

MANAGING PERSONAL FINANCE BY ROBO-ADVICE USERS DURING THE COVID-19 PANDEMIC AND IN THE POST-PADEMIC PERIOD. A COMPARATIVE ANALYSIS OF POLAND AND SLOVAKIA

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Design/methodology/approach: This article aims to compare the behaviour of Polish and Slovak robo-advice users in the area of personal finance management during the COVID-19 pandemic, as well as their expected saving, expenditure and investment action after the end of the pandemic. An important aspect of the analysis is a comparison of how the respondents use the PFM application for personal finance management. The article was based on a literature analysis, statistical data, as well as our own pioneering empirical study conducted in September 2021 among clients of the Slovak brokerage house Finax in Poland and Slovakia, which was the first entity in Poland to offer a robo-advice service. A number of statistical methods were used to analyze the collected statistical material: Mann-Whitney U Test, Pearson's Chi-square test, Linear Regression Analysis, Kendall's tau correlation analysis.

Findings: The COVID-19 pandemic did not adversely affect the personal finance of Polish and Slovak robo-advice users and they differed in terms of investment methods during the pandemic as well as their investment plans after the pandemic. Polish and Slovak robo-advice users used spreadsheets plus special banking and non-banking applications to manage their personal finance. Sociodemographic variables did not largely explain how Poles and Slovaks used the application to configure personal finance. During the pandemic, saving was associated with the use of an application to configure personal finance and the awareness of the existence of such an application among both Poles and Slovaks.

Research limitations/implications: The conclusions of the study can be used by financial institutions, FinTechs, robo-advisors and PFM application providers for managing the home budget.

Originality/value: The novelty of the article is the first comparative study of robo-advice users in Poland and Slovakia on personal finance management during the COVID-19 pandemic and financial plans in the post-pandemic period.

Keywords: COVID-19 pandemic, robo-advice, personal finance management, PFM applications.

Category of the paper: research paper.

1. Introduction

The World was gripped by a pandemic over the first half of 2020, of which the second wave emerged in the fall. It was identified as a new coronavirus (severe acute respiratory syndrome coronavirus 2, or SARS-CoV-2), and later renamed as Coronavirus Disease-19 or COVID-19 (Brodeur et al., 2021). The COVID-19 pandemic as the so-called the black swan, i.e. an unexpected and sudden phenomenon, has affected all spheres of socio-economic life, including the finance of economic entities – enterprises and households. For countries, the COVID-19 pandemic meant increased public spending, preceded by crisis shields and aid to households (Li et al., 2021). The financial resilience and vulnerability of households (Bruce et al., 2022) depended on their financial resources and the ability to deal with crisis situations. Policies and programs that enhance financial resilience can help low and moderate-income households withstand economic shocks and be able to better address unexpected income needs (Clark, Mitchell, 2022). The results indicate that vulnerability is experienced and reflected through a multitude of fears and concerns and is influenced by personality traits (agreeableness, neuroticism, conscientiousness, need for material resources, and need for body resources) and can result in increased spending on products/services that are not normally perceived as necessities (Yazdanparast, Alhenawi, 2022). The outbreak of pandemic is having major effects on the economy both for households and nations (Barrafrem et al., 2020). The interruption of education is a key channel through which the pandemic risks having a long-term adverse impact on inequality and household welfare, with children in rural households and with less-educated parents being less likely to continue learning during school closures (Bundervoet, 2022). According to EU households' data the COVID-19 pandemic is likely to affect significantly households' disposable income in the EU, with lower income households being more severely hit (Almeida et al., 2021). In China households' liquidity constraints become serious after the outbreak of COVID-19. Households' likelihood of liquidity constraints increases with the severity of the pandemic, mainly due to the COVID-19 pandemic shock to employment and household income (Li et al., 2020).

Lockdowns, social isolation and quarantine, work and remote learning, the closure of restaurants and the entertainment industry made us home more often than before the pandemic. There was also more time to think about personal finance – the structure of income and expenses, change habits in payments (Kubota et al., 2021). Spending declined due to fears of tomorrow, uncertainty, and refraining from purchasing, which may have increased savings and the demand for automatic financial advice. Therefore, an empirical look at the financial behavior of households on the example of Poland and Slovakia is justified, and the target group, due to the availability of data, will be robo-advice users.

The following research hypotheses were proposed:

1. The COVID-19 pandemic did not adversely affect the personal finance of Polish and Slovak robo-advice users.
2. Polish and Slovak robo-advice users differed in terms of investment methods during the pandemic as well as their investment plans after the pandemic.
3. Polish and Slovak robo-advice users used spreadsheets plus special banking and non-banking applications to manage their personal finance.
4. Sociodemographic variables did not largely explain how Poles and Slovaks used the application to configure personal finance.
5. During the pandemic, saving was associated with the use of an application to configure personal finance and the awareness of the existence of such an application among both Poles and Slovaks.

2. The impact of the COVID-19 pandemic on personal finance – a literature overview

COVID-19 has caused profound socio-economic changes worldwide (Khetan et al., 2022). The outbreak of the COVID-19 pandemic, reduction in income and total loss of jobs have affected the financial behaviour of consumers worldwide. People's lives are mainly affected in two ways: First, a notable fraction of the population is concerned that they or their family members and friends may get infected with the coronavirus. Second, many people suffer from socio-economic consequences of the crisis, including a discontinuation of employment, a decrease in household income, and worries about financial troubles (Immel et al., 2022). Managing the budget in times of turbulence and crisis has posed a challenge for households (Waliszewski, Warchlewska, 2021a). According to research in European countries consumers who had been making cashless payments prior to the outbreak of the pandemic have often been doing so more frequently since, while those who had preferred to pay in cash have for the most part continued to do so. This may indicate financial inclusion issues—e.g. people without cashless instruments could have difficulties adapting to the new situation within the confines of the imposed restrictions. During the COVID-19 pandemic payment behaviour shifted toward cashless payments. The scale of change in payment patterns varied between the European countries. Heavy cash users were generally less likely to adopt cashless solutions. The divide between cash and cashless users seems to have widened during the pandemic (Kotkowski, Polasik, 2021). The pandemic caused falling living standards of low and middle-income households (Egger et al., 2021). As results shows inhabitants were interested in compromising their spending and other forms of savings to have more emergency savings (Gopal et al., 2022).

Research has shown the devastating effects of COVID-19, and the impact on families' financial stress and well-being is one of them (Rodrigues et al., 2021).

