Digital payments during the COVID-19 pandemic in Poland: An initial insight on the consumer perception of security and convenience

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Abstract: Purpose/Research problem – The paper's key purposes are twofold: first, to identify the most important determinants for using mobile payments in the initial phase of the COVID-19 pandemic when the rules and behaviour changed; second, to investigate whether and why the coronavirus pandemic increased the degree of digital payments usage.

Design/Methodology/Approach – The aim of the survey was to capture the 'fresh' effect of restrictions imposed by the government in Poland regarding digital payments. The research data were obtained in the CAWI survey after the pandemic started and before the end of the first wave to assess the result just for that period.

Results – The study proved that the first phase of the COVID-19 pandemic increased the degree of mobile payments usage due to the prevailing sense of uncertainty. The pre-pandemic preferences of

buyers towards the cost, convenience, and risk have changed. In the initial phase of the pandemic, perceived personal security was extended and covered not only transaction security, but also health safety with benefits resulting from avoiding touching the banknotes and maintaining social distancing. This was identified as more important than perceived convenience and costs.

Originality/Value – The time of the analysis time was a kind of a 'research window', when the researchers and respondents were exposed to the first wave of the pandemic and did not have a foresight of the coming waves of virus transmission. The questions concerning the sum and quantity of spending were adjusted to the time of quasi-stability in the economy – after the previous crisis and before the inflation level rose in the subsequent waves – which was mainly the effect of the monetary policy response to lockdowns.

1. Introduction

The COVID-19 pandemic was an exceptional international problem whose effects could even surpass the global financial crisis of 2008–2009 (Loayza & Pennings, 2020). With the spread of the COVID-19 virus, the world that humanity was used to has changed and exposed the fragility of the established rules. During the pandemic, a high level of threat was felt along with a high level of uncertainty (Berezka et al., 2021; Kim et al., 2022). Consumers' needs and behaviour changed very quickly and the perceived security and convenience began to take on a different dimension. Closing citizens in their homes, shutting down some production plants and stores, and freezing supply chains created both new opportunities and threats. The pandemic changed the relation between consumers and entities operating in the market, and also highlighted many new problems on a global, regional and local scale. Globally, consumers, irrespective of their age, material status, level of education, and nationality, were greatly affected by the suddenly imposed restrictions on movement and direct contact. This new situation also created new opportunities. The lockdown made most people start using the Internet and Internet services intensively as most of the retail trade could only be conducted online, making it necessary to popularise digital payments with instruments other than cash. The use of Internet services rose from 40% to 100%, compared to pre-lockdown levels (De et al., 2020). Mobile payments allow the transfer of funds using mobile devices, which can be remote or contactless and have the character of a card or non-card payments.

Mobile payments are based on a financial exchange between two participants of the market using wireless technology supported by the adoption of consumer-based technology (Hampshire, 2017). The European Payments Council broadly defines mobile payments as all contactless payments through cards and other consumer devices (smartphones, portable computers, tablets, phablets, watches etc.), which broadens the understanding of mobile payments in the range of digital payments.

Digital payments developed during the COVID-19 pandemic due to many determinants analysed in the study. Firstly, the information provided to consumers was a plea to minimise the use of coins and banknotes, as it was pointed out that COVID-19 infection can be transmitted on them (Al-Sharafi et al., 2022; Zhao & Bacao, 2021). It was recommended instead to use non-contact digital payments such as payment cards, mobile, and internet payments. The growing use of digital payments was also associated with the increasing use of e-commerce purchases (De et al., 2020). The e-commerce environment is affected by a higher level of risk that accompanies the transaction, mainly due to the lack of direct access to products and the physical distance between buyers and sellers. In online purchases, security and trust are of the utmost importance (Cardoso & Martinez, 2019). The problem of financial institutions' reputation was analysed in the context of bank performance which may influence the consumer's ultimate trust in the provider of mobile payments (Miklaszewska et al., 2020).

The research question in the study concerned the security and convenience of the mobile payments: does it impose consumers' decisions regarding the choice of payment methods? In the context of security, the research emphasises various aspects of payment security concerning health safety, which during the pandemic was an important (and relatively new or better perceived) criterion for choosing the method of making payments and transferring funds, and the safety of payment mechanisms and infrastructure (transaction security) as the universal criteria.

The article's objective was to examine the reasons for changing and maintaining the use of mobile payments, or for deviating from the use of cash at the beginning of the pandemic in 2020 in Poland. The specific and detailed aim of the study was to capture the 'fresh' effect of restrictions and new regulations made centrally by the government, but most importantly also by the shops and other places where cash payments were made, asking to pay digitally. This approach seemed to be reasonable due to three additional factors which could affect the consumer behaviour: the repeated waves of the COVID-19 virus, which led to imposing the restrictions, the changing situation in the economy connected with rising inflation and interest rates levels altering the social reaction to expenditure and savings, and the way of making payments.

In this context, the period under analysis was a kind of a 'research window'. The researchers and respondents were exposed to the first wave of the pandemic and at that time did not have any perception of the coming waves of virus infections. Additionally, the questions concerning the total sum and quantity of spending/expenses, were adjusted to the time of long-lasting quasi-stability in the economy after the previous crisis, and just before the inflation levels rose in the subsequent waves, which was mainly the effect of the new monetary policy approaches and lockdowns in response to COVID.

Based on the literature review and the latest observations on the state of the surrounding environment at the beginning of the COVID-19 pandemic, the research questions were formulated on such assumptions as perception of security, convenience and cost as essential factors determining the usage or not of mobile payments. The author also attempted to examine the level and determinants of mobile payment use, with an emphasis on the circumstances of special regulations, and behavioural attitudes to making mobile payments.

The hypotheses assumed in the article are as follows:

(H1) *In the pandemic's initial phase, the most important determinant for using mobile payments as a contactless method is security*.
(H2) *In the initial phase of the pandemic, perceived security was more important for the customers than perceived convenience*.
(H3) *In the initial phase of the pandemic, the costs of using payment methods were less important for customers than security*.
(H4) *The coronavirus pandemic increased the degree of mobile payments usage*.

The main source of data for the analysis in this study was an anonymous online survey (CAWI). The aim was to gather the data after the beginning of the pandemic and before the end of the first wave, in order to assess only the result of this first wave. It was carried out between 27 May and 26 June 2020, when 217 filled questionnaires were received. The questions were divided into three groups: general financial preferences, use of mobile payments before and after the pandemic outbreak, and socioeconomic data (see Annex, Table A3).

The results were presented in the form of descriptive statistics, text analysis, and econometric analysis. For text analysis (only for one open question), the answers were collected and then the word clouds were created using the R package and an online generator. The variables considered in this study were mainly nominal or ordinal. All the outcomes are presented jointly in the results section. For the econometric aspect of the results, Statistica 13 software was used. In the econometric analysis, there were two elements: the McNemara test to check if the number of respondents using mobile payments was different than during the pandemic. The second and third parts of the analysis involved calculating the probit model with the same independent variables and different dependent variables on the ordinal scale (closed questions from the questionnaire with the Likert scale from 1 to 5). Before calculating the probits, correlations between variables were checked and two potential independent variables were excluded from further analysis.

All the probits were calculated with the most popular parameterisation approach with sigma restrictions. The default effects for the intergroup layout were used. To confirm and check the results, the Maximum Likelihood Test (LR1) was prepared for every ordinal probit model. The diagnostics of the probits were made according to the values of AIC (Akaike Information Criterion) and BIC (Bayesian Information Criterion) ratios.

The study is divided into three following sections. Section 1 presents the literature review results underlying the formulation of the four research hypotheses verified using the questionnaire survey and Delphi techniques. Section 2 clarifies the research methodology, and shows the empirical research results, and then the results are discussed. The final section concludes the paper, presents its limitations and proposes the future research directions.

2. Literature review

2.1. Mobile payments

The development of mobile devices and e-commerce has driven the growth of the mobile payment market worldwide (Mustafa, Hao, Qiao, Kifayat, Sun, 2022; Newman et al., 2018; Ul et al., 2017). In response to the emergence of online shopping, which relies on mobile payment services, more companies were entering the mobile payment-related market.

In the previous, pre-pandemic studies, the choice of payment method depended on the perception of convenience and risk (Arango & Taylor, 2009, pp. 11-12) as well as the perceived compatibility, usefulness, ease of use, and subjective norms (Aslam et al., 2017).

Past studies on the drivers and barriers of using mobile payment were valid, but at the same time inconclusive due to rapid changes in consumers' views on security, convenience, and cost in terms of the new limitations. Some studies concerned the risk and safety-related behaviour and started to search for factors related to the preparatory purchasing of healthcare products during the pandemic (Clemens et al., 2020; De et al., 2020; Garg et al., 2020). The rapid changes specifically covered lockdowns and virus transmission not only on goods but also on some payment tools, such as (plastic) cards and (paper or metal) cash, which involved cleaning the surface and/or keeping it aside for the required time. This was then connected with the growing awareness of the security of money transmission aligned with health safety, and the need to involve new parameters in the expected security and convenience.
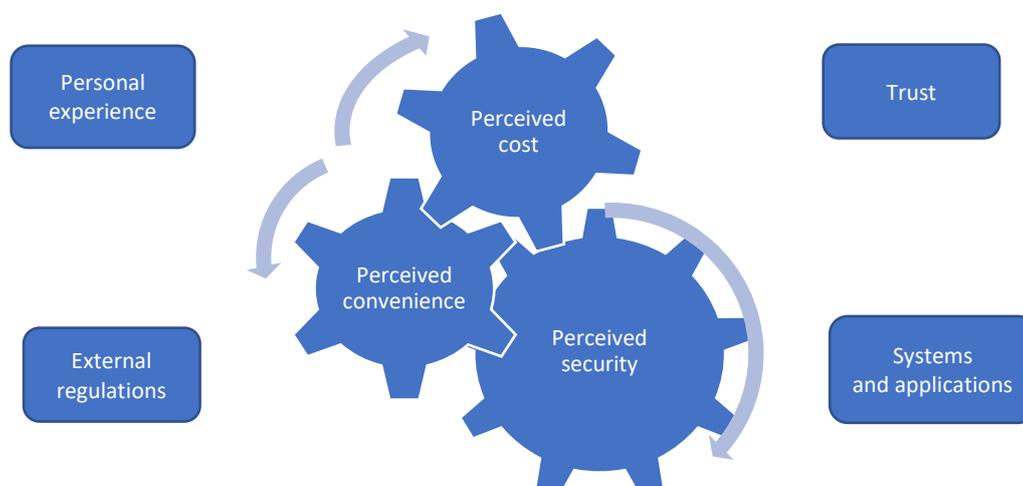

Fig. 1. Consumer perception factors connected with the use of mobile payments based on the literature review

Source: own preparation by authors.

The literature review shows different views on consumer perception concerning factors which are essential either in adopting mobile payments or in maintaining their use and acceptance (see Figure 1).

