Behavioral Finance in the Digital Era

Saving and Investment Decisions

Elżbieta Kubińska
Magdalena Adamczyk-Kowalczuk
Anna Macko

4 Decisions on saving and investment in the digital era

Empirical evidence

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Chapter overview

The chapter presents results of original research undertaken on the propensity to invest and save in the era of rapid development of new technologies and their impact on financial markets. The research examines the behavior and preferences of market participants and their relationship with financial literacy and attitudes toward digitalization of financial services. Research was conducted on international samples of similar sizes from countries chosen as representative – Poland, India, and the US, which adds a country-diversity dimension to the examination of the economic and psychological perspectives. It incorporates the post-pandemic reality and worldwide effects of the Russian–Ukrainian war. The questionnaire included numerous detailed questions regarding saving and investment decisions while the analysis also included factor analysis giving standardized values for the whole dataset for all three countries. We derived factor variables, which provided a more comprehensive understanding of the inclinations of individuals toward saving or investment. Results show the current picture of financialization of contemporary societies, accounting for the impact of economic and cultural differences, by comparing data from international samples. Special attention is paid to analyzing financial literacy, the familiarity with digital financial tools, and attitudes toward recommendations made by AI algorithms versus human financial advisors.

4.1 Research overview

4.1.1 Research purpose and scope

The purpose of the empirical study undertaken for this book is to provide a current picture of behaviors and preferences in financial decisions of people from different cultural backgrounds unified by the experience of accessing rapidly changing new technologies, which reduce traditional barriers to financial services. The study examines the propensity to save and invest in the era of new technologies with attention given to analyzing financial literacy,

as well as attitudes toward digital form of payments and usage of banking services and financial robo-advisors.

The research focuses on economical and psychological factors emerging in the world of digital finance and was conducted in three countries: the US, India, and Poland. Such choice results in the country-diversity dimension added to economical and psychological perspectives. Cultural differences between countries are clear, so through the country-diversity dimension we added cultural factors into the discussion. In terms of cultural differences, based on the Hofstede (1980) cultural dimensions model, the US serves as an example of Western culture, emphasizing individualism, lower power distance, and moderate uncertainty avoidance. India represents Eastern cultures, prioritizing group harmony, higher power distance, and greater tolerance for uncertainty. Poland, while positioned in the middle, leans closer to the US, displaying a blend of Western and Eastern influences with its focus on individualism, moderate power distance, and strong uncertainty avoidance. The Business Culture Complexity Index (BCCI) (Commisceo, 2022), which highlights the potential complexity of a country's business culture and is based on 14 indicators, including internet use, economic freedom, literacy, and human development index or position in the world economy, provides data for the three chosen countries. The BCCI value for the US is 28.087, which ranks it as 5th in the world while the score of 18.572 for Poland places it at the 26th place, and a score of 6.984 for India ranks it at the 45th place. Survey results confirm cultural diversity through measures that take into account the economic conditions and business environment of the country.

The picture of contemporary people's preferences and decisions related to saving and investment behavior includes:

• Perception and preferences of saving and investment, including information about how people build their saving and investment portfolios, how diversified those portfolios are, and how people perceive and assess risk and profitability of different forms of saving and investment;
• Factors determining saving and investment decisions, including the actual financial literacy of respondents, their subjectively evaluated knowledge, familiarity with the digital reality of finance, and perceptions regarding the impact of the pandemic as a crisis factor in their digital behaviors;
• Attitudes to digital finance and robo-advisory, including perception, assessment, and usage of digital and robo-advisory tools in their saving and investment decisions.

Comparing the aforementioned factors among three diverse groups of respondents allows for deeper insight into areas of differences driven by individual and cultural-level preferences and patterns of behavior. Such a nuanced picture of financial preferences and decisions in turn can be useful for designing efficient ways of supporting behavior aimed at building financial well-being.