The COVID-19 pandemic has changed the daily lives of people in many countries. It has affected the level and forms of the employability of an individual, freedom of movement and how income is spent. In such economically and socially difficult situations, the importance of financial literacy is being increased because these adverse circumstances which do not depend on a citizen significantly affect people who make financial decisions and change their behaviour (Ciemleja, Kozlovskis, 2021). The pandemic situation has changed the way we work, learn and shop. Digital finance has helped individuals and companies to meet challenges. The pandemic has pushed forward digital solutions for payments and banking services. People have been dragged from their comfort zone when it comes to managing personal finance. The discrepancies between those who have access to digital devices and knowledge and those left out between poor and rich became more obvious during this pandemic (Bostan, 2021). According to research conducted in China, households who know someone infected with COVID-19 lose confidence in the economy. They are more likely to change their attitude to risk and become more risk-averse. Furthermore, COVID-19 increases the probability that a household will change its investment portfolio. In the context of the impact of the COVID-19 pandemic on personal finance, the term household financial resilience is used. Financial resilience is the declared, probable ability of households to withstand financial shocks, the possibility of obtaining funds for unforeseen expenses. This is the ability to cope financially when faced with a sudden fall in income or unavoidable rise in expenditure. These financial shocks can arise in many ways including a drop in income due to sickness, job loss or reduced working hours, a relationship breakdown or bereavement, or a jump in housing costs including essential repairs to the home, or taking on new responsibilities such as caring. Some households are less resilient to financial shocks than others. This may be because they have low levels of savings, have limited access to affordable credit, already hold high levels of debt or lack the skills required to manage household budgets. Financial resilience is difficult to estimate because it is a dynamic concept – the ability to recover quickly from an income or expenditure shock. This means that we have different indicators of resilience (Knight, Rucci, 2020). Personal financial counseling is of great importance in maintaining financial resilience to external shocks with the lack of knowledge and financial education of the society. Financial advisors have long held the responsibility to assist their clients when they encounter financial shocks. Financial planners typically recommend 3 to 6 months of income or expenses in an emergency fund. To manage unexpected shocks, the emergency savings accounts could be one potential solution to short-term financial fragility. Financial advisors could demonstrate to households the importance of building an emergency fund as part of a financial plan, such as having an emergency savings account that is separated from long-term assets. Low-income households and single-parent families are more vulnerable to financial shocks and thus should prioritise building emergency funds, and the size of the emergency fund could be larger than the standard

benchmark of 3 to 6 months' worth of income or expenses (Sun, Small, Huang, Ger, 2022). Additionally financial and digital literacy are key factors to building financial resilience. Traditional financial literacy needs to be redefined to include digital literacy. A dual literacy approach is necessary to improve financial inclusion and resilience (Kass-Hanna, Lyons, Liu, 2021).

During the pandemic, there was an increase in use mobile financial services (MFS). The gap between the registered users and active users of MFS and found some interesting factors leading to this phenomenon. These are dependency, lack of basic digital literacy, lack of perceived usefulness, lack of perceived ease of use, security concerns and transaction costs (Afroze, Rista, 2022). The use of remote and automatic financial solutions due to social isolation during the pandemic was becoming more and more popular. Figure 1 illustrates the benefits of robo-advice during a pandemic.

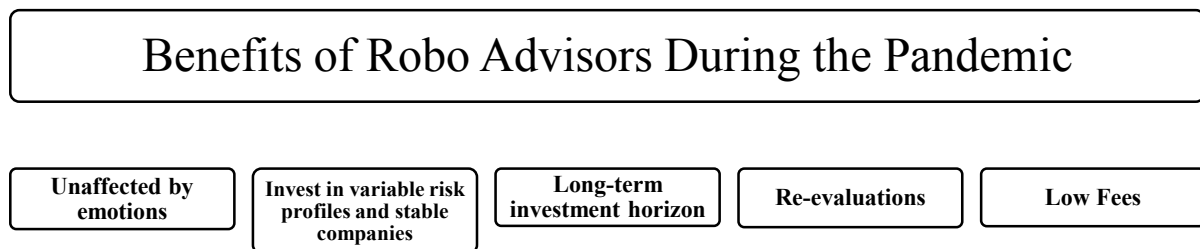


Figure 1. Benefits of Robo Advisors during the Pandemic. Source: own study based on The Rise in Robo Advisory Services during Covid-19, <https://www.corporatevision-news.com/the-rise-in-robo-advisory-services-during-covid-19/> (access 4.05.2022).

At the global level, respondents shared that the practice of financial planning has accelerated its adoption of communication technology (Fox, Bartholomae, 2020). The digital acceleration will likely have important longer-term implications for involved consumers and providers. On the demand side, while the large-scale shifts in fintech adoption and particularly the use of alternative lending sources may have helped many households and small firms mitigate the expected short-term fall in productivity and economic growth stemming from COVID, they may also have implications for overindebtedness and consumer protection. It remains to be seen whether these newer fintech lending sources acted as complements or substitutes and whether the adopting borrowers suffer disproportionately from loan performance issues and other adverse outcomes over time. On the supply side, the trends have policy relevance for regulators and supervisors who have been closely watching the trajectory of fintech and interplay between traditional incumbents, “BigTech” and other fintech players, such as neobanks (Fu, Mishra, 2022).

3. Methodology of research

The current state of affairs and future prospects regarding the development of the market for robo-advice services in Poland and Slovakia—a comparative analysis.

Robo-advisors have emerged from the entwinement of two strands of history represented by investment theory and AI-technology during the latter part of the 20th century. The leading robo-advisory models **founded** in today's AI-driven technological environment are mostly based on Modern Portfolio theory (MPT), based on an optimal portfolio for a given investor's risk preference (Waliszewski, Warchlewska, 2020). In previous research the diagnosed differences in the development of automated financial advisory services in Eastern and Central European countries are grounded in economic, regulatory, technological and socio-cultural factors (Waliszewski, Warchlewska, 2021b).

To compare the scale and potential of the Polish and Slovak markets, it is worth recalling the demography. The population of Slovakia at the end of 2021 was 5.43 million, while the population of Poland stood at 37.7 million.

The Polish robo-advice market

Assets under management in the robo-advice segment are projected to reach US\$3.00bn in 2022. Assets under management are expected to show an annual growth rate (CAGR 2022-2026) of 17.20% resulting in a projected total amount of US\$5.67bn by 2026. In the robo-advice segment, the number of users is expected to amount to 1.184m users by 2026. The average assets under management per user in the robo-advice segment is expected to equal US\$3.60k in 2022. From a global comparison perspective it is shown that the most assets under management are in the United States (US\$1,230.00bn in 2022). (Robo-Advisors – Poland, Slovakia). Assets under management in the robo-advice segment are projected to reach US\$469.30m in 2022.

The Slovak robo-advice market

Assets under management are expected to show an annual growth rate (CAGR 2022-2026) of 24.15% resulting in a projected total amount of US\$1,115.00m by 2026 (figure 2). The average assets under management per user in the robo-advice segment is expected to equal US\$3.66k in 2022 (figure 3). In the robo-advice segment, the number of users is expected to be 0.175m users by 2026 (figure 4). The penetration rate is expected to grow in Poland and Slovakia to the level above 3% by 2026 (figure 5).