Souiden, Ladhari and Chaouali (2021) found that the TAM (Technology of Acceptance Model) and the UTAUT (Unified Theory of Acceptance and Usage of Technology) are the main conceptual frameworks and models adapted by scholars to explain consumers' use and intention to make mobile payments. They also categorised approaches to mobile payments within five main perspectives: (1) m-banking, attributes-based perspective based on system and applications, (2) customer-based perspective connected with personal experience, (3) social influence-based perspective, (4) trust-based perspective, and (5) barriers-based perspective (Souiden et al., 2021). Another approach proposed a conceptual model based on the theory of reasoned action, extended with additional mobile payment constructs identified in the literature review. These are usefulness, subjective norms, and personal innovativeness have a powerful, direct influence on the intention to use mobile payments (Liébana-Cabanillas et al., 2021). Based on the extensive literature review and revision of 46 studies, the factors affecting the adoption of digital payment methods in GCC (Gulf Cooperation Countries) were recognised as trust, perceived security and perceived usefulness (Alkhowaiter, 2020).

2.2. Security and risk in the payment system

Security is a critical feature in any payment system. In the annual Surveys of Consumer Payment Choice in the USA, consumers select security as the most significant aspect of payments, above convenience, speed, cost, and acceptance (Kahn et al., 2017; Kahn & Liñares-Zegarra, 2016; Zhao & Bacao, 2021). In these surveys, security consisted of three components: security of personally identifiable information, security of financial wealth and security of information about payment transactions. Payment speed was rated in four dimensions: speed at time of payment, speed of payment deduction, speed of recipient receiving payment and speed of notification of balances (Schuh & Stavins, 2016). When comparing the abovementioned aspects of payment security and the four aspects of speed to consumers, the most important are all three aspects of security, which were rated higher than any aspect of speed. "The security of financial wealth was ranked as the most important. Among the speed aspects, the speed at time of payment was ranked as the most important, although there are small differences among the speed-related responses" (Schuh & Stavins, 2015).

Limited attention has been devoted to the understanding of risk preferences. Risk can be defined as uncertainty concerning an action (Miklaszewska et al., 2020). The perceived risk is significant in the online environment due to "the inherently risky nature of the Internet, intangibility, lack of control, anonymity, potential opportunism and lack of security and privacy protection"(Kaur & Arora, 2021). In order to advance the body of knowledge on this subject, this study included perceived risks, among which an important dimension in shaping the behavioural intention and usage of mobile payments (Liébana-Cabanillas et al., 2014). Similar to the focus on consumers' risk perception, some previous studies stressed psychological concerns, including trust and distrust (Dimoka, 2010; Xin et al., 2013), perceived security risk, and financial, privacy and safety, in modelling consumers' intention to use online services. Trust entails a sense of emotional security (affective trust) and is based on beliefs about the trustee's competency and integrity (cognitive trust) (Atalay, Birincioglu, Acuner, 2022; Järvinen, 2014; Vasileiadis, 2014; Xin et al., 2013). It was found that trust in the mobile service provider and mobile technology and the mobile payment vendor are vital factors influencing the intention to use mobile payment (Geebren & Jabbar, 2021; Ramos et al., 2018; Sharma & Sharma, 2019). A similar conclusion applies to the consumer's online repurchase behaviour. Neuroscience has also investigated consumers' neural response to risky and secure e-payments and how consumers process online risks. It was found that consumers' choice of payment systems is determined by the consumer's neural response (Casado-Aranda et al., 2018). Financial incentives in different forms, monetary and/or nonmonetary rewards, resulted to be effective in attracting and retaining customers in the process of mobile payments (Agarwal et al., 2012), while only a handful of studies provided empirical evidence to support the effect, especially that of monetary rewards offered by mobile pay companies, on the usage of this new payment alternative (Wang et al., 2019).

Security was found to be significant in consumers' perception of intermediaries taking part in payment transactions. These institutions guarantee that "the payment is sent and received by the intended person at the correct amount" (Rehncrona, 2018).

Intermediaries that consumers trust reduce the risk perceived as uncertainties involving losses – both the loss of money and privacy risks (de Kerviler et al., 2016; Taylor, 2016; Yang et al., 2015). It is worth adding that the media influences consumers' confidence and perception of the security of payment instruments as well as their payment behaviour (Kosse, 2013a) which leads us to the analysis of consumer behaviour and intention.

Consumer-oriented technology is an integral part of contemporary society in which trust and risk affect the intention to use mobile payments. Perceived risk is built upon two different perspectives: the probability of the event and the consequences of the outcome affected by this risk (Hampshire, 2017). The pandemic was associated with a new dimension of security which was health safety, and therefore the article emphasises various aspects of payment security, which concern both health safety and the safety of payment mechanisms and infrastructure.

In this context, hypothesis (H1) was formulated that *in the pandemic's initial phase, the most important determinant for using mobile payments as a contactless method is security*.

2.3. The role of convenience

The studies regarding the choice of payment method indicated the perceptions of convenience and risk (Arango & Taylor, 2009) as well as perceived compatibility, usefulness, ease of use, and subjective norms (Aslam et al., 2017). Kosse proved that consumers' perceptions of safety were mainly influenced by their views on the likelihood of incidents (Kosse, 2013b). It was found that consumers' beliefs about the probability and consequences of possible safety incidents were influenced by their experiences and personal characteristics. However, perceived incompatibility, lack of trust, and technological anxiety would hold back older customers from using cash to making cashless transactions (Cham et al., 2022).

Based on other analyses (Gros, 2017) it can be said that financial innovations such as electronic payment systems seem to have had little impact on the use of cash. The ratio of currency in circulation to GDP has increased in most OECD member countries (except Sweden and Denmark) over the last decade before the pandemic. In this context, it was particularly interesting to investigate whether the global COVID-19 pandemic became an opportunity to increase the use of cashless payments. Conversely, Al-Sharafi et al. confirmed the ability to sustain the use of mobile payments in the short and long term of the COVID-19 pandemic (Al-Sharafi et al., 2022).

The other research of the results on online convenience in mobile payments indicated that access, transaction, benefit and post-benefit convenience significantly affect m-banking adoption intention (Jebarajakirthy & Shankar, 2021). The findings are in accordance with previous literature findings (Duarte et al., 2018; Roy et al., 2018). Consumers tend to adopt mobile payments because they expect to be provided with the services at all times and in all places which means their full undisturbed availability. Furthermore, consumers may be motivated to adopt mobile payments due to the perceived convenience performed by fast-click transactions and the several methods available to contact the customer support team when needed.

In particular, some research proved that search convenience and evaluation convenience have no significant impact on the intention to adopt mobile payments. This outcome is associated with the similarity of products and services, when in fact search convenience and evaluation convenience have less impact on consumers' decisions regarding channel for mobile payments (Jebarajakirthy & Shankar, 2021). McCole's findings of the moderated mediation analysis suggested that the mediating impact of all convenience dimensions (e.g. access, transaction, and post-benefit convenience) connected with

personal experience does not fluctuate nor impact on consumers' perceived security concern (McCole et al., 2010). The results also indicated that perceived utilitarian values significantly facilitate the impact of dimensions of online convenience on adoption intention (Kacen et al., 2013). Accessing the banking services at any time and from anywhere, the availability of online information, quick transactions, easy and immediate evaluation of payment services, and several options to connect with a support team, not only provide enjoyment but also utility to the consumers, and therefore they tend to adopt the mobile payment services (Jebarajakirthy & Shankar, 2021).

Taking the above considerations into account, hypothesis (H2) was formulated that in the initial phase of the pandemic perceived, security was more important for the customers than perceived convenience.

2.4. The impact of cost

Mobile payments are very demanding due to the need to support electronic transactions' security and convenience. The complexity of the methods is linked to cryptographic needs, the number and frequency of transactions, settlements and the involvement of various financial institutions in the process of acceptance and verification. Some research link mobile payments to the usage of context information (Abedi et al., 2012).

The impact of risk and cost on the users' intention to adopt mobile payments were also analysed by Liu, Wang and Li. Their research on the acceptance of mobile payments indicated that risk and cost were discovered as inhibiting factors. Perceived mobility had a positive and direct impact on perceived convenience; however, perceived risk and perceived cost negatively affected a user's intention to use mobile payments (Liu et al., 2019).

Humbani et al. noted that convenience and compatibility drive consumers' adoption, whereas risk, cost, and insecurity are inhibitors (Humbani & Wiese, 2018).

Abedi, Nematbakhsh, and Abdolmaleki indicated the types of cost paid by consumers using mobile payments, which is consistent with the consumer-centred approach, such as: call costs (domestic or roaming connections), digital content purchase cost (music, video, news, ring tones, online game subscription, wallpapers etc.), cost of using services and internet transfer through mobile devices, cost of purchasing hard goods (books, magazines, cinema tickets etc.), cost of transportation (bus tickets, tram or train fare, car park fees etc.). They also described the importance of context information in mobile payments, which influences the volume of payment (in calls, it was the time of a day or a week, the special discount provided with time or place, membership and loyalty discounts, type of SIM card, showing or not the adverts, selection of payment method, delivery duration and method (Abedi et al., 2012).

It is also worth paying attention to the results of the survey conducted by KPMG, showing that value for money was the most critical factor influencing purchasing decisions for 80% of Polish respondents participating in the survey before the outbreak of the pandemic. This means that Poles were even more sensitive to the price factor than international consumers, where the price was important for 60% of the respondents. Next there were factors such as ease of purchase and trust in the brand. However, the outbreak of the COVID-19 pandemic changed Poles' expectations. The factor that gained the most importance during the pandemic was safety, which 58% more Poles began to pay attention to than before its outbreak. In turn, the ease of shopping during the COVID-19 pandemic began to attract 41% more Poles than before its outbreak (Karasek, Musiał, Gaponiuk, 2020).

Considering the importance of cost for consumers, hypothesis (H3) was formulated that *in the initial phase of the pandemic, the costs of using payment methods were less important for the customers than security*.

2.5. Digital payments in Poland before the initial phase of the COVID-19 pandemic

Digital payments are mostly dependent on the following: payment via VISA or Mastercard or other supplying institution card in the form of a credit card or a debit card, accepted through SMS, a mobile application, and WAP technology(Abedi et al., 2012). In Poland, one of the essential applications for mobile payments is BLIK, supported by a network of leading Polish commercial banks.