4.1.2 Research methodology – survey design and sample

The research was conducted using the CAWI questionnaire method, with multiple choice options and rankings. The survey was administered by the Polish Ariadna market research agency that operated the survey panel. The research procedure was designed to guarantee participant anonymity. Research encompassed 3,093 adults, aged between 18 and 93 (M=43, SD=16.238). More than half of the participants were women (51.9%), and just over 48% were men. Geographically diverse, large samples were selected within the US (N=1,006), India (N=1,017), and Poland (N=1,070) through an initial screening survey. The group of respondents, presented in Table 4.1, varied by age, place of residence, and education.

4.1.3 Research methodology – survey and statistic procedures

The survey covered several attributes of saving and investment: propensity for saving, diversification of investment, portfolio selection, investment profitability-riskiness perception, frequency of the use of digital forms of payment, as well as familiarity with and preference for robo-advisory (a full list of attributes is presented in Table 4.2). To examine the differences between the US, Poland, and India, cross-country and demographic comparative analyses were conducted. Cluster analysis was used to identify the typology of respondents according to their financial literacy and confidence. By means of logistic regression, the relationships between the use of AI advice (versus human advice) or the use of digital financial tools were examined in the context of propensity to save and invest, financial literacy, and perceived impact of the pandemic. Due to large sample sizes, parametric tests were used for statistical analysis – the central limit theorem (Kwak and Kim, 2017) ensured that the assumptions of normality of distribution were met for sample sizes of more than a thousand people from each country. Adequate to the variables analyzed, parametric or nonparametric statistical procedures were performed. Statistical analysis was carried out in the PS IMAGO PRO 8.0 (IBM SPSS Statistics).

4.2 Perception and preferences in saving and investment

The propensity to save is an individual's ability to postpone consumption over time with various motives that were discussed earlier (see Chapter 2). Households may accumulate wealth as a means of providing financial security and protection against unpredictable circumstances which becomes particularly significant during periods of turmoil, such as post-pandemic recovery and times of war. This chapter compares the propensity to save and invest using the example of the three countries subject to the analysis. Propensity for savings and investment was examined by the question: "What percentage of your income do you set aside for savings (on average per month)?" The results, presented in Table 4.3, show that household savings are the highest in India,

Table 4.1 Demographics of the respondent group

Age	Percentage			
	Total	Poland	US	India
18–24 years old	13.95%	13.0%	11.2%	18.3%
25–34 years old	23.29%	20.0%	19.2%	33.9%
35–44 years old	18.48%	16.6%	16.2%	25.5%
45–54 years old	16.30%	16.7%	16.2%	13.4%
55 years old or more	27.98%	33.7%	37.2%	8.9%
Place of residence	*Total*	*Poland*	*US*	*India*
Village	21.50%	34.1%	7.8%	6.8%
Small town (up to 20,000 inhabitants)	13.40%	12.1%	25.1%	4.8%
Medium town (from 20,000 to 99,000 inhabitants)	19.80%	19.7%	27.5%	12.5%
Large city (from 100,000 to 500,000 thousand inhabitants)	21.80%	19.2%	23.6%	25.8%
Very large city (over 500,000 inhabitants)	23.50%	15.0%	16.0%	50.1%
Education	*Total*	*Poland*	*US*	*India*
Primary/secondary school	1.90%	2.1%	1.6%	1.6%
Secondary vocational	6.40%	9.8%	2.9%	2.4%
High school	26.60%	31.8%	36.5%	5.3%
Post-secondary	13.20%	13.0%	18.8%	8.2%
Bachelor	21.90%	11.9%	24.5%	41.8%
Master and above	30%	31.5%	15.8%	40.8%

Source: Own elaboration.