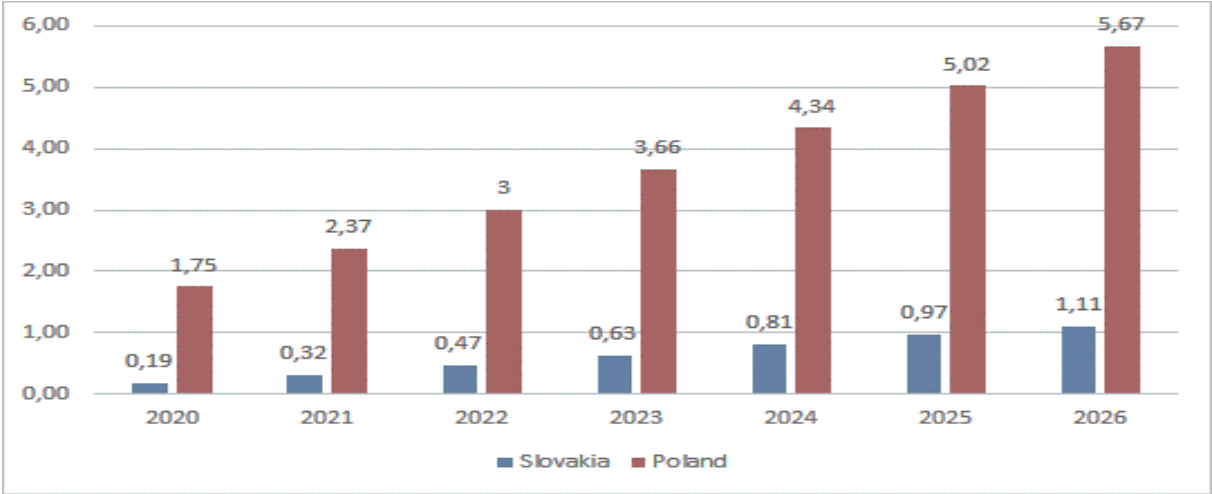


Figure 2. Assets under Management by Robo-Advisors in billion USD. Source: Statista.

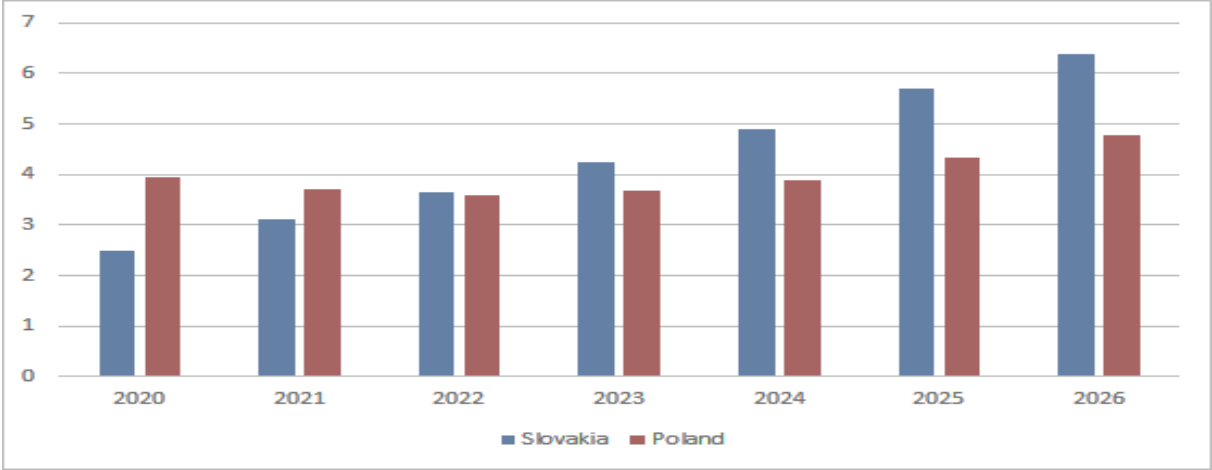


Figure 3. Average Assets under Management by Robo-Advisors per User in thousand USD. Source: Statista.

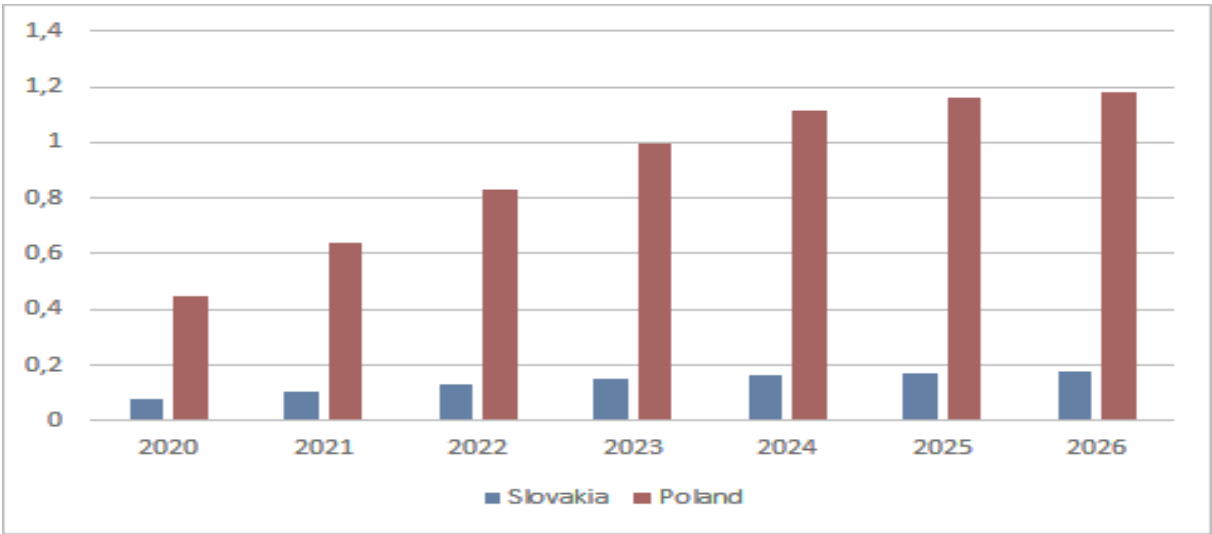
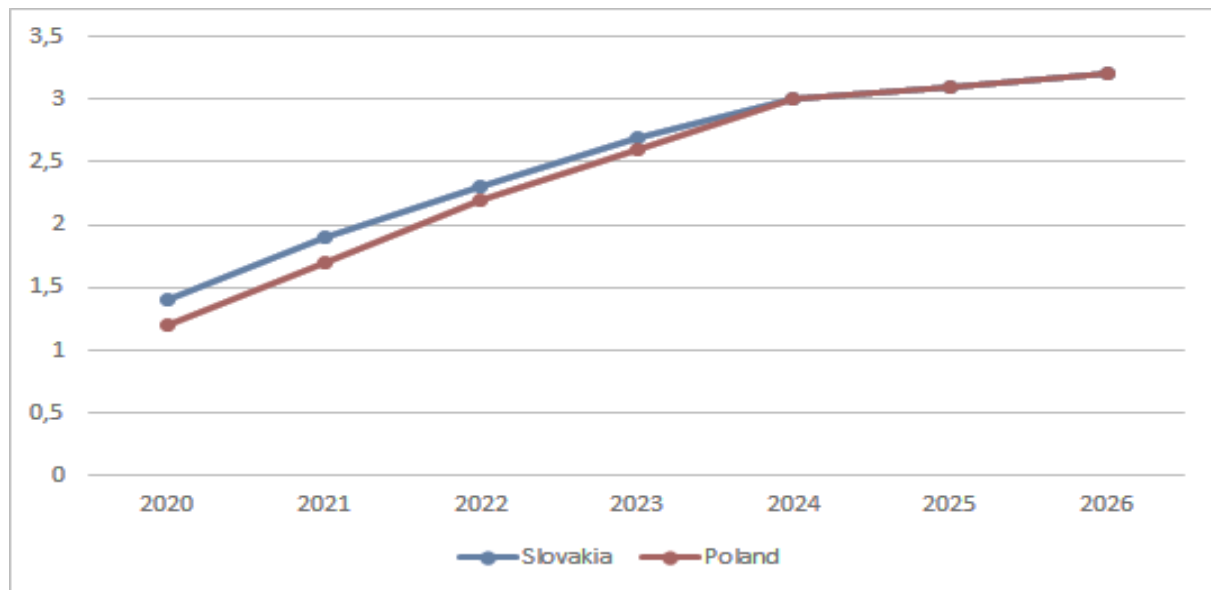