At the time of the study, precisely in the second quarter of 2020, there were 43.3 million payment cards in circulation in the Polish market (active and inactive), and it is worth adding that the number of cards increased over two times between 2004 and 2019 (Figure 2).
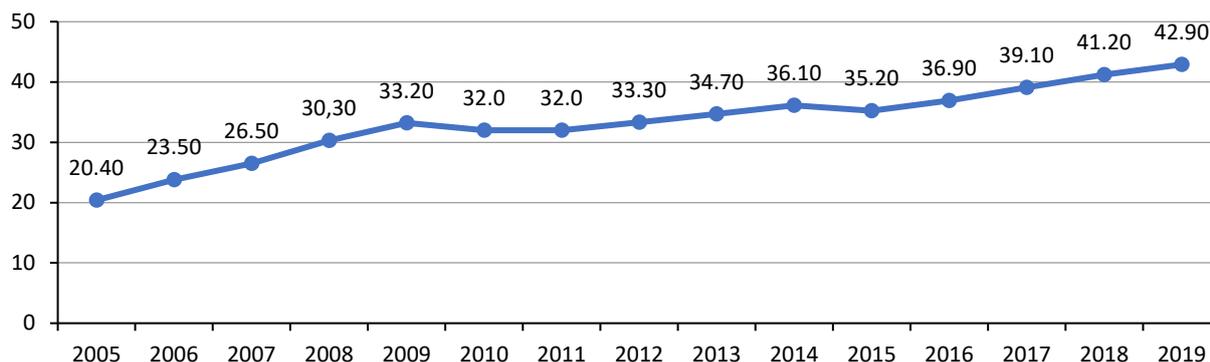

Fig. 2. The number of payment cards in Poland in 2004-2019 (in millions)

Source: own elaboration based on (National Bank of Poland, 2020a).

At the end of June 2020, the number of active payment cards held by both business and private customers amounted to 28.5 million (65.7% of all cards issued), where 51.2% of payment cards were issued by VISA, and 48.1% by Mastercard. Regarding the method of transaction settlement, debit cards (35 million) had the largest share (80.8%), and 5.5 million credit cards (12.8%). Prepaid and charge cards had the lowest market share (6% and 0.5%, respectively) (National Bank of Poland, 2020a).

It is worth emphasising that the value of individual orders has been growing since the beginning of the pandemic in Poland in 2019 (from PLN 1.32 to 1.51 trillion PLN).

In analysing the number and value of orders (Figures 3 and 4), it is worth noting that the most commonly used systems are Express Elixir and Blik.
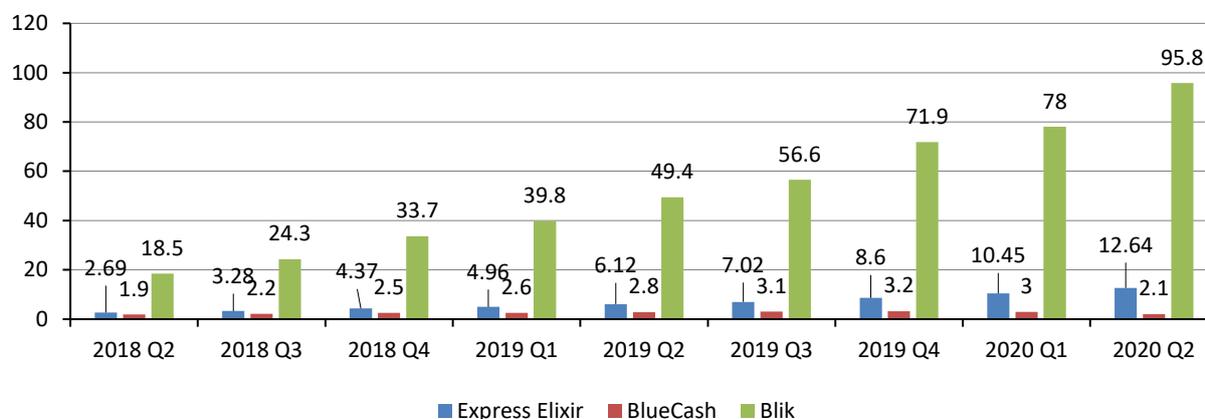

Fig. 3. Number of orders executed in the Express Elixir, BlueCash, BLIK systems in subsequent quarters from 2018 Q2 to 2020 Q2 (in millions PLN)

Source: own elaboration based on (National Bank of Poland, 2020b).

The specificity of the Express Elixir system is that the number of transactions is relatively small, but their value is significant and even dominant. In turn, Blik is a system gaining the greatest popularity – the number and value of payment orders are systematically growing.
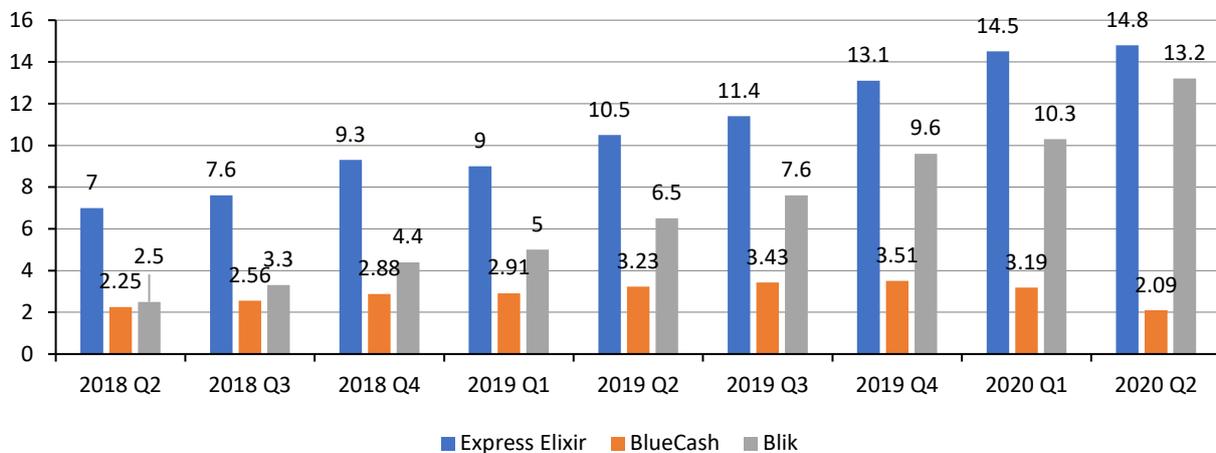

Fig. 4. Value of orders processed in the Express Elixir, BlueCash, Blik systems in subsequent quarters from Q2 2018 to Q2 2020 (in billions PLN)

Source: own elaboration based on (National Bank of Poland, 2020b).

The preliminary analysis before the study showed that the respondents' awareness of the mobile payments concept (*cognitive bias*) was often shaped by texts posted on the Internet, different definitions of products offered by financial institutions themselves, as well as by the sellers of products and services. Consumers use mobile payments in many ways, having many options at their disposal. The respondents used payments offered in the omni-channel and multi-channel system by banking institutions, as well as by entities with the status of fintechs. The examples are non-cash payments, e.g. for transport services (SkyCash, Uber, Lime, e-scooters and bicycles), ApplePay and GooglePay transfers. Mobile payments were a construct understood by the respondents as non-cash payments involving remote or contactless money transfers, while the initial research carried out during the development of the questionnaire content showed that questions about digital, contactless, or electronic payments would be less understandable. In the study, the separation of such non-cash payment methods as card payments and payments with the use of a mobile phone was an element of their distinction due to the determination of consumer preferences as to the method of making non-cash payments. Card payments have been used on the payment market for longer than payments using mobile phones, which is related to the development of technology, while during the pandemic more people than before could make card payments online. Thus, it was important to indicate card payments as one of the alternatives to non-cash payments, next to those using applications installed on a mobile phone (Annex, Table 3).

The focus in the research was, however, on consumer behavioural change at the beginning of the pandemic, concerning similar observations in different parts of the world (the UK, the USA, Thailand, India, BRICS countries, etc.) (Berezka et al., 2021; Chronopoulos et al., 2020; Clemens et al., 2020; Girish & Manu, 2020; Schindler, 2021; Yakean, 2020). For this reason, it was decided to examine this situation in Poland, formulating hypothesis (H4) that *the coronavirus pandemic increased the degree of mobile payment usage.*

3. Research methodology

The broad literature and reports on the customers' behaviour during the pandemic provided an initial insight into possible changes in using mobile payments. The research questions concerned the area of advantages and disadvantages of digital banking in the period of the pandemic, and the evolution of the attitude to the use of contactless payments.

The hypotheses were verified in the two-stage research: a survey with the customers and a Delphi interview with experts. The non-random sampling for the survey required the use of the additional verification to confirm or not the proposed hypotheses.

The main source of data for the analysis in this study was the data obtained in an anonymous online survey (CAWI). The aim was to gather the data soon after the pandemic started and before the end of the first wave, to assess only the result of this first wave. It was carried out between 27 May and 26 June 2020. The questionnaire contained a range of closed questions and one open question. The questions were divided into three groups: general financial preferences, mobile payments before and after the pandemic outbreak, and socioeconomic data.

The study was not based on random sampling. The main procedure to obtain completed questionnaires was sharing the link to the survey using the snowball method, which was confirmed to be one of the reliable methods when adequately designed and combined with the additional method (Biernacki & Waldorf, 1981; Noy, 2008). As a result, 217 filled-in questionnaires were received. Despite the non-random sampling and a limited number of responses, the results can still provide interesting insights for examining the use of mobile payments as an effect of unexpected events.

The main socioeconomic characteristics of the research sample are presented in Table 1. The age of the respondents ranged from 17 to 70. The Z (aged 18-24) and Y generations (aged 25-40 at the point of carrying out the survey) (Bhavana & Thiruchanuru, 2018) constituted 88.94% of the research sample, which may be explained by the higher digital literacy of younger potential respondents (Gentilviso & Aikat, 2019; Kilian et al., 2012; Parry & Battista, 2019).

Due to the specifics of young adults' lives, in the data analysis the respondents were divided into age groups, with the youngest cohorts split into two groups: under 25 years old and 25-30 years old. This was reflected by the division made usually for consumer behaviour according to life stages associated with professional and education careers as well as the phases of private life (moving from the family house, getting married, having children, children leaving home, etc.) (Parment, 2013). However, the differences between the age groups were not observed in this study.

Table 1. Characteristics of the research sample

Variable		Research sample [%]
Gender	women	63.13
	men	35.02
	non-binary	0.92
	prefer not-to-say	0.92
Age group [years]	below 25	71.43
	25-30	10.60
	31-40	6.91
	41-50	10.14
	above 50	0.92
Place of residence [towns/villages by number of population in thousands]	over 500	5.53
	250-500	37.33
	100-250	13.82
	50-100	4.61
	20-50	17.51
	up to 20	21.20

Source: own preparation.

The results are presented in the form of descriptive statistics, text analysis and econometric analysis. For text analysis (for the only one open question) the unification of answers was made, and then the word clouds were created using the R package and an online generator. The variables considered in this study were nominal or ordinal. All three elements are presented jointly in the section Empirical Results.

For preparing the econometric part of the results, Statistica 13 software was used.

In the econometric analysis, two elements were used: first, the McNemara test to check if the number of respondents using mobile payments before the outbreak differed from that during the pandemic. The second and central part of the analysis was calculating the probit model (Delle Site et al., 2019) with the same independent variables and different dependent variables on the ordinal scale (closed questions from the questionnaire with the Likert scale from 1 to 5). The research questions are listed in Annex, Table A3.