Table 4.2 Research questions and statistical procedures

Question	Attribute of savings and investment	Statistic procedures
What percentage of your income do you set aside for savings (on average per month)?	Propensity for saving	Cross-country and demographic comparative analysis (ANOVA, t-test, chi-square)
What percentage of all your savings are the following categories? (11 forms of saving and investments)	Diversification of investment	Cross-country comparative analysis (ANOVA, chi-square); Factor analysis
What do you think is the most profitable way to save? (11 forms of saving and investments)	Portfolio selection	Cross-country comparative analysis (ANOVA, chi-square)

Question	Attribute of savings and investment	Statistic procedures
Rate the profitability level of your investment in the following categories on a scale of 1 to 5 (11 forms of saving and investments) Assess the risk level of your investment in the following categories on a scale of 1 to 5 (11 forms of saving and investments)	Profit–risk relation	Cross-country comparative analysis (ANOVA); Factor analysis; Correlation analysis
6 quiz questions from FINRA	Financial literacy typology	Two-step cluster analysis, cross-country comparative analysis (chi-square)
How do you assess your financial knowledge?	Self-evaluated financial knowledge	Cross-country and cross-cluster financial literacy typology comparative analysis (ANOVA)
Determine the direction and degree of change caused by the pandemic in your life.	Post-pandemic changes in different spheres of life	Cross-country comparative analysis (ANOVA); One-sample t-tests
Compared to the pre-pandemic period, your trust in the following forms of payment?	Post-pandemic changes in trust in different forms of payment	Cross-country comparative analysis (ANOVA); One-sample t-test; Factor analysis
Specify to what extent you use the following forms of online payment.	Usage of the digital forms of payment	Cross-country and demographic comparative analysis (ANOVA), Factor analysis, Logistic regression
How do you mainly use banking services?	Usage of the digital forms of payment	Cross-country and demographic comparative analysis (ANOVA), Logistic regression
How familiar are you with automated financial advisory tools, such as a virtual avatar?	Familiarity with robo-advisory	Cross-country and demographic comparative analysis (ANOVA); Logistic regression
Determine whose recommendations you would consider when making a decision in different spheres of life.	Preferences for following AI advisory in different spheres of life	Cross-country and demographic comparative analysis (ANOVA)
Determine whose recommendations you would consider when making a decision regarding investment advisory.	Preferences for following saving and investment robo-advisory	Cross-country and demographic comparative analysis (ANOVA); Logistic regression

Source: Own elaboration.

Table 4.3 Average responses by country and gender to the question: *What percentage of your income do you set aside for savings (on average per month)?*

	Total			Female			Male		
	M	N	SD	M	N	SD	M	N	SD
US	21.21	609	22.80	17.11	281	19.06	24.82	323	25.00
India	34.60	895	21.54	37.11	435	22.39	32.23	460	20.45
Poland	15.22	1070	17.42	14.48	561	16.44	16.03	509	18.41
Total	23.38	2574	21.97	22.77	1277	21.83	24.00	1292	22.08

Source: Own elaboration.

with Indian respondents declaring 34.6% of income set aside for savings, Americans 21.21%, and Poles setting aside the least, at 15.22% (p<0.001). In the US, men save more; in India, it is women; and both observed gender differences are statistically significant (p<0.001). In Poland, men and women save at a similar level, and the result does not differ significantly (p=0.149).

Data for gross domestic savings (% of GDP) for India, Poland, and the US indicate improving the financialization of savings rate of Indian households, which is one of the highest in the world. At the end of 2021, the Indian domestic savings rate of 29.3% was higher than the global average of 26.9%, while Poland was at 24.87%, and the US at 17.41% (regarding the digital financial landscape, see Chapter 3). Gross domestic savings consist of savings of the household sector, private corporate sector, and public sector, and it is expressed as a percentage of GDP. In 2021, the US economy was the largest in the world with a GDP of $23,315,080 million in 2021, India's economy was the 5th with a score of $3,176,295 million and represented 13.62% of US GDP, while Poland had the smallest GDP giving it the 21st position with a score of $679,445 million or 2.91% of American GDP (World Bank National Accounts data and OECD National Accounts data files, 2022). The size of the economy underscores the interpretation of differing positions of the US and Poland, when comparing declared household savings and gross domestic savings. Poles declared 15.22% of their income to set aside for savings, that is the smallest value among the three analyzed countries, but Poland has a higher score at the aggregate economy level because the Polish economy is much smaller, being less than 3% of the American economy.