Figure 4. Users of Robo-Advice in million users. Source: Statista.



* The Penetration Rate shows the share of active paying customers (or accounts) from the total population of the selected market (market segment, region) for each year.

Figure 5. Penetration rate* as a percentage. Source: Statista.

Own empirical research

A survey in the form of an online questionnaire distributed among Finax customers was conducted in September 2021 on a group of $N = 438$ Poles and $N = 1059$ Slovaks. The Polish citizens were aged between 20 and 77 with an average age of $M = 36.29$ years with a deviation of ± 9.49 years, and the median in this group was 35 years. The Slovak citizens were aged between 19 and 74 with an average age of $M = 36.60$ years with a deviation of ± 9.25 years, and the median in this group was also 35 years. The Mann-Whitney U test analysis revealed no differences between the groups in terms of age distribution $Z = 0.84$; $p = .402$; $r = .02$.

Table 1.

Comparative age analysis with Mann-Whitney U tests between groups

		<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>	<i>Me</i>	<i>Z</i>	<i>p</i>	<i>r</i>
Age	Poland	20	77	36.29	9.49	35	0.84	.402	.02
	Slovakia	19	75	36.60	9.25	35			

Symbols: Min – minimum, Max – maximum, M – mean, SD – standard deviation, Me – median, Z – Mann-Whitney U statistic, p – level of statistical significance, r – strength of the relationship.

The majority of the study group were men—84.5% of the Polish and 83.8% of the Slovak group. Most of the respondents had higher education (82.2% of Poles and 74.5% of Slovaks), followed by people with secondary education with a high school diploma (14.8% of Poles and 23.9% of Slovaks), and more rarely with a secondary education without a high school diploma (3% of Poles and 1.6% of Slovaks). In terms of education, there were slight differences between the groups, $p < .001$. The Slovak group contained more economically active people (93.8%) than the Poles (90.2%), and this difference was statistically significant $p < .001$, but minor $V = .09$. There were also statistically significant differences between Poles and Slovaks in terms

of their place of residence $p < .001$; $V = .23$. The Poles featured a greater percentage of inhabitants of large cities (66.9%) than the group of Slovaks (42.3%). On the other hand, the Slovaks had a greater percentage of inhabitants of small towns and villages. The study groups did not differ in terms of household size—most of the respondents lived in households of two, three or four people. The mean average net income per person in the household was also compared between the groups, and this difference was statistically significant $p < .001$ and moderate $V = .20$. The Poles had a higher average household income per capita than the Slovaks.

Table 2.

Characteristics of the group of respondents with the results of Pearson's χ^2

		Poland		Slovakia		<i>p</i>	<i>V</i>
		<i>N</i>	%	<i>N</i>	%		
Sex	Women	68	15.5%	172	16.2%	.731	.01
	Men	370	84.5%	887	83.8%		
Education	Secondary without high school diploma	13	3.0%	17	1.6%	***	.11
	Secondary with high school diploma	65	14.8%	253	23.9%		
	Higher	360	82.2%	789	74.5%		
Professional situation	Unemployed	15	3.4%	10	0.9%	.005**	.09
	Student	17	3.9%	38	3.6%		
	Professionally active	395	90.2%	993	93.8%		
	Retired	11	2.5%	18	1.7%		
Place of residence	Village	42	9.6%	224	21.2%	***	.23
	Town up to 50,000 inhabitants	53	12.1%	248	23.4%		
	Town with 50-150,000 inhabitants	50	11.4%	139	13.1%		
	City with more than 150,000 inhabitants	293	66.9%	448	42.3%		
Number of people in household	One	67	15.3%	134	12.7%	.131	.07
	Two	149	34.0%	320	30.2%		
	Three	95	21.7%	230	21.7%		
	Four	102	23.3%	293	27.7%		
	Five and more	25	5.7%	82	7.7%		
Average monthly income (net) per person in the household in Euro	Up to 250	11	2.5%	2	0.2%	***	.20
	251-500	25	5.7%	50	4.7%		
	501-750	51	11.6%	141	13.3%		
	751-1000	50	11.4%	193	18.2%		
	1001-1500	94	21.5%	332	31.4%		
	1501 and more	207	47.3%	341	32.2%		

Symbols: *p* – level of statistical significance, *V* – strength of Cramer's *V* relationship.

A number of statistical methods were used to analyse the statistical material collected from an initial study of Poles and Slovaks. Mann-Whitney U Test to:

- comparison of average age,
- comparison of satisfaction with the application, the likelihood of recommending the application and using it.

Pearson's Chi-square test to:

- comparison of gender, education, place of residence, number of people in the household, income,
- comparison of the financial impact of the pandemic between countries,
- comparison of app usage rates between countries,
- relationship between awareness of the existence of the application and use of the application to configure personal finance with being a Finax client.

Linear Regression Analysis to analyse:

- impact of sociodemographic variables on the use of the application,
- impact of sociodemographic variables on the awareness of the application,
- influence of sociodemographic variables on being a Finax client.

Kendall's tau correlation was used to analyse relationship between the evaluation of the application for configuring personal finance and sociodemographic variables.

The following research hypotheses were proposed:

1. The COVID-19 pandemic did not adversely affect the personal finance of Polish and Slovak robo-advice users
2. Polish and Slovak robo-advice users differed in terms of investment methods during the pandemic as well as their investment plans after the pandemic.
3. Polish and Slovak robo-advice users used spreadsheets plus special banking and non-banking applications to manage their personal finance.
4. Sociodemographic variables did not largely explain how Poles and Slovaks used the application to configure personal finance.
5. During the pandemic, saving was associated with the use of an application to configure personal finance and the awareness of the existence of such an application among both Poles and Slovaks.