Some of the questions were only described by basic statistics, and others by probit models (Q9, Q11, Q12, Q13, Q14, Q15), but all the Likert-scale questions were checked to prove compatibility or non-compatibility between the respondents and experts. Before calculating the probits, correlations between variables were checked. Two potential independent variables were excluded from further analysis. All the probits were calculated with the most popular parameterisation approach with sigma restrictions.

The default effects for the intergroup layout were used.

For every ordinal probit model, to confirm and check the results, the maximum likelihood test (LR1) was prepared (Ierza, 1985). Diagnostics of the probits were made according to the values of AIC and BIC ratios. The age group was insignificant in all the analyses, but it has to be noted that this was the only socioeconomic variable strongly biased because of the overrepresentation of younger respondents, therefore it was decided to validate the results with the Delphi technique.

Delphi technique (or Delphi method) is widely used in social sciences. It assumes engaging the field experts to express their opinions about the current state or changes in the field they specialise in.

The experts were asked to indicate how in their opinion, the customers made their decisions and used mobile payments during the first wave of the pandemic in 2020. The Delphi interview was designed according to three sources (Barrios et al., 2021; Habibi et al., 2014; Päivärinta et al., 2011). The questions included in the Delphi interview with experts were chosen from the previous survey (the questions about customer behaviour related to mobile payments).

Using the experts' opinions aimed at the validation (or not) the survey results were based on non-random sampling. After collecting the results, they were analysed to examine the homogeneity of scores given by the experts from different subgroups (sector, position, experience) and their compatibility with those given by the survey respondents. For that, the study used the dispersion coefficient proposed by (Kiba-Janiak, 2016):

$$D_r = \frac{k}{k-1}\left(1 - \sum_{j=1}^{k} f_{rj}^2\right) \qquad (1)$$

where $0 \leq D_r \leq 1$; D_r – dispersion coefficient; k – number of categories in question r; f_{rj} – incidence of category j in question r.

The results of the expert opinions, according to the approach of the dispersion coefficients examination presented, revealed that there was no need to carry out another interview round (Kiba-Janiak, 2016).

In the Delphi interview conducted in the research process, 26 experts took part, representing different genders, positions, and sectors (see Table 2).

The recruiting of the expert's group was purposive and the restrictions for group members were as follows: minimum 5 years of experience, working in Poland, employment related to the financial sector (banks or non-banking institutions or financial departments of big companies).

Table 2. Characteristics of the expert's group

Variable		Research sample [%]
Gender	women	50
	men	50
Age group	under 30	11.54
	30-35	19.23
	36-40	23.08
	41-45	23.08
	46-50	23.08
Professional experience [years]	5-10	26.92
	11-15	26.92
	16-20	23.08
	above 20	23.08
Position	director	30.77
	manager	34.62
	specialist	34.62
Sector	banks	57.69
	non-banking financial institutions	30.77
	financial departments in companies	11.54

Source: own preparation.

First, from the ready-to-use database of the research team, the sampling was made to obtain a similar number of men and women, a similar number of age groups (except the group aged under 30 because of the smaller probability to have at least five years of experience), similar experience and position. It was also assumed that bank employees should represent 50% of the group because of their wider focus and understanding of mobile payments adoption and banking consumer behaviour.

To be compatible with the rules of the Delphi technique, it was important to calculate the dispersion coefficient for the expert group – the whole group or the subgroups. The dispersion coefficient describes this homogeneity as high/good (when it is lower than 0.5), moderate (0.5-0.8) or low (above 0.8). Low homogeneity requires making the second round of experts' interviews. If the dispersion coefficient is high, the second round of experts is not necessary, if moderate – the second panel is required on some conditions. The dispersion coefficients are presented in Table 3.

Table 3. Coefficient of dispersion in the expert's group

Variable		Research sample
Gender	Women	0.67
	Men	0.55
Age group [years]	under 30	0.67
	30-35	0.61
	36-40	0.44
	31-45	0.51
	46-50	0.53
Professional experience [years]	5-10	0.64
	11-15	0.53
	16-20	0.44
	above 20	0.57
Position	director	0.54
	manager	0.53
	specialist	0.57
Sector	banks	0.46
	non-banking financial institutions	0.62
	financial departments in companies	0.53

Source: own preparation.

The results for the experts group, considering it being a large group, are supportive. Most of the coefficients were near 0.5 or 0.6, reflecting moderate homogeneity in the subgroups. For the whole group of experts the coefficient was 0.63 and varied for different scale questions examined. Summing up, because of the moderate homogeneity, there was no need to carry out the second round of the Delphi panel.

Finally, to check the compatibility of answers of the respondents and experts on the scale questions (Q2, Q5, Q14), the Kruskal-Wallis test was held, and a non-parametric test used for comparing two independent groups with non-normal distribution.

4.   Empirical results of the analysis

The results were presented in the form of descriptive statistics, text analysis and econometric analysis. For text analysis (for the only one open question) the unification of answers was made and then the word clouds were created using the R package and an online generator. For preparing the econometric part of the results, Statistica 13 software was used, while the econometric analysis had two elements: the McNemara test and probit model. Diagnostics of the probits were made according to the values of AIC and BIC ratios.

The initial examination of the survey respondents' preferences covered the factors they considered as important features of payment methods (Q1: *What are the most important issues for you in using banking services?*). The survey respondents declared using different payment methods, both traditional and digital (e.g. online banking, mobile payments, cards, cash, others). As a result, all the respondents assessed the security issue very highly (80% of the indications, see Figure 5).

Fig. 5. General priorities of the respondents in the field of banking services features (Q1: *What are the most important issues for you in using banking services?*)

Source: own preparation.

Additionally, the users of mobile payments also revealed the speed and convenience of mobile payment as very important. The third determinant indicated by the respondents was the cost understood as the level of bank commissions, the fee for using a payment card as well as the costs and other inconveniences related to cash transactions carried out at ATMs.

At the same time, non-users of mobile payments (being a minority in the study) did not want to give up their habits because they liked paying with cash or (second option) by card and also did not trust in the security of mobile payments. Those findings were supported by examining what kinds of transactions were made with the use of mobile payments. Regular payments, occasional ones and transfers to another person dominate in this matter. The least popular were online loans, cash-back and online deposits. The experts answered similarly regarding the customers' preferences (see Figure 6). Almost all of the experts thought that security of funds, speed and convenience of use, card fees and fee level were the most important features while using different payment methods by customers.

Hypothesis H1 stating that *in the initial phase of the pandemic, the most important determinant for using mobile payments as a contactless method is security*, may be assessed as proven. The results also proved hypothesis H2 that *in the initial phase of pandemic, perceived security was more important for the customers than perceived convenience*.
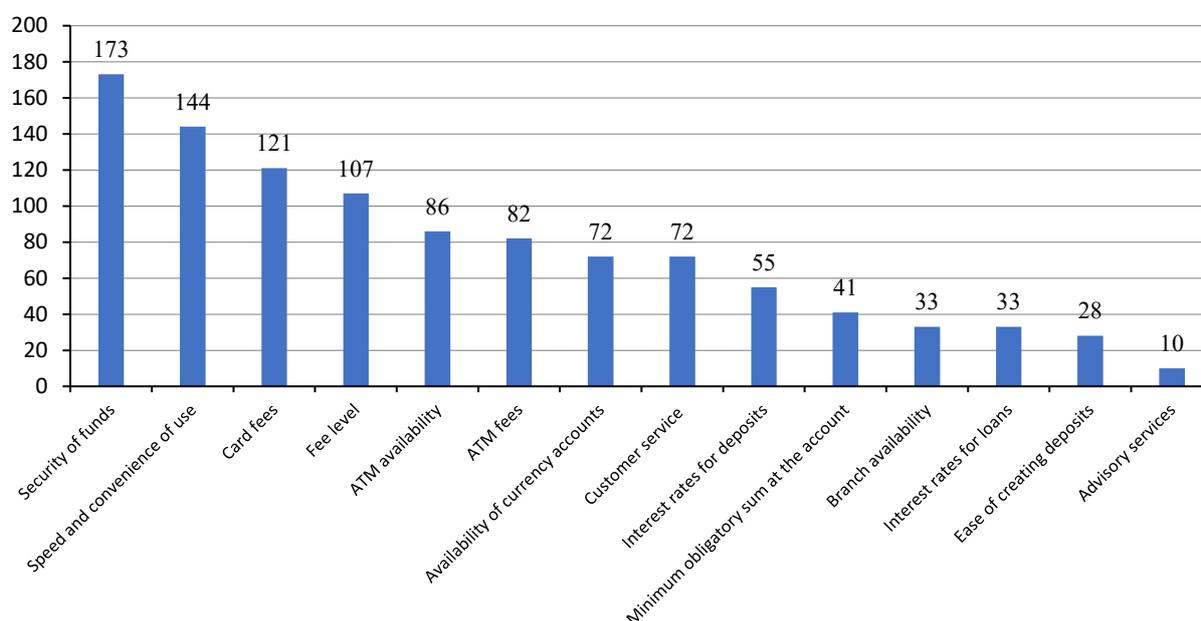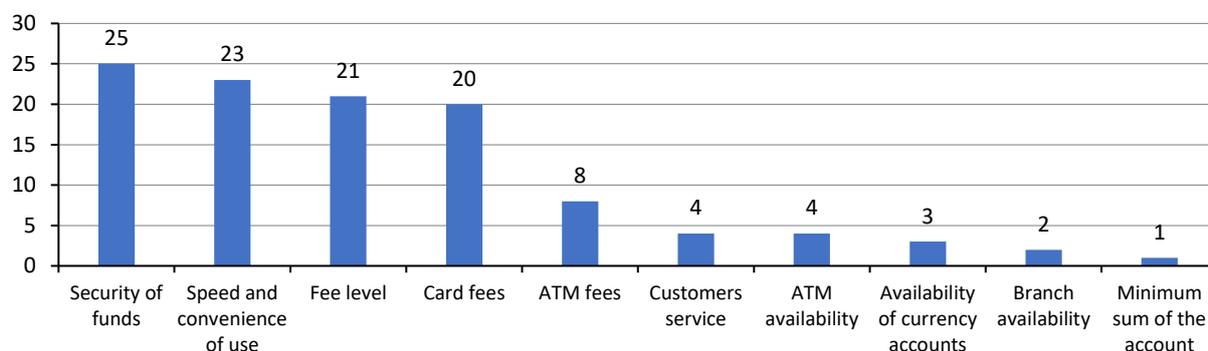

Fig. 6. Experts' answers on customer priorities in the field of banking services features (Q1: *What are the most important issues for you in using banking services?*)

Source: own preparation.