Next, the impact of age on propensity of savings was checked (Figure 4.1). In India, people aged 35–44 save the most, in the US, the maximum saving rate occurs in the age group of 25–34, and in Poland, the maximum saving rate is observed among the youngest age group. In the US and India, we observe a reversed U-shaped relationship between age and the percentage of savings. At the beginning, people save relatively little, then reach a maximum, and later save less as they age. In Poland, where the maximum savings rate occurs in the first age group, we observe a decreasing relationship with age throughout the entire time span. As one gets older (from the maximum

noted in a country, as presented in Figure 4.1), the number of people saving is reduced, with the last age group saving an average of 14.23% of the total surveyed group (observed differences are significant at $p<0.000$ for every analyzed country). Generally, the older the respondents are, the less they save, where the correlation coefficient is negative $–0.274$ ($p<0.001$). The observed pattern is consistent with the life-cycle hypothesis; the people surveyed save the most during their working lifetime to be able to finance consumption in retirement, which allows them to keep the level of consumption relatively constant throughout their lives.

The propensity to save varies according to respondent's place of residence (Figure 4.2), with less than 7% indicating a village as their place of residence while 50% indicated a very large city. In the case of Indian respondents,
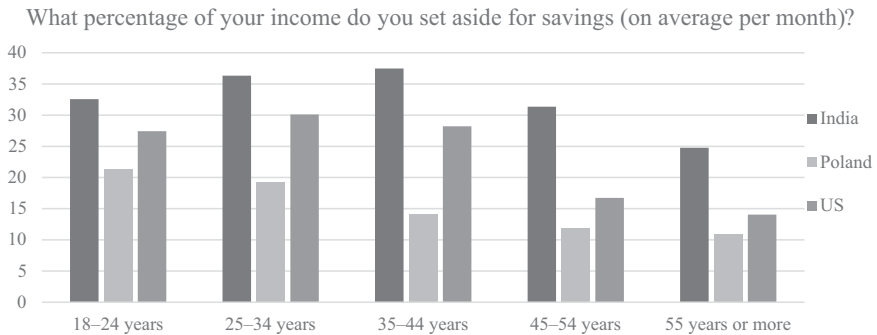

Figure 4.1 Average responses in different age groups to the question on propensity for saving
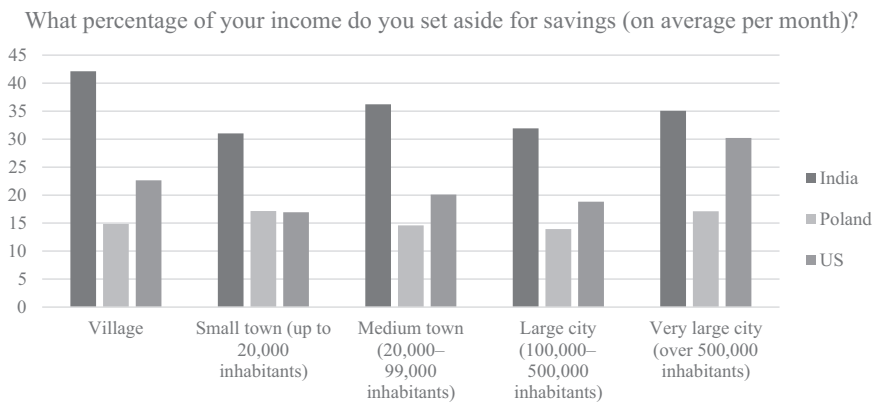
Source: Own elaboration.