4. Results and discussion

Assessment of the impact of the pandemic on the financial situation

Table 3 presents the results of Pearson's χ^2 test the analyses to compare groups with regard to the financial impact of the pandemic. The pandemic did not adversely affect the finance of

50.5% of Poles and 60.8% of Slovaks (statistically significant difference $\chi^2(1) = 13.62$; $p < .001$; $V = .10$), and an increase in income despite the pandemic occurred in 37.4% of Poles and 30.5% of Slovaks (statistically significant difference $\chi^2(1) = 6.80$; $p < .01$; $V = .07$). A decrease in income during the pandemic was observed by 15.1% of Poles and 12.5% of Slovaks. Therefore, most of the people surveyed did not feel the impact of the pandemic on their finance or their financial situation improved compared to the pre-pandemic period.

Table 3.

The results of analyses using Pearson's χ^2 tests to compare groups in terms of the financial impact of the pandemic

How did the COVID-19 pandemic influence your finance?	Poland	Slovakia	χ^2	p	V
I received less income	15.1%	12.5%	1.83	.176	.03
I lost my job	4.6%	2.7%	3.27	.071	.05
I had difficulty keeping up with loan repayments	0.5%	0.1%	2.03	.154	.04
The pandemic hit my company	7.1%	4.9%	2.78	.095	.04
The pandemic did not negatively affect my finance	50.5%	60.8%	13.62	***	.10
My income rose in spite of the pandemic	37.4%	30.5%	6.80	.009**	.07

Symbols: χ^2 – Chi-square statistic, p – level of statistical significance, V – strength of Cramer's V relationship.

The study groups were also compared in terms of how the pandemic affected financial behaviour, and these results turned out to be statistically significant at $p < .0001$ (Table 4). During the pandemic, most of the respondents had lower expenditure (67.4% of Poles and 70.5% of Slovaks), but more than half of the respondents did not plan to change their level of expenditure going forward (53.0% of Poles and 59.1% of Slovaks). During the pandemic, most of the respondents increased their savings (63.9% of Poles and 61.7% of Slovaks).

Table 4.

The results of Pearson's χ^2 test analyses to compare groups in terms of how the pandemic impacted financial behaviour

		Fewer expenses/ less saving	No change	More expenses/ saving	χ^2	p	V
How did the COVID-19 affect your expenses?	Poland	67.4%	32.6%	0.0%	28.29	***	.14
	Slovakia	70.5%	24.8%	4.7%			
What are your spending plans for the future compared to what you were spending before the pandemic?	Poland	28.5%	53.0%	18.5%	35.31	***	.15
	Slovakia	33.0%	59.1%	7.9%			
How did the pandemic affect your savince?	Poland	12.1%	24.0%	63.9%	24.24	***	.13
	Slovakia	5.8%	32.7%	61.7%			

Symbols: χ^2 – Chi-square statistic, p – level of statistical significance, V – strength of Cramer's V relationship.

Comparisons were also made between Polish and Slovak groups on how the pandemic impacted their investments. The study groups differed in a statistically significant way in terms of shifts in investment habits during the pandemic $\chi^2(3) = 21.26$; $p < .001$; $V = .12$ as well as investment plans post pandemic $\chi^2(3) = 9.71$; $p < .05$; $V = .08$. Poles tended to state that they invested more during the pandemic (70.1% vs. 65.9%), while Slovaks were more likely than Poles to have invested the same amount during the pandemic (27.7% vs. 18.9%). On the other hand, the surveyed Slovaks declared that after the pandemic they intend to invest more than Poles (57% vs 49.8%).

Table 5.

Pearson's χ^2 test results analysis to compare groups in terms of how the pandemic impacted investments

		Poland	Slovakia	χ^2	p	V
How did your investment habits change during the pandemic?	I didn't invest at all	7.1%	3.2%	21.26	***	.12
	I invested less	3.9%	3.2%			
	I invested the same	18.9%	27.7%			
	I invested more	70.1%	65.9%			
What are your investment plans post-pandemic?	I am not going to invest	2.3%	0.9%	9.71	0.021*	.08
	I will invest less	3.2%	2.6%			
	I will invest the same	44.7%	39.5%			
	I will invest more	49.8%	57.0%			

Symbols: χ^2 – Chi-square statistic, p – level of statistical significance, V – strength of Cramer's V relationship.

Use and evaluation of applications for configuring personal finance

The study also aimed to determine how often Poles and Slovaks used financial management applications and how they assessed the efficacy and usefulness of such tools. These respondents indicated that applications for tracking expenses at the bank were used more often by Slovaks (17.1% vs. 6.6%), while Poles tended to plan their finance with the help of Excel (37% vs. 26%) and a special application (15.1% vs. 11.7%), and this difference was moderately strong $\chi^2(5) = 41.41$; $p < .001$; $V = .17$. In the study group, Finax clients were more likely to be Slovaks than Poles $\chi^2(1) = 35.76$; $p < .001$; $V = .16$.

Poles using applications to track expenses at their bank usually used ING bank and Millenium apps, while the Slovaks used George, Tatra and VUB bank apps. On the other hand, when it comes to special applications for tracking expenses in Poland, the most popular ones were Money, My finance and YNAB, while in Slovakia, Spendee, E0xpense and Wallet tended to be used.

Table 6.

Pearson's χ^2 test results analysis to compare groups in terms of approach to supervising finance

		Poland		Slovakia		χ^2	p	V
		N	%	N	%			
Do you have an overview of your expenses?	No	69	15.8%	179	16.9%	41.41	***	.17
	Yes, I check bank statements	79	18.0%	201	19.0%			
	Yes, I use an app to track my bank expenses	29	6.6%	181	17.1%			
	Yes, I use my own spreadsheets	162	37.0%	275	26.0%			
	Yes, I use paper and pen	33	7.5%	99	9.3%			
	Yes, I use a special app to track expenditure	66	15.1%	124	11.7%			
Are you a Finax client?	No	82	18.7%	85	8.0%	35.76	***	.16
	Yes	356	81.3%	974	92.0%			

Symbols: χ^2 – Chi-square statistic, p – level of statistical significance, V – strength of Cramer's V relationship

In the case of people who used an application to configure personal finance, the majority did so via a mobile app and website (45.3% of Poles and 59.3% of Slovaks) or via mobile app alone (40% of Poles and 35.4% of Slovaks), and the difference between the groups was statistically significant $\chi^2(2) = 11.68$; $p < .01$; $V = .17$. Bugs in the applications were noticed by 13.7% of Poles and 15.7% of Slovaks (no statistically significant differences between the groups $p > .05$).

Table 7.