Mobile payments were generally important for the respondents (Q2: *Are mobile payments important for you?*). The average assessment of their importance was 4.44 on the scale from 1 to 5 (the experts assessed this similarly, at 4.78).

Digital banking services, including mobile payments, were assessed as useful during the pandemic (see Figure 7).

Fig. 7. Reasons for using mobile payments during the COVID-19 pandemic (Q3: *Why do you use mobile payments during the pandemic?*)

Source: own preparation.

The respondents could indicate more than one answer for the question (Q3: *Why do you use mobile payments during the pandemic?*). Ultimately, they agreed to meet the expectations of the government as to keeping social distancing and minimising the opportunities to become infected in a space where ma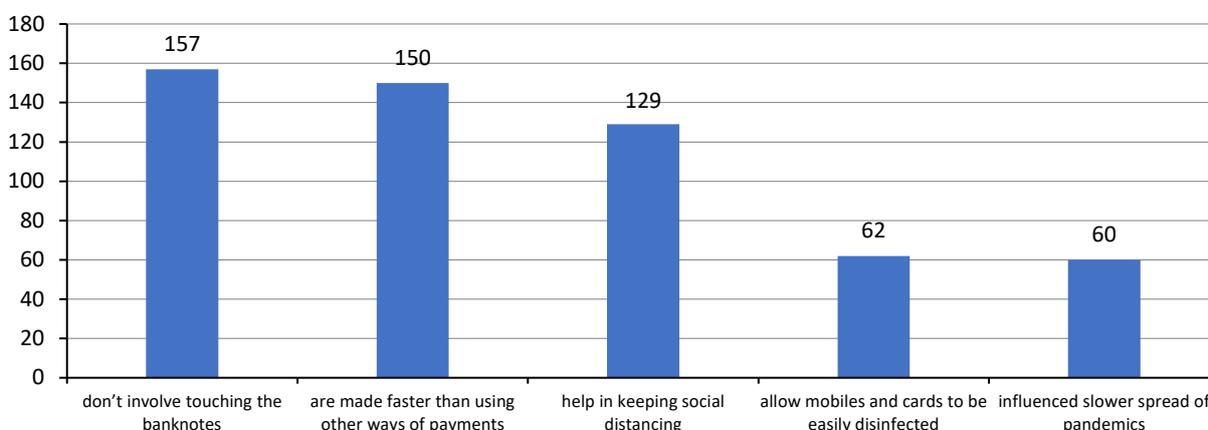ny people are present together at the same time. However, the respondents assessed higher the convenience of mobile payments in avoiding touching the banknotes and faster payment process. In addition, and as a side effect, the mobile payment users appreciated the speed of mobile payments more than other kinds of payments. As a result, the users noticed the mentioned advantages of mobile payments, and this could be a good start for a fast rise in the number of new mobile payment users attracted by consumer opinion. The experts assessed the issue similarly to the respondents (see Figure 8), but underestimated the attention of the users to the slower spread of the pandemic.
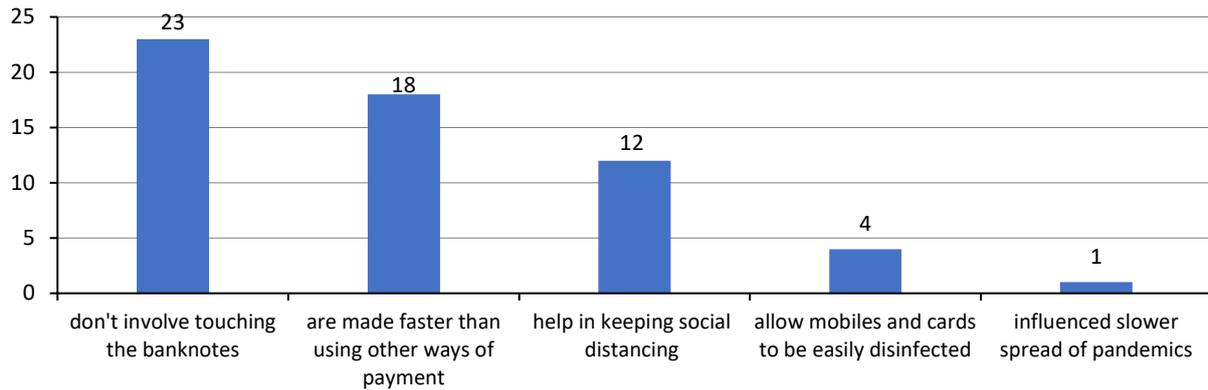
Fig. 8. Experts' opinions about reasons for using mobile payments by customers during the COVID-19 pandemic (Q3: *Why do you use mobile payments during the pandemic?*)

Source: own preparation.

Question 4 (*What kinds of payment do you use: cash, cards, mobile payments?*) provided the point of analysis for further questions (Q5 and the following) and also allowed analysing the consumer behaviour in the questions Q1 to Q3, dividing the respondents into users and non-users of mobile payments at the beginning of the pandemic and thereafter.

Hence, the respondents mostly did not declare starting the use of new mobile tools since the beginning of the pandemic (Q5: *COVID-19 has increased the scale of my use of mobile banking services*), because they generally used them before the pandemic's outbreak, while only 12.90% of the respondents confirmed using some new tools, whereas most were using several tools before. The experts assessed that the customers used mobile payments before the pandemic and only continued this during the pandemic. They also thought that most of the respondents in the survey indicated that they use mobile payments.
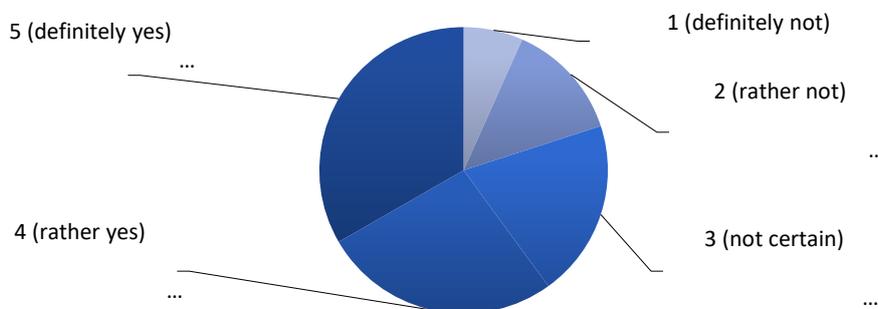

Fig. 9. Increase in intensity of using mobile payment during the pandemic (Q7: *Did you increase using mobile payments during the pandemic?*)

Source: own preparation.

Another dimension of using those tools is the intensity of use. The respondents were asked to indicate if they increased their use of mobile payments because of the pandemic (Q7: *Did you increase using mobile payments during the pandemic?*), and 59.91% indicated the answers "not" or "rather not", while the remaining 40.01% "yes" or "rather yes".

Generally, as presented in Figure 9, 60% of the respondents declared higher intensity of using mobile payments during the pandemic.

Within the surveyed group, 84.79% used at least one mobile payment method before the first wave of the pandemic – 177 persons, who used mobile payments before the pandemic, used them during the pandemic, and there were also 14 new users, while 7 people stopped using mobile payments, and there were 19 staunch non-users (see Table 4).

Table 4. Data for users (Yes) and non-users (No) of mobile payments before and during the pandemic outbreak (Q7)

	Before the pandemic				
	Answer	Yes	No	Total	%
During the pandemic	Yes	177	14	191	88.02%
	No	7	19	26	11.98%
	Total	184	33	217	100%
	%	84.79%	15.21%	100%	

Source: own preparation.

To assess if the pandemic influenced significantly the number of users, the McNemara test was carried out according to the data for using those kinds of payments before and after the pandemic outbreak. The value of the test (1.71 with p=0.191) confirms that the pandemic did not cause an increase in mobile payment users.

These results were supplemented by the answers to the open question regarding the reason for starting using the new tool, refraining from one, or no change in the habits (Q8: *Why did you use or not use mobile payments?*). Most declared not changing their habits because of using mobile payments before the pandemic. The answers dealing with some reasons for changing the habits were refined, and then analysed in two groups: presenting the reasons for using those payments (see Figure 10), and the reasons for refusing to use them (Figure 11). In the respondents' opinion, the main advantages of mobile payments were simplicity, convenience (and comfort), speed, safety and being helpful. The general outcome was that mobile payments are perceived as simplifying the lives of people. The above results proved hypothesis H4 that *the coronavirus pandemic increased the degree of mobile payments usage*.

Fig. 10. Reasons for using mobile payments during the pandemic (Q8: *Why did you use or not use mobile payments?*)

Source: own preparation.

Fig. 11. Reasons for not using mobile payments during the pandemic (Q8: *Why did you use or not use mobile payments?*)

Source: own preparation.

An interesting result was that even if the responding person did not use the mobile payments, he/she assessed its convenience as high. The average score in this matter was 4.23 for the whole group in the Likert scale (Q7 and Q8, see Annex, Table A3). However, if the reason for using those payments as legal regulations was declared, they assessed it on the same scale significantly lower (Q9, mean score 2.55). Moreover, using mobile payments was not greatly determined by the restrictions made by shops (Q10, *I used mobile payments during the pandemic because it was suggested by shops*, mean score of 2.63). The respondents also admitted that this kind of payment helped them to keep social distancing (Q11, mean 3.55). The responses were compared to those given by the experts in the next part of the results. The possibility of staying at home was not declared as an essential factor in using mobile payments (52.99% of respondents), but for a substantial part of the group, it was a significant motivation (35.02%).

These results were confirmed by the answers to the other questions, in which the surveyed group assessed mobile payments as the easiest way to pay, e.g. bills (Q6, *Mobile payment was a convenient payment method, also for bills during the pandemic,* score 4.12), when as a result, they can stay at home. The respondents also declared that they became accustomed to using mobile payments to pay for goods and services on the Internet (Q15, mean score 4.35).

Only 19 out of the 217 respondents (8.76%) indicated that they did not use mobile payments. The remainder of the surveyed group pointed to one or more products or services bought using mobile payments (not only on the Internet) (see Figure 12). The most popular products were clothes, food, shoes, and cosmetics, which generally are hard goods, not services.
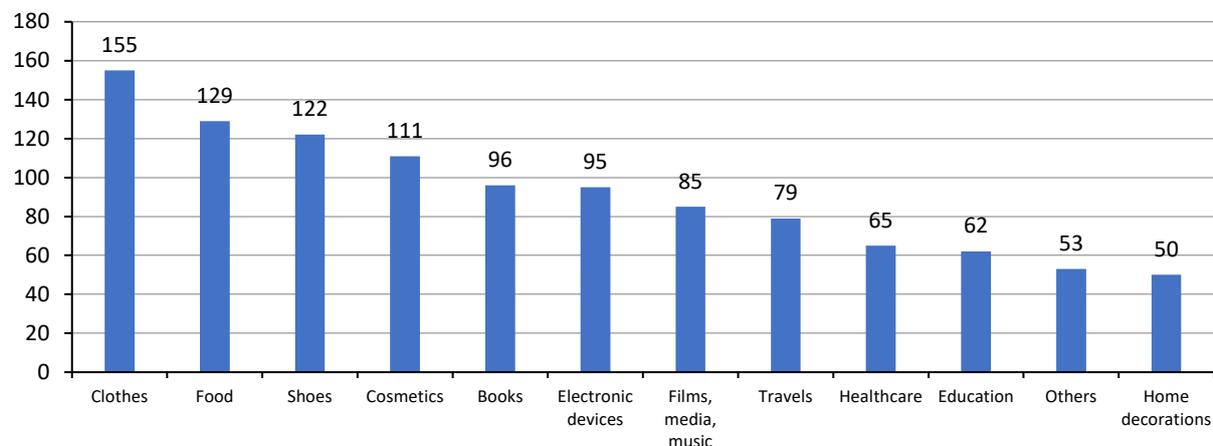

Fig. 12. Goods and services bought with the use of mobile payments (Q17: *What goods or services do you buy on the Internet?*)

Source: own preparation.