Figure 4.2 Average responses by place of residence to the question on propensity for saving

Source: Own elaboration.

those living in villages declared the highest level of savings, followed by those living in medium-sized cities. Indians living in joint families may have lower living expenses and more support from their relatives, which could help them save money. They may also have more traditional values and habits that encourage saving and avoiding debt. In the US, very large cities save the most. Americans living in big cities may have higher incomes and more job opportunities than people living in small towns or the countryside. Additionally, people living in big cities may have more diverse and competitive financial markets and institutions that offer better saving options and incentives than people living in less urbanized areas. In the case of India and the US, the pattern is not monotonic with respect to the size of the place of residence, but the differences observed are statistically significant (p<0.001 and p=0.024 for the US and India, respectively). There is no consistent pattern when looking at the place of residence in relation to the percentage of savings. The changes are not regular once the savings amount becomes larger when considering a larger town, while in others, it is smaller. For example, in India, those living in small towns up to 20,000 inhabitants save less compared to those living in villages, and those residing in medium-sized towns with a population of 20,000 to 99,000 tend to save more than those living in small towns. In Poland, the differences are not statistically significant, with Poles saving at similar levels regardless of where they live (p=0.322).

It would be expected that those with the highest level of education have the highest level of savings in the entire sample. However, this pattern is not confirmed from country to country (Figure 4.3). In India, those with the lowest education save the highest percentage, while in Poland and the US, those with the highest education save the most. The degree of education has the greatest impact on the level of savings among Americans, and the results vary statistically significantly across groups (p<0.001). In Poland, the results also differ statistically (p=0.004). The apparent differences in the averages

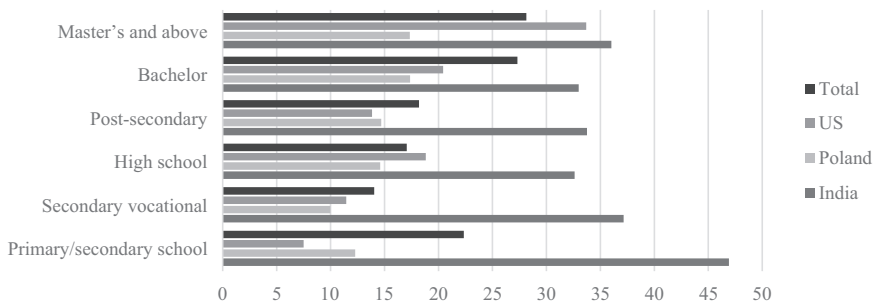What percentage of your income do you set aside for savings (on average per month)?

Figure 4.3 Average responses by education level to the question on propensity for saving

Source: Own elaboration.

in India are not statistically significant due to the large spread in the groups, and the level of education of Indians does not significantly affect the level of savings (p=0.153).

The impact of demographic variables on the propensity for savings can provide evidence of the influence of culture. Based on the cultural differences described by Hofstede's cultural dimensions, it can be observed that Indians have a higher tendency to save, while Americans have a lower level of savings. Indians are an example of a culture with a high propensity for saving as an Asian culture (Ye et al., 2021). In Indian culture, the emphasis on group harmony and collective welfare may encourage individuals to save for the well-being of their families and future generations. The practice of living in joint families, where expenses are shared, can also contribute to higher savings rates in more traditional communities like villages and in the groups with lower education. On the other hand, in American culture, individualism is emphasized, which may lead to a more diverse range of spending habits and priorities. While Americans may have access to higher incomes and job opportunities in big cities accompanied by higher education levels, their spending patterns and lifestyle choices may result in higher savings rates. As for Poland, being positioned between Western and Eastern cultural influences, the savings behavior may vary. However, with a focus on individualism and shorter time orientation, Poles exhibit a lower savings rate compared to Indians. These differences align with findings from the literature. Srivisal, Sanoran and Bukkavesa (2021) investigated the influence of culture on national saving rates, focusing on three key dimensions: collectivism, uncertainty avoidance, and future orientation. The findings reveal a robust and significant positive impact of future orientation on the savings ratio, indicating that countries with a strong emphasis on long-term planning and future goals tend to have higher saving rates like in India. On the other hand, uncertainty avoidance shows a negative impact on the savings ratio, suggesting that societies that are more risk-averse and strive to minimize uncertainty tend to have lower saving rates which was observed in Poland.