Pearson's χ^2 test results analysis to compare groups in terms of using applications to configure personal finance

		Poland		Slovakia		χ^2	p	V
		N	%	N	%			
How can you use your app?	Only on my mobile phone	38	40.0%	108	35.4%	11.68	.003**	.17
	Only on the Internet	14	14.7%	16	5.3%			
	Mobile phone and Internet	43	45.3%	181	59.3%			
Does the app have any bugs?	No	31	32.6%	71	23.3%	3.34	.189	.09
	I don't know/I haven't noticed	51	53.7%	186	61.0%			
	Yes	13	13.7%	48	15.7%			

Symbols: χ^2 – Chi-square statistic, p – level of statistical significance, V – strength of Cramer's V relationship

The respondents were of the opinion that the application meets most of their requirements regarding control over daily expenses (74.7% of Poles and 73.8% of Slovaks) as well as an overview of expenditure structure by category (91.6% of Poles and 85.9% of Slovaks). Poles were demonstrably more appreciative of the application in terms of being able to plan a monthly budget $\chi^2(1) = 12.61$; $p < .001$; $V = .18$, future expenses $\chi^2(1) = 13.79$; $p < .001$; $V = .19$ and monitor savings $\chi^2(1) = 10.17$; $p < .01$; $V = .16$. On the other hand, a small percentage stated that the application they use to configure personal finance meets their requirements in terms of maintaining a positive balance on their account.

Table 8.

Pearson's χ^2 test results analysis to compare groups in terms of evaluating how the application meets the requirements for configuring personal finance

What needs does the application meet?	Poland	Slovakia	χ^2	<i>p</i>	<i>V</i>
I have control over my daily expenses	74.7%	73.8%	0.04	.851	.01
Overview of the expenditure structure by category	91.6%	85.9%	2.10	.147	.07
Automatic categorisation of expenses	49.5%	57.0%	1.68	.195	.06
Monthly budget planning	52.6%	32.5%	12.61	***	.18
Planning future / regular expenses	58.9%	37.4%	13.79	***	.19
It helps me to maintain a positive balance on my account	30.5%	23.0%	2.23	.135	.07
It helps me to take control of my savings budget	50.5%	32.5%	10.17	.001**	.16

Symbols: χ^2 – Chi-square statistic, *p* – level of statistical significance, *V* – strength of Cramer's *V* relationship.

Comparing the assessment of the benefits offered by an application for configuring personal finance, Poles were demonstrably more inclined to mention the benefit of developing the habit of saving $\chi^2(1) = 13.77$; $p < .001$; $V = .19$ and financial security through constant monitoring of the account balance $\chi^2(1) = 12.50$; $p < .001$; $V = .18$, but they mentioned the benefit of building a credit history less frequently than the Slovaks $\chi^2(1) = 5.85$; $p < .05$; $V = .12$. The main benefit offered by the application used was control of expenses, followed by the habit of saving and financial security. The least frequently mentioned benefit of an application for configuring personal finance was personalised product recommendations.

Table 9.

Pearson's χ^2 test results analysis to compare groups in terms of the benefits of using an app to configure personal finance

Name the benefits of using an application:	Poland	Slovakia	χ^2	<i>p</i>	<i>V</i>
Control over banking products in one place	40.0%	46.6%	1.26	.262	.06
Control of expenses	95.8%	93.4%	0.71	.400	.04
Support for financial decisions	33.7%	27.5%	1.33	.249	.06
Developing the habit of saving	67.4%	45.6%	13.77	***	.19
I am building a positive credit history, clearing payments on time	9.5%	20.3%	5.85	.016*	.12
Financial security through constant monitoring of the account balance	57.9%	37.4%	12.50	***	.18
Personalised product recommendations	2.1%	4.3%	0.93	.334	.05

Symbols: χ^2 – Chi-square statistic, *p* – level of statistical significance, *V* – strength of Cramer's *V* relationship.

Through analyses of Pearson's χ^2 tests, the study groups were compared in terms of shortcomings in the application for configuring personal finance (Table 10). Most of the results of the analyses turned out to be statistically insignificant $p > .05$, which means that Poles and Slovaks in the study groups did not differ in terms of how they evaluate deficiencies in applications. The respondents most often found intelligent financial advice in the application to be lacking, as well as the possibility to compare their own financial behaviour with the average customer and to synchronise with the bank. Poles were more likely than Slovaks to express the opinion that the application lacked offers of more advantageous products, which they currently use $\chi^2(1) = 6.50$; $p < .05$; $V = .13$.

Table 10.

Pearson's χ^2 test results analysis to compare groups in terms of shortcomings in applications for configuring personal finance

What's lacking in the application you use:	Poland	Slovakia	χ^2	<i>p</i>	<i>V</i>
The application has everything I need, nothing is lacking	26.3%	30.8%	0.70	.402	.04
I'd like to set a monthly budgets and see how much more I can spend in that category this month	23.2%	22.6%	0.01	.914	.01
I would like the app to sync with my bank/multiple banks	43.2%	32.5%	3.65	.056	.10
I also miss being able to link my partner's account to see expenses for the entire household	18.9%	26.9%	2.43	.119	.08
I'd like the app to advise me on what I can improve based on my expenses	53.7%	47.2%	1.21	.271	.06
I would like to be able to compare my spending structure with the average of people with a similar lifestyle	47.4%	46.9%	0.01	.934	.00
I would like to communicate with the app via smart chat to answer my questions	8.4%	7.5%	0.08	.779	.01
Suggestions of more advantageous products that I am currently using	23.2%	12.5%	6.50	.011*	.13

Symbols: χ^2 – Chi-square statistic, *p* – level of statistical significance, *V* – strength of Cramer's V relationship.

People who use an app to configure their personal finance were also asked to evaluate it. Comparisons between groups were made by means of analyses with Mann-Whitey U tests (Table 11). It was not demonstrated that the groups were statistically significantly different in terms of satisfaction with the application and the probability of recommending it $p > .05$. The average rating of satisfaction with the application was $M = 7.89$ points with a deviation of $SD = 1.54$ points in the Polish group of Poles and $M = 8.01$ points with a deviation of $SD = 1.59$ points in the Slovak group. The likelihood of recommending the application to a friend was, on average, $M = 7.84$ points with a deviation of $SD = 1.97$ points in the Polish group and $M = 7.71$ points with a deviation of $SD = 2.23$ points in the Slovak group. Slovaks claimed they would be more likely to use an application that would help manage the family finance was ($M = 6.79$) than the Poles ($M = 2.72$ points).

Table 11.

U Mann-Whitney test results to compare groups in terms of evaluation of applications to configure personal finance

		<i>Min</i>	<i>Max</i>	<i>M</i>	<i>SD</i>	<i>Me</i>	<i>Z</i>	<i>p</i>	<i>r</i>
How satisfied are you with the application?	Poland	3	10	7.89	1.54	8	1.04	.299	.05
	Slovakia	1	10	8.01	1.59	8			
How likely are you to recommend this application to a friend?	Poland	1	10	7.84	1.97	8	0.05	.963	.00
	Slovakia	1	10	7.71	2.23	8			
What is the likelihood that you would consider using an app to help to manage your family finance?	Poland	1	10	6.43	2.76	7	2.18	.030*	.07
	Slovakia	1	10	6.79	2.72	8			

Symbols: *Min* – minimum, *Max* – maximum, *M* – mean, *SD* – standard deviation, *Me* – median, *Z* – Mann-Whitney U statistic, *p* – level of statistical significance, *r* – strength of the relationship.

