W literaturze przedmiotu można znaleźć liczne badania dowodzące wyższej efektywności kosztowej płatności elektronicznych, na przykład za pomocą kart płatniczych. Polska znajduje się w grupie krajów, gdzie przywiązanie do gotówki jest względnie duże. Równocześnie innowacje płatnicze są szybko adaptowane. Polska w drugiej połowie 2018 roku była pierwszym krajem na świecie, w którym wszystkie terminale płatnicze akceptowały płatności zbliżeniowe. Było to możliwe dzięki działaniom odgórnym (np. Programu Wsparcia Obrotu Bezgotówkowego), ale również dzięki szybkiemu przyswojeniu tychże nowych metod płatności przez dużą część naszego społeczeństwa. Mogło się to wiązać z relatywnie krótszym okresem funkcjonowania płatności bezgotówkowych, przez co adaptacja innowacji była łatwiejsza niż w krajach dojrzałych. Koncepcja implementowania najnowszego technologicznie etapu z pominięciem stadiów wcześniejszych nosi nazwę leapfroggingu. Implementacja i dynamiczny rozwój najnowszych technologii płatniczych na polskim rynku noszą znamiona tego procesu, choć nie są nim w znaczeniu dosłownym. Co interesujące, po wdrożeniu nowoczesnych metod płatniczych w naszym kraju rozpoczęły się procesy dalszego rozwijania metod płatności (system BLIK), który zyskał zainteresowanie światowego giganta płatniczego (Mastercard). Mamy zatem do czynienia nie tylko z zaadoptowaniem technologii, ale i z wkroczeniem do grona technologicznych liderów w sferze płatności.

Słowa kluczowe: leapfrogging, metody płatności, płatności bezdotykowe, płatności zbliżeniowe