These findings were supported by examining what transactions were made with the use of mobile payments (see Figure 13). Regular payments, occasional ones and transfers to another person dominated in this matter, whilst the least popular were online loans, cash-back and online deposits. These results applied only to the respondents who previously stated that they were mobile payments users.
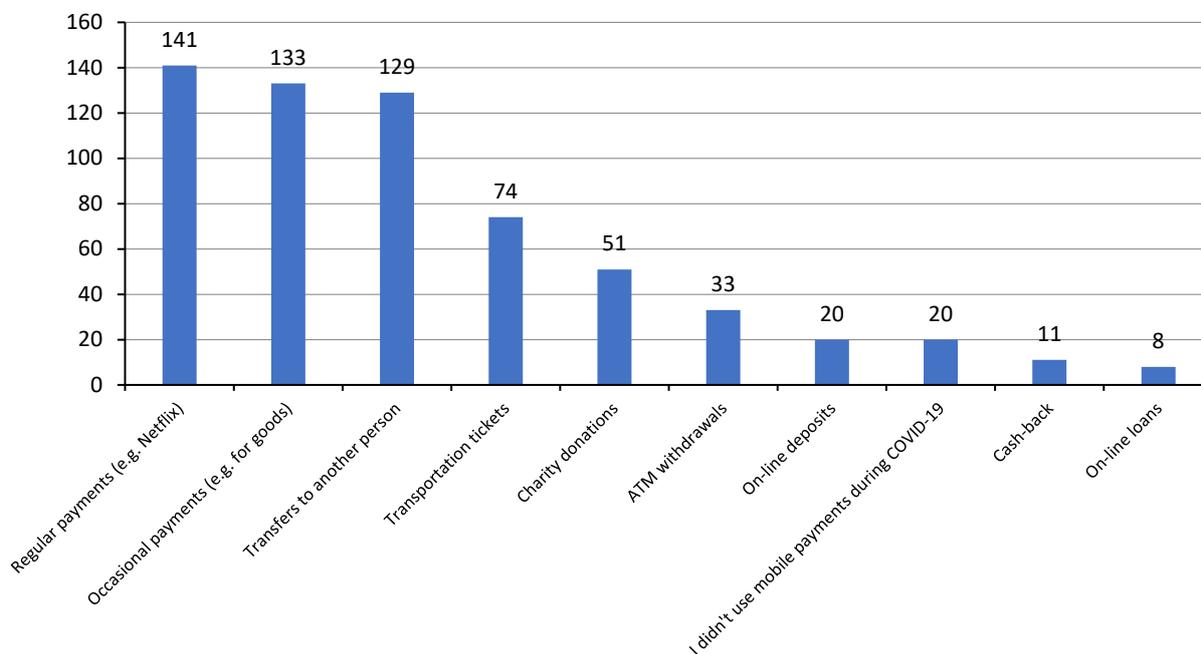

Fig. 13. Transactions made by mobile payment users (Q18: What payments and transfers did you make on the Internet during the pandemic?)

Source: own preparation by authors

During the pandemic, the respondents generally did not make more mobile payments or did more frequent shopping (Q12, *I made shopping more frequently and paid more with mobile payments during the pandemic*, mean score 2,74). There was no opposite situation – paying more even if buying less (Q13, *I did shopping less frequently but paid more with mobile payments during the pandemic*, score 2,8).

In the complementary section, the answers of both the respondents and the experts were compared to check if the experts' opinions were homogeneous with the respondents' ones (see Table 5).

Table 5. Comparison of respondents' and experts' opinions

Question	Mean		Wald-Wolfowitz		Kolmogorov-Smirnov	U Mann-Whitney	
	Experts	Respondents	Z (corr.)	P	P	Z (corr.)	p
Q2	4.808	4.442	3.704	0.000	p > .10	1.786	0.074
Q7	2.885	2.876	0.699	0.485	p > .10	0.089	0.929
Q6	4.500	4.226	1.672	0.095	p > .10	0.590	0.555
Q9	2.423	2.553	0.360	0.719	p > .10	-0.027	0.978
Q10	2.500	2.631	1.333	0.183	p > .10	-0.132	0.895
Q11	3.769	3.548	-0.022	0.983	p > .10	0.161	0.872
Q12	3.385	2.742	0.360	0.719	p > .10	2.448	0.014
Q13	2.885	2.802	-0.022	0.983	p > .10	0.339	0.735
Q14	1.846	2.350	-0.022	0.983	p < .05	-1.993	0.046
Q15	4.808	4.355	3.704	0.000	p > .10	1.929	0.054
Q16	3.808	3.189	0.022	0.983	p < .05	1.885	0.059

Source: own preparation.

As indicated in Table 5, the experts and the respondents generally had similar opinions about particular elements of behaviour presented by mobile payment users. The most suitable econometric test was the U Mann-Whitney test, nevertheless other tests were carried out to check the results where the p-value was below 0.05 and 0.1. The results show that both the experts and the respondents did not agree in five areas represented by Q2, Q12, Q14, Q15 and Q16. To sum up, the experts rated the importance of mobile payments higher than the respondents (probably the professionals from the financial sector are more familiar with mobile payments than the respondents). The experts also overestimated the use of mobile payments to maintain social distancing, even if rating it relatively low.

The respondents assessed higher the opinion that in the pandemic they did their shopping paying less frequently with mobile payments because of buying less frequently (Q14: *I did shopping less frequently and paid less with mobile payments during the pandemic*). The experts overestimated the willingness of the respondents to make mobile payments when buying goods on the Internet. Lastly, they overestimated the fact that mobile payment is the easiest way to pay. Cards could be still more popular and convenient in the respondents' opinion.

The respondents concerned about ATM availability used mobile payments to follow legal regulations during the pandemic (Q9: *I used mobile payments during the pandemic because it was recommended by official regulations*). The reason may be a general propensity to use new technological solutions. People making charity donations with mobile payments presented similar opinions, stressing speed and convenience of use, whereas those making mobile payments for clothes presented the opposite views as did customers caring about branch availability – they do not emphasise the meaning of convenience and speed.

Another aspect of the COVID-19 pandemic was connected with maintaining social distancing, which possibly could influence customer payment behaviour (Q11: *I used mobile payments during the pandemic because it helped me to keep social distancing*). Most of the respondents admitted that social distance was important to them.

The cost-sensitive persons who care about price level usually made mobile payments due to the importance of the cost estimation, because it may bring the advantages of discounts, lower prices, and promotion advantages. In addition, however, they underlined the benefits of keeping up social distancing.

People for whom cost was important considered mobile payments to be essential at the beginning of the pandemic because of two benefits: cost reductions and social distance. In particular, in transactions paying for food using mobile payments, this allowed taking advantage of social distancing. At the beginning of the pandemic, the situation in the case of food purchases offered two options: online purchases, where mobile payments were a good solution before delivery or during delivery, due to the difficult access to cash at ATMs and the impossibility of disinfecting banknotes. At the same time, people who cared about speed and convenience used mobile payments because of social distancing. Similar reasons drove those people who bought food in stores when mobile payments eliminated contact with banknotes and limited interpersonal contact. Such factors as safety and security were important in this case.

The above, in addition to the obvious regulations related to the lockdown, explains the willingness to make online purchases. Convenience and comfort were also associated with protection and distance for such users, and therefore encouraged mobile payments because it helped to maintain social distancing.

Despite the fact that mobile and card payments create a temptation to use the funds in the owner's account which are somewhat 'invisible' when they are spent, in the initial phase of the pandemic the respondents did not record significantly higher expenditure with the use of mobile payments.

However, the respondents for whom the cost of banking products was important, noted the relevance of such factors as the amount of the monthly fee related to the use of main and additional payment

and credit cards, as well as other commissions, such as increasing the limit, blocking the card, issuing a duplicate, etc. However, this answer may be misleading, because only some card payments are mobile payments, while some payments may be related to the payment for the transfer from the card account, directly or via PayPal or other intermediaries (certainly this topic would require further in-depth research). Using ATMs also involves the cost of withdrawing funds via ATMs other than those belonging to a given bank, making express deposit transactions, withdrawing cash in a foreign currency from multi-currency cards, and checking the balance in ATMs. Other difficulties in accessing cash were also the changing limits of withdrawals at ATMs.

The last of the scale questions examined using mobile payments while buying goods online (Q15: *I am used to paying with mobile banking services when I buy goods or services on the Internet*). These were less used by customers caring for speed and convenience of use, paying for media, films and music, books, and electronic devices. Even those making regular mobile payments indicated the same response, which is surprising, but could be related to higher priority and preferences to use cash on delivery or parcel lockers.

The econometric analysis was based mostly on ordinal probit models because of the fixed set of independent variables potentially influencing the dependent ones being the answers for particular questions on a scale from 1 to 5. The probit model was made for the six dependent variables (six chosen questions in the survey for which at least one independent variable was significant). The results of this analysis are presented in Table 6. The more detailed results are presented in the Annex, Table A1, where the significance of particular levels of the independent variables are shown. The independent variables were constituted of gender and general preferences or habits of the surveyed group, whilst the place of living and age group were not statistically significant for any dependent variable, so they were excluded from the study.

The above results prove hypothesis H3 that *in the initial phase of the pandemic, the costs of using payment methods were less important for the customers than security*.