Awareness of applications for configuring personal finance and evaluation of their functionality

Among those who did not use applications that can connect to bank accounts and help configure personal finance, 67.9% of Poles and 64.5% of Slovaks were aware of the possibility of using such applications (no statistically significant differences between the groups in this respect $\chi^2(1) = 1.26$; $p = .262$; $V = .03$).

Table 12.

Results of Pearson's χ^2 test analysis to compare groups in terms of awareness of applications for configuring personal finance

Do you know that there are modern applications today that, with your consent, can connect to your bank accounts and help you configure your personal finance?	Poland		Slovakia		χ^2	p	V
	<i>N</i>	%	<i>N</i>	%			
No	110	32.1%	268	35.5%	1.26	.262	.03
Yes	233	67.9%	486	64.5%			

Symbols: χ^2 – Chi-square statistic, p – level of statistical significance, V – strength of Cramer's V relationship.

From a handy app that configures personal finance, the respondents most often expected an overview of their spending structure by category, automatic categorisation of expenses, and tips for improvement. There were statistically significant differences between the groups in terms of whether they expected the app to be able to connect their account with a partner's account $\chi^2(1) = 3.99$; $p < .05$; $V = .06$, tips on improvement $\chi^2(1) = 4.20$; $p < .05$; $V = .06$ or offers of more advantageous products $\chi^2(1) = 6.64$; $p < .05$; $V = .08$. The Slovaks would tend to expect these features more than the Poles. The latter group had more expectations that the app would be able to plan budgets for individual categories $\chi^2(1) = 6.16$; $p < .05$; $V = .07$.

Table 13.

Pearson's χ^2 test results analysis to compare groups in terms of evaluation of an application's functionality for configuring personal finance

What features would you expect from the handy app?	Poland	Slovakia	χ^2	p	V
The ability to connect my account with my partner in one application to obtain a competent overview of household expenses	45.5%	52.0%	3.99	.046*	.06
Overview of expenditure structure by category	70.0%	67.9%	0.47	.494	.02
Automatic categorisation of expenditure	66.2%	65.9%	0.01	.931	.00
Planning monthly budgets for individual categories of expenses	51.0%	43.0%	6.16	.013*	.07
Tips on where I have room for improvement	55.4%	61.9%	4.20	.040*	.06
Oferta korzystniejszych produktów	36.2%	44.4%	6.64	.010*	.08

Symbols: χ^2 – Chi-square statistic, p – level of statistical significance, V – strength of Cramer's V relationship.

Relationship between sociodemographic variables and the use of an application to configure personal finance, knowledge of the existence of such an application and its evaluation

The sociodemographic factors influencing the use of an application to configure personal finance, knowledge about the existence of such an application and its evaluation were also studied. In order to check the impact of metric variables on the use of an application, a logistic regression analysis was performed on the Polish and Slovak groups separately. It was demonstrated that the probability distribution in the model did not differ in a statistically significant manner from the distribution in the sample, both in the case of the model for Poland $\chi^2(2) = 31.26$; $p = .506$ and Slovakia $\chi^2(8) = 9.30$; $p = .318$. R^2 Nagelkerke's coefficient of determination was $R^2 = .03$ for Poland and $R^2 = .04$ for Slovakia. This means that the metric variables did not go far to explain the use of an application to configure personal finance. In the case of Poland, applications for configuring personal finance were demonstrably used by people living in larger urban agglomerations $W(1) = 7.76$; $p < .01$; $OR = 1.47$. However, the model for Slovakia indicated that the application was used by younger people $W(1) = 10.86$; $p < .01$; $OR = 0.97$, with higher education $W(1) = 6.65$; $p < .05$; $OR = 1.53$ and living in larger agglomerations $W(1) = 5.83$; $p < .05$; $OR = 1.16$. The remaining metric variables were not shown to have an impact on the use of applications to configure personal finance in the study groups.

Table 14.

Results of logistic regression analyses for the impact of sociodemographic variables on the use of an application to configure personal finance

Use of an application		<i>B</i>	<i>SE</i>	<i>W</i>	<i>p</i>	<i>OR</i>
Poland	Permanent	-2.62	.51	26.60	.000	.07
	Place of residents	.38	.14	7.76	.005**	1.47
Slovakia	Permanent	-1.55	.54	8.14	.004	.21
	Age	-.03	.01	10.86	.001**	.97
	Education	.43	.17	6.65	.010*	1.53
	Place of residence	.15	.06	5.83	.016*	1.16

Symbols: *B* – non-standardised coefficient, *SE* – standard error, *W* – Wald coefficient, *p* – level of statistical significance, *OR* – odds ratio.

Similarly, logistic regression analyses were used to examine the influence of sociodemographic variables on the awareness of the existence of an application for configuring personal finance among those who had not used such an application yet. It was indicated that the probability distribution in the model did not differ significantly from the distribution in the sample, both in the case of Poland $\chi^2(3) = 0.15$; $p = .985$ and Slovakia $\chi^2(8) = 4.68$; $p = .791$. Nagelkerke's R^2 coefficient of determination was $R^2 = .02$ for Poland and $R^2 = .03$ for Slovakia. This means that the metric variables did not explain much of the knowledge about the existence of an application for configuring personal finance. Among the Poles, awareness of the existence of an application for configuring personal finance was influenced solely by higher income $W(1) = 5.03$; $p < .05$; $OR = 1.20$ while in the Slovak group, male gender

W (1) = 10.10; $p < .01$; OR = 0.52, higher education W (1) = 3.04; $p = .081$; OR = 1.30 (the result on the border of the statistical tendency) and a larger household W (1) = 4.42; $p < .05$; OR = 1.15 were relevant.

Table 15.

Results of logistic regression analyses for the influence of sociodemographic variables on the awareness of the existence of an application for configuring personal finance

Knowledge of the existence of an application		<i>B</i>	<i>SE</i>	<i>W</i>	<i>p</i>	<i>OR</i>
Poland	Permanent	-.14	.41	.12	.731	.87
	Net income	.19	.08	5.03	.025*	1.20
Slovakia	Permanent	-.41	.46	.80	.372	.67
	Sex	-.64	.20	10.10	.001**	.52
	Education	.26	.15	3.04	.081	1.30
	Household size	.14	.07	4.42	.036*	1.15

Symbols: *B* – non-standardised coefficient, *SE* – standard error, *W* – Wald coefficient, *p* – level of statistical significance, *OR* – odds ratio.