The next question examined diversification of investment and tested which assets the respondents have invested in and how diversified their portfolios were by asking them what percentage of all their savings were from the given categories. Results, presented in Figure 4.4, show that for all categories, the observed differences are statistically significant (p<0.001) besides two categories: Bank deposit or savings account and Retirement Savings Programs (where p=0.069 and p=0.525 respectively). In all countries, Cash and Bank deposits or savings accounts have the highest percentage of indications as a form of savings, and both categories combined account for 43.42% in India, 60.08% in the US, and as much as 70.33% in Poland. Poles declare that 44.1% of their savings is cash, which is the largest indication in all countries surveyed, while in India and US, the largest percentage is in the form of bank deposits or savings accounts. Indians have the most diverse forms of investment, which points to a high level of financialization. In most investment
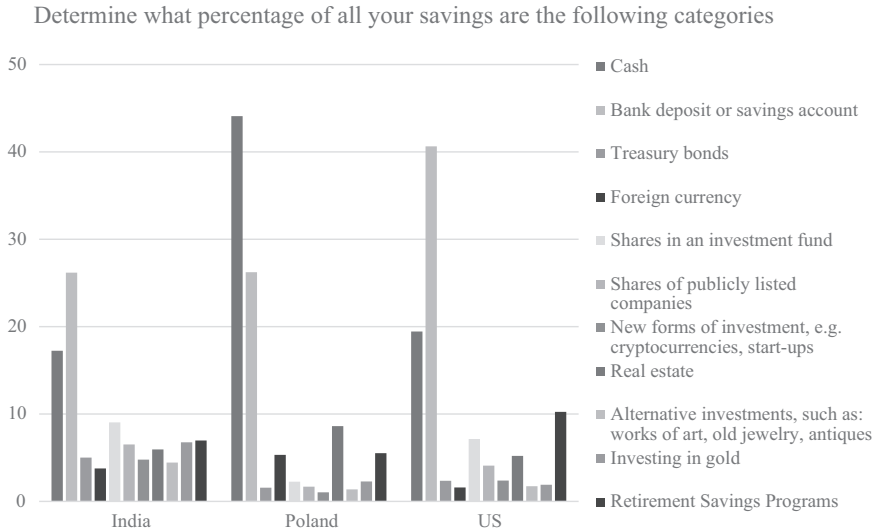
Determine what percentage of all your savings are the following categories

Figure 4.4 Average responses by country to the question on diversification of investment

Source: Own elaboration.

Note: For every item the answers were in the range from 0 to 100, and the question provided the following note: *If you do not have assets in a given category, enter 0. Remember that the sum of all values must be 100.*

categories, that is, apart from cash and bank deposits, Indian respondents have a higher proportion of funds invested, compared with the Americans and Poles. Only Retirement Savings Programs have a higher share of investment portfolios in the US compared to other countries, while in Poland real estate and foreign currencies dominate. Disregarding cash equivalents and bank accounts, Indians have the most diversified portfolios; Americans dominate retirement savings; and Poles appear to be the most conservative country, where people mainly have foreign currency and real estate savings. The number of indicated different forms of saving (without cash, bank account) was the highest in India (M=4.36, SD=3.49), and in the US and Poland, it was almost the same (M=1.41, SD=2.51; M=1.40, SD=2.19 respectively) and three times less than in India. Observed differences are statistically significant (p<0.001).

The saving and investment decisions are mostly influenced by uncertainty avoidance and long-term perspective, as defined by Hofstede's cultural dimensions (Hofstede, 1980; Hofstede and Minkov, 2010; Ye et al., 2021). Poles tend to hold their savings in safe forms, such as cash, bank deposits, or savings accounts, and invest in real estate, which is linked to their uncertainty avoidance. At the same time, Indians have a predominantly

long-term approach, opting for diversified forms of investment and choosing long-term categories. Americans, on the other hand, exhibit a more short-term approach, which, combined with indulgence and individualism, leads to a strong preference for liquidity. As a result, a significant portion of their investments is held in the most liquid forms, that is, cash and deposits. This is consistent with the cultural differences discussed in the literature, such as Srivisal, Sanoran, and Bukkavesa (2021).

Factor analysis was conducted to observe more general trends that are not immediately apparent when comparing the preferences of Indians, Americans, and Poles with the results for all 11 forms of saving/investment (Figure 4.4). Factor analysis identified six factors that provide a better picture of investment portfolios. The results of an orthogonal rotation of the solution are shown in Table 4.4.

Two items, Bank deposit or savings account and Cash, had a load in the first factor, which was labeled Electronic Money. The item, Bank deposit or savings account, has a positive load while Cash has a negative load, so this factor shows the propensity to deposit money in the bank and not keeping it in cash. The second factor shows the propensity to invest in equity and combines the items Shares in an investment fund and Shares of publicly listed companies. The next one is related to New and old alternatives that groups together old forms of alternative investments like investing in gold, works of art, old jewelry, antiques, and new forms of investments like cryptocurrencies. Another factor, Bonds and Forex, combines items Foreign currencies and Treasury bonds. The last two factors are based on single items Real Estate and Retirement Saving Programs. All factors are obtained using a regression model and are standardized, meaning that positive/negative values, respectively, indicate above/below average level of savings in a given category (Figure 4.5).

Average values of the Electronic money factor across the countries show that Americans declare to use mostly bank systems for saving their money, and Indians also use mostly bank deposits or savings accounts. Bank deposit or savings accounts have positive load, while Cash has a negative load in the factor Electronic Money due to the fact that Poles mostly use cash, results in Poles having the lowest value of the factor Electronic Money among the three countries. The National Bank of Poland (NBP, 2021) analyzed how retail payment transactions are made, as well as such aspects as the scope and methods of using the services of financial institutions and individual payment instruments. Among the reasons for not using a payment account, Poles gave a lack of need for one (80.6%), a preference for keeping money in cash (30.3%), a perception that the costs involved were too high (21.2%), and a lack of trust in financial institutions (17.7%). The last issue can be attributed to the experience of communism, which collapsed in Poland in 1989 but continues to impact Polish society through many burdens and limitations that were carried into the new economic reality. Among the most severe consequences are

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Table 4.4 Obliquely rotated component loadings for 11 survey items of the question: *Determine what percentage of all your savings are the following categories*

	Component						Communalities
	Electronic money	Equity	New and old alternatives	Bonds and Forex	Real estate	Retirement programs	
Bank deposit or savings account	0.87						0.99
Cash	-0.81						0.99
Shares in an investment fund		0.75					0.57
Shares of publicly listed companies		0.71					0.51
Investing in gold			0.76				0.60
Alternative investments. such as: works of art, old jewelry, antiques			0.70				0.51
New forms of investment, e.g., cryptocurrencies, start-ups		0.35	0.42				0.36
Foreign currency				0.84			0.73
Treasury bonds				0.64			0.48
Real estate					0.99		0.98
Retirement savings programs						0.99	0.98
Eigenvalues	1.921	1.428	1.185	1.098	1.053	1.005	
% of Variance	17.46	12.98	10.77	9.98	9.57	9.13	
Cumulative %	17.46	30.44	41.21	51.19	60.76	69.89	

Source: Own elaboration.

Note: Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Loadings less than 0.30 were excluded.