Table 6. Summary of the probit model

Independent variable		Scale question		
		Q9	Q11	Q15
Constant	Constant	0.000	0.000	0.000
Importance of payment method features (Q1)	Security of funds	0.316	0.474	0.523
	Fee level	0.151	0.031	0.828
	Ease of creating deposit	0.709	0.522	0.328
	ATM fees	0.725	0.894	0.196
	Interest rates -creating deposits	0.355	0.891	0.239
	Interest rates - taking loans	0.583	0.662	0.225
	Minimum sum obligatory to keep	0.224	0.087	0.811
	Branch availability	0.065	0.318	0.121
	Customer service	0.322	0.803	0.555
	Currency accounts	0.421	0.236	0.372
	Card fees	0.883	0.218	0.325
	ATM availability	0.043	0.268	0.449
	Advisory	0.177	0.018	0.141
	Speed and convenience of use	0.059	0.036	0.037
Bought goods or services (Q17)	Food	0.153	0.007	0.059
	Shoes	0.344	0.330	0.850
	Clothes	0.021	0.306	0.523
	Home decorations	0.833	0.189	0.076

	Films. Media. Music	0.887	0.783	0.012
	Healthcare	0.621	0.366	0.590
	Cosmetics	0.509	0.270	0.365
	Books	0.500	0.672	0.016
	Education	0.839	0.741	0.808
	Electronic devices	0.909	0.355	0.027
	Travels	0.376	0.380	0.162
Used transactions (Q18)	Transfers to another person	0.391	0.548	0.216
	Regular payments	0.211	0.460	0.018
	Occasional payments	0.137	0.755	0.190
	Charity donations	0.044	0.226	0.580
	ATM withdrawals	0.514	0.238	0.002
	Online loans	0.095	0.636	0.699
	Online deposits	0.333	0.376	0.705
	Transportation tickets	0.276	0.306	0.093
	Cash-back	0.099	0.344	0.008
Gender (Q19)	Gender	0.308	0.048	0.365

Source: own preparation.

Learning a functionality in new conditions gave a new perception of security. It involved not only reliability and secured process, but also health safety.

In this context, Figure 14 shows the significance of perceived security and its superior role which is consistent again with hypothesis H1 stating that *in the initial phase of pandemic, the most important determinant for using mobile payments as a contactless method is security*. The aspect of perceived convenience was of lesser importance, and perceived cost was at other positions indicated by the respondents in terms of the initial period of the pandemic.

According to the results, it could be proved that the priority for consumers were the issues connected with perceived security which covered the following aspects: reliability, secure acceptance process, compliance with regulations, trust in the provider, health safety, fear of touching banknotes, and keeping-up social distance.
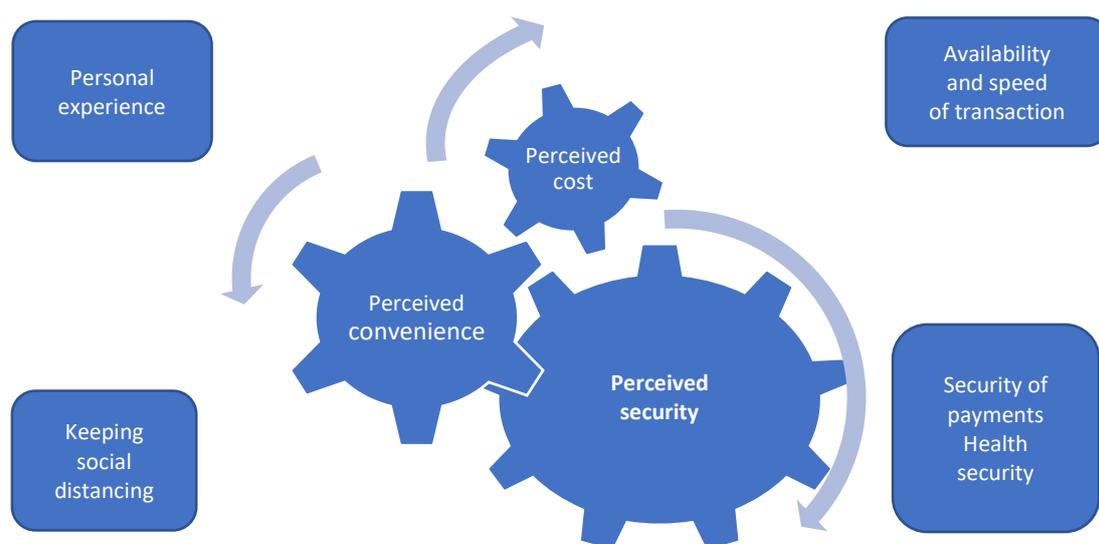

Fig. 14. Consumer perception factors connected with the use of mobile payments based on the survey results

Source: own preparation by authors.

Perceived convenience, both analysed in the research and emphasised by the respondents in their answers to the open question, was associated with such features as simplicity, availability, comfort, notifications, functionality (practical), speed (quick, fast, leaving more free time), ease of use, user-friendly, compatibility with the range of devices (smartphones, tablets), payments for delivery from small shops, effectiveness. The perceived cost was connected in the analysis with fee level, transfer cost, ATM fees, card fees, minimum sum obligatory to keep at the account, interest rates – creating deposits, interest rates charged and cost of taking loans.

5. Conclusions

In conclusion, it should be underlined that the first phase of the COVID-19 pandemic did not initiate the use of mobile payments but increased the degree of mobile payments usage (H4: *The coronavirus pandemic increased the degree of mobile payments usage*). This was confirmed by Al-Sharafi (Al-Sharafi et al., 2022) and data published by the National Bank of Poland, which clearly indicate an increase in the use of payment cards (issued by VISA and Mastercard), as well as the number and value of individual orders (Express Elixir and Blik) (National Bank of Poland, 2020a, 2020b). It can be assumed with a high degree of probability that mobile payments will continue to develop, especially since young consumers (generations Y and Z) with high digital literacy will be entering the market (Gentilviso & Aikat, 2019; Kilian et al., 2012; Parry & Battista, 2019). However, the respondents also declared using different payment methods, both traditional and digital (e.g. online banking, mobile payments, cards, cash, etc.). The initial examination of their preferences gave an overview of the factors and features of payment methods.

Referring to the research goal, it should be noted that the first phase of the COVID-19 pandemic changed the existing market, social rules, and consumer behaviour. The pandemic has significantly increased the level of the sense of uncertainty and even threat to humanity. Therefore, it was not surprising that the pre-pandemic preferences of buyers – convenience and risk (Arango & Taylor, 2009, pp. 11-12), as well as perceived compliance, usefulness, ease of use, and subjective norms (Aslam et al., 2017) have changed.

In the initial phase of the pandemic, the most critical determinant for using digital payments as a contactless method was security (H1: *In the initial phase of the pandemic, the most important determinant for using mobile payments as a contactless method was security*). This finding corresponds with results of the other research either before or during the pandemic (Kahn et al., 2017; Kahn & Liñares-Zegarra, 2016; Zhao & Bacao, 2021). Security was more important for the customers than perceived convenience (H2: *In the initial phase of the pandemic, perceived security was more important for the customers than perceived convenience*) and the costs of using payment methods (H3: *In the initial phase of the pandemic, the costs of using payment methods was less important for the customers than security*). The results obtained from the research confirm these three hypotheses. The respondents assessed security as the highest factor (security of payments, health profits coming from avoiding touching the banknotes, and keeping social distancing). This was appreciated more than convenience (speed of payments, possibility to make payments online without going out to the shops, ATM availability). The least interest to the respondents was cost (fees, transfer cost) as previously suggested by Abedi et al. (2012). These results are also consistent with the KPMG report published in September 2020, during the COVID-19 pandemic, its outbreak changed the attitude of Poles and made them recognise the priority of their own safety compared to transaction costs and the convenience of making purchases (Karasek et al., 2020). Security forced consumers' decisions regarding the choice of payment methods. The respondents assessed higher the usefulness of digital payments in avoiding touching the banknotes and maintaining social distancing, and also, as a side effect, the users discovered the speed of digital payments in comparison to other kinds of payments.

It is worth mentioning that non-users of mobile payments (a minority in the study) were not interested in giving up their habits and did not express trust in mobile payments, yet the non-users did not want to give up their habits, because they like using cash or (most often) cards. They also did not have trust in this kind of payment.

The specific aim of the empirical study was to capture the first effects of centrally introduced restrictions and new regulations, e.g., wearing face masks and maintaining distance in public places. Government and medical authorities as well as retail stores requested payments in a non-cash form, and hence some of the research questions were prepared to examine if the respondents are inclined to having as the priority legal regulations and government recommendations, and recommendations of the shops. The respondents concerned about ATMs availability, used digital payments because of the legal regulations introduced during the pandemic. The use of digital payments was not strongly determined by the restrictions imposed shops, however, the respondents admitted that this kind of payment helped them to keep-up social distancing.

The period of the analysis was a kind of a 'research window'. The researchers and respondents were exposed to the first wave of the pandemic and did not have a perception of the coming new waves of virus transmission. Additionally, the questions concerning the sum and quantity of spending or expenses were adjusted to the period of the long-lasting quasi-stability in the economy – after the previous crisis and just before the inflation level rise in the next waves – which was mainly the effect of new monetary policy approaches and lockdowns, being the response to COVID. This seemed to be reasonable due to three additional factors which might affect the consumer approach: repeated waves of the COVID-19 infections, which led to imposing the restrictions, the changing situation in the economy, connected with rising inflation and interest rates levels altering the social reaction to expenditure, savings and forms of payment. The above circumstances created limitations for this study due to the difficulty of repeating the research in the same unexpected situation, being a global 'black swan'.

Further analysis might include the differences, and examine if respondents are prone to new regulations and recommendations, among different countries due to their social culture (e.g. Hofstede's theory and individualistic culture; Westbrook, 2007). Even during the pandemic in many countries, different variations of adherence to recommendations of wearing face masks in public places were observed, which might be the consequence of multiple reasons such as personal experience, state of health, but also culture and obedience to legal restrictions or recommendations. This research was focused on the Polish sample, and cultural differences were not its subject, but at some point, it may be reasonable to include such aspects in future analysis. Future research should aim to carry out a longitudinal analysis, including a focus on the national and social culture, and adherence to recommendations in different countries.

A better understanding of the driving or deterring factors of mobile payment adoption can help service practitioners and researchers in designing promotion strategies to make the new payment mode broadly acceptable to the largest group of their potential adopters. Therefore, the findings in this study can provide important implications for developing cost-effective market communication strategies in the digital payments market and in exclusively mobile payments. Raising awareness that security significantly incorporates perceived safety might be considered by reliable, socially responsible organizations. Before the pandemic, health safety was not perceived as important and existing on such a scale – understanding this creates additional value for the organization, and creates alignment with communities and society as a whole.

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Annex

Table A1. Detailed presentation of surveyed group

Age group	Gender:	City over 500k residents	City 250k-500k residents	City 100k-250k residents	City 50k-100k residents	Town 20k-50k residents	Village, small town up to 20k residents	Total	%
Below 25	Woman	4	35	12	6	19	23	99	45.62%
	Man	2	17	7	4	8	14	52	23.96%
	Prefer not to say	0	0	1	0	1	0	2	0.92%
	Non-binary	0	0	1	0	1	0	2	0.92%
25-30	Woman	2	7	1	0	3	1	14	6.45%
	Man	1	4	1	0	2	1	9	4.15%
31-40	Woman	2	2	1	0	0	2	7	3.23%
	Man	0	3	2	0	2	1	8	3.69%
41-50	Woman	1	8	3	0	1	2	15	6.91%
	Man	0	5	1	0	0	1	7	3.23%
Over 50	Woman	0	0	0	0	1	1	2	0.92%
	Man	0	0	0	0	0	0	0	0.00%
Total		12	81	30	10	38	46	217	100%
%		5.53%	37.33%	13.82%	4.61%	17.51%	21.20%	100%	

Source: own preparation.

Table A2. Detailed results of ordered probit calculations

		Q9		Q11		Q12		Q13		Q14		Q15	
		Parameter	P	Parameter	p	Parameter	p	Parameter	p	Parameter	p	Parameter	p
Constant	Const1	-0.620	0.101	-0.556	0.145	-0.577	0.119	1.043	0.003	0.218	0.544	-0.501	0.258
	Const2	0.281	0.456	0.043	0.910	0.165	0.655	1.788	0.000	1.228	0.001	-0.097	0.824
	Const3	0.622	0.101	0.321	0.398	0.773	0.037	2.415	0.000	1.928	0.000	0.391	0.367
	Const4	1.649	0.000	1.421	0.000	1.705	0.000	3.395	0.000	2.628	0.000	1.511	0.001
Q1	Security of your funds	0.211	0.316	0.155	0.474	-0.206	0.324	0.145	0.486	0.232	0.274	0.172	0.523
	Fee level	0.252	0.151	-0.384	0.031	0.261	0.132	-0.089	0.604	0.356	0.042	0.048	0.828
	Ease of creating the deposits	0.094	0.709	0.161	0.522	0.733	0.004	-0.321	0.192	0.138	0.587	0.316	0.328
	ATM fees	-0.069	0.725	-0.026	0.894	0.095	0.626	-0.199	0.303	-0.138	0.480	0.322	0.196
	Interest rates when creating deposits	0.195	0.355	0.029	0.891	0.154	0.454	0.098	0.635	0.281	0.186	-0.315	0.239
	Interest rates when taking loans	0.137	0.583	-0.110	0.662	-0.238	0.329	-0.123	0.609	-0.225	0.358	0.367	0.225
	Minimum sum obligatory to keep at the account	-0.258	0.224	-0.375	0.087	-0.205	0.330	-0.376	0.071	0.071	0.738	-0.067	0.811
	Branch availability	-0.433	0.065	-0.239	0.318	0.284	0.229	0.268	0.247	-0.209	0.367	0.459	0.121
	Customer service and care about the user	-0.177	0.322	0.045	0.803	0.194	0.273	-0.290	0.098	0.200	0.263	-0.135	0.555
	Possibility of using the currency accounts	0.140	0.421	0.209	0.236	0.003	0.987	0.175	0.307	0.241	0.166	0.199	0.372
	Card fees	0.026	0.883	0.220	0.218	0.001	0.996	0.294	0.090	-0.047	0.790	-0.214	0.325
	ATM availability	0.364	0.043	0.199	0.268	0.010	0.953	0.041	0.814	-0.062	0.727	-0.176	0.449
	Advisory	-0.537	0.177	-0.981	0.018	-0.391	0.324	-0.333	0.391	-0.189	0.629	-0.809	0.141
	Speed and convenience of use	0.339	0.059	0.385	0.036	0.071	0.687	0.071	0.687	0.044	0.805	-0.458	0.037
Q17	Food	-0.263	0.153	-0.506	0.007	0.232	0.197	-0.312	0.082	0.120	0.507	-0.431	0.059
	Shoes	-0.215	0.344	-0.227	0.330	-0.174	0.442	-0.206	0.360	-0.286	0.214	-0.054	0.850
	Clothes	-0.588	0.021	-0.262	0.306	-0.495	0.049	-0.266	0.285	0.421	0.097	-0.189	0.523
	Home decorations	-0.047	0.833	0.305	0.189	0.271	0.223	0.173	0.440	0.030	0.894	0.572	0.076
	Films, media, music	0.029	0.887	0.057	0.783	0.230	0.250	-0.087	0.661	-0.268	0.182	-0.739	0.012
	Healthcare	0.102	0.621	-0.192	0.366	0.139	0.496	-0.325	0.115	-0.068	0.747	0.149	0.590
	Cosmetics	-0.146	0.509	-0.248	0.270	-0.271	0.214	-0.117	0.590	0.185	0.400	-0.256	0.365
	Books	-0.128	0.500	0.082	0.672	-0.101	0.590	-0.016	0.933	-0.157	0.407	-0.600	0.016
	Education	0.044	0.839	-0.072	0.741	-0.295	0.166	-0.476	0.024	-0.135	0.525	0.072	0.808
	Electronic devices	-0.023	0.909	0.188	0.355	0.182	0.360	0.145	0.462	-0.133	0.505	-0.571	0.027
	Travels	0.161	0.376	0.162	0.380	0.316	0.080	0.221	0.217	0.225	0.214	0.333	0.162
Q18	Transfers to another person	0.151	0.391	0.107	0.548	0.156	0.372	-0.118	0.494	0.089	0.607	-0.274	0.216
	Regular payments (e.g. Spotify. Netflix, energy,…)	-0.245	0.211	-0.147	0.460	-0.236	0.224	0.181	0.346	0.130	0.504	-0.552	0.018
	Occasional payments (e.g. for goods, services,…)	0.282	0.137	-0.060	0.755	0.000	0.998	0.051	0.787	0.447	0.018	-0.299	0.190
	Charity donations	0.410	0.044	0.248	0.226	-0.130	0.515	0.272	0.175	-0.136	0.498	-0.160	0.580
	ATM withdrawals	-0.148	0.514	-0.277	0.238	-0.591	0.009	-0.152	0.499	-0.479	0.036	-1.102	0.002
	Online loans	-0.851	0.095	0.239	0.636	-0.593	0.234	0.054	0.912	-0.323	0.515	-0.249	0.699
	Online deposits	0.291	0.333	-0.266	0.376	0.161	0.581	-0.025	0.930	-0.616	0.035	0.164	0.705
	Transportation tickets	0.213	0.276	0.200	0.306	-0.083	0.668	0.249	0.193	0.114	0.556	-0.457	0.093
	Cash-back	0.695	0.099	0.384	0.344	0.106	0.790	0.000	1.000	0.008	0.985	1.352	0.008
Q19	Gender (Woman)	-0.300	0.354	-0.745	0.023	-0.152	0.630	-1.620	0.000	-1.775	0.000	0.012	0.975
	Gender (Prefer not to say)	-0.187	0.777	0.211	0.752	0.802	0.234	-1.439	0.009	-1.084	0.051	0.687	0.362
	Gender (Non-binary)	0.467	0.512	0.873	0.220	-0.741	0.257	4.783	n.a.	4.596	n.a.	-1.007	0.192

Source: own preparation.

Table A3. The research questions/statements

	cali
Q1	What are the most important issues for you in using banking services? Take into consideration different features of payment methods that you have ever used (online banking, mobile payments, cards, cash, others). What is important for you? You may choose more than one answer.
	Security of your funds Fee level Ease of creating the deposits ATM fees Interest rates when creating deposits Interest rates when taking loans Minimum sum which is obligatory to keep at the account Branch availability Customer service and care about the user Possibility of using the currency accounts Card fees ATM availability Advisory services Speed and convenience of use
Q2	Are mobile payments important for you?
	Please choose one answer (1 – definitely not important, 2 – not important, 3 – I don't know, 4 – important, 5 – definitely very important)
Q3	Why do you use mobile payments during the pandemic?
	don't involve touching the banknotes help in keeping social distancing are made faster than using other ways of payments allow mobiles and cards to be easily disinfected influenced slower spread of the pandemic
Q4	What kinds of payment do you use?
	cash cards cashless
Q5	Does it apply to you: COVID-19 has increased the scale of my use of mobile banking services
	Please choose one answer (1 – definitely not, 2 – no, 3 – I don't know, 4 – yes, 5 – definitely yes)
Q6	Mobile payment was a convenient payment method, also for bills during the pandemic.
	Please choose one answer (1 – definitely not, 2 – no, 3 – I don't know, 4 – yes, 5 – definitely yes)
Q7	Did you increase the use of mobile payments during the pandemic? (Yes or No)
Q8	Why did you use or not use mobile payments? (open question)
Q9	I used mobile payments during the pandemic because it was recommended by official regulations.
	Please choose one answer (1 – definitely not, 2 – no, 3 – I don't know, 4 – yes, 5 – definitely yes)
Q10	I used mobile payments during the pandemic because it was suggested by shops.
	Please choose one answer (1 – definitely not, 2 – no, 3 – I don't know, 4 – yes, 5 – definitely yes)
Q11	I used mobile payments during the pandemic because it helped me to keep up social distancing.
	Please choose one answer (1 – strongly disagree, 2 – disagree, 3 – I don't know, 4 – agree, 5 – strongly agree)
Q12	I did my shopping more frequently and paid more with mobile payments during the pandemic.
	Please choose one answer (1 – strongly disagree, 2 – disagree, 3 – I don't know, 4 – agree, 5 – strongly agree)
Q13	I did my shopping less frequently, but paid more with mobile payments during the pandemic.
	Please choose one answer (1 – strongly disagree, 2 – disagree, 3 – I don't know, 4 – agree, 5 – strongly agree)
Q14	I did my shopping less frequently and paid less with mobile payments during the pandemic.
	Please choose one answer (1 – strongly disagree, 2 – disagree, 3 – I don't know, 4 – agree, 5 – strongly agree)
Q15	I'm used to paying with mobile banking services when I buy goods or services on the Internet.
	Please choose one answer (1 – strongly disagree, 2 – disagree, 3 – I don't know, 4 – agree, 5 – strongly agree)
Q16	I used cards to pay during the pandemic because it was just easier for me.
	Please choose one answer (1 – definitely not, 2 – no, 3 – I don't know, 4 – yes, 5 – definitely yes)

Q17	What goods or services do you buy on the Internet?
	Food Shoes Clothes Home decorations Films, media, music Healthcare Cosmetics Books Education Electronic devices Travel Other I don't use mobile payments.
Q18	What payments and transfers did you make on the Internet during the pandemic?
	Transfers to another person Regular payments (e.g. Spotify, Netflix, energy, rent) Occasional payments (e.g. for goods, services, multimedia) Charity donations ATM withdrawals On-line loans On-line deposits Transportation tickets Cash-back I didn't use mobile payments during COVID-19.
	Information about the respondent
Q19	Please indicate your gender:
	Woman Man Non-binary Prefer not to say
Q20	Please indicate your age group:
	Below 25 25-30 31-40 41-50 Over 50
Q21	Please indicate the size of your place of living (with number of residents):
	City over 500k residents City 250k-500k residents City 100k-250k residents City 50k-100k residents Town 20k-50k residents Village, small town up to 20k residents

Source: own preparation.