The possible relationship between how applications for configuring personal finance are evaluated and sociodemographic variables was checked. Most of the results of Kendall's tau correlation analyses turned out to be statistically insignificant $p > .05$ (Table 16). The only indication was that Poles from larger households tended to rate the probability of using an application for family finance management higher $\tau = .09$; $p < .05$, as well as those with a lower income per person in the household $\tau = -.10$; $p < .05$. Among the Slovaks, it was shown that younger people rated the probability of using a family finance management application higher $\tau = -.13$; $p < .01$.

Table 16.

The results of Kendall's tau correlation analyses on the relationship between the evaluation of personal finance configuration applications and sociodemographic variables

	Satisfaction with the application		Likelihood of recommending the application		Likelihood of using the application for managing the family's finance	
	Poland	Slovakia	Poland	Slovakia	Poland	Slovakia
Sex	.16	.00	.14	.06	-.01	.00
Age	.07	-.04	.06	-.07	-.06	-.13**
Education	.12	-.02	.01	-.02	-.05	-.01
Professional activity	.01	-.04	.02	-.05	-.06	-.02
Place of residence	.08	-.07	.11	-.04	.05	-.01
Household size	-.11	.04	-.11	.09	.09*	.05
Income	.12	-.01	.11	-.01	-.10*	.02

Symbols: * $p < .05$; ** $p < .01$.

Relationship between financial behaviour during the pandemic with the use of an application to configure personal finance, knowledge of the existence of such an application and its evaluation

The aim of the study was also to investigate the relationship between using an application to configure personal finance and expenditure during the pandemic. Pearson's χ^2 test results analysis showed that in the Slovak group, albeit on the border of statistical tendency, people who spent more money during the pandemic than prior to it used an application for configuring personal finance more often. No such relationship was found in the Polish group.

Table 17.

Pearson's χ^2 test results analysis for the relationship between using an application to configure personal finance and expenditure during the pandemic

		Less expenditure		The same expenditure		More expenditure		χ^2	<i>p</i>	<i>V</i>
		<i>N</i>	%	<i>N</i>	%	<i>N</i>	%			
Poland	I don't use an app	227	76.9%	116	81.1%			0.99	.321	.05
	I use an app	68	23.1%	27	18.9%					
Slovakia	I don't use an app	538	72.0%	188	71.8%	28	56.0%	5.92	.052	.08
	I use an app	209	28.0%	74	28.2%	22	44.0%			
Poland	Unaware	68	30.0%	42	36.2%			1.38	.241	.06
	Aware of the existence of an application	159	70.0%	74	63.8%					
Slovakia	Unaware	193	35.9%	64	34.0%	11	39.3%	0.38	.826	.02
	Aware of the existence of an application	345	64.1%	124	66.0%	17	60.7%			

Symbols: χ^2 – Chi-square statistic, *p* – level of statistical significance, *V* – strength of Cramer's V relationship.

Analysis of Pearson's χ^2 tests also helped investigate the relationship between using an application to configure personal finance and saving during a pandemic. However, no connection was demonstrated between saving during a pandemic and the use of an application to configure personal finance and the awareness of the existence of such an application among both Poles and Slovaks (Table 18).

Table 18.

Pearson's χ^2 test results analysis for the relationship between using an application to configure personal finance and saving during the pandemic

		Less saving		The same level of saving		More saving		χ^2	<i>p</i>	<i>V</i>
		<i>N</i>	%	<i>N</i>	%	<i>N</i>	%			
Poland	I don't use an app	42	79.2%	84	80.0%	217	77.5%	0.31	.856	.03
	I use an app	11	20.8%	21	20.0%	63	22.5%			
Slovakia	I don't use an app	49	80.3%	249	72.2%	456	69.8%	3.23	.198	.06
	I use an app	12	19.7%	96	27.8%	197	30.2%			

Cont. table 18.

Poland	Unaware	15	35.7%	24	28.6%	71	32.7%	0.77	.680	.05
	Aware of the existence of an application	27	64.3%	60	71.4%	146	67.3%			
Slovakia	Unaware	24	49.0%	93	37.3%	151	33.1%	5.39	.068	.09
	Aware of the existence of an application	25	51.0%	156	62.7%	305	66.9%			

Symbols: χ^2 – Chi-square statistics, p – level of statistical significance, V – strength of the V-Cramer relationship.

The possible relationship between evaluation of an application for configuring personal finance and financial behaviour during the pandemic was also verified. These links were investigated using Spearman's rho correlation analyses (Table 19). The only statistically significant results were found among the Slovaks, who incurred higher expenses during the pandemic, assessed their satisfaction with the application as lower $\tau = -.10$; $p < .05$ as well as the probability of using the application to manage family finance $\tau = -.09$; $p < .05$. In the case of the Slovaks, who saved more during the pandemic, their satisfaction with the application was higher $\tau = .14$; $p < .01$, as was their likelihood of recommending the application to a friend $\tau = .11$; $p < .05$ and using the application to manage family finance $\tau = .06$; $p < .05$.

Table 19.

The results of Kendall's tau correlation analyses on the relationship between evaluation of an application for configuring personal finance and financial behaviour during the pandemic

	Impact of the pandemic on expenses		Impact of the pandemic on savings	
	Poland	Slovakia	Poland	Slovakia
Satisfaction with the application	.02	-.10*	-.02	.14**
Likelihood of recommending the application	.07	-.05	-.05	.11*
Likelihood of using the application to manage the family finance	.00	-.09*	.02	.06*

Symbols: * $p < .05$; ** $p < .01$.

5. Conclusions

The COVID-19 pandemic had an impact on personal finance as an external shock, but this was not a one-way street—for some households, rationalisation and reduced consumption at certain levels of income led to increased savings. On the other hand, for some households working in industries closed by lockdown, or affected by SARS-cov 2 virus itself or other comorbidities, income fell and they dipped into savings where possible. Otherwise, the household sought external funds from family, friends or financial institutions—banks and non-banking lending institutions. Previous research has shown that using applications to manage personal finance during a pandemic enabled better control of these finance. The pandemic gave us more time to look at our spending and to adopt spending and savings and investment plans after the pandemic period.

The comparative empirical study of Poles and Slovaks regarding personal finance management by users of robo-advice services positively verified the following research hypotheses:

1. The COVID-19 pandemic did not adversely affect the personal finance of Polish and Slovak robo-advice users.
2. Polish and Slovak robo-advice users differed in terms of investment methods during the pandemic and their investment plans post pandemic.
3. Polish and Slovak robo-advice users used spreadsheets as well as special banking and non-banking applications to manage their personal finance.
4. Sociodemographic variables did not largely explain how Poles and Slovaks used personal finance management applications.
5. Saving during the pandemic was linked with the use of an application to configure personal finance as well as the awareness of the existence of such an application among both Poles and Slovaks.

The author is aware that the conducted empirical study has certain limitations in terms of the Internet survey method or the sample size. However, taking into account the pioneering nature of this type of comparative research, the author accepts these limitations. The results of the study may be an inspiration for further in-depth research on the presented issues.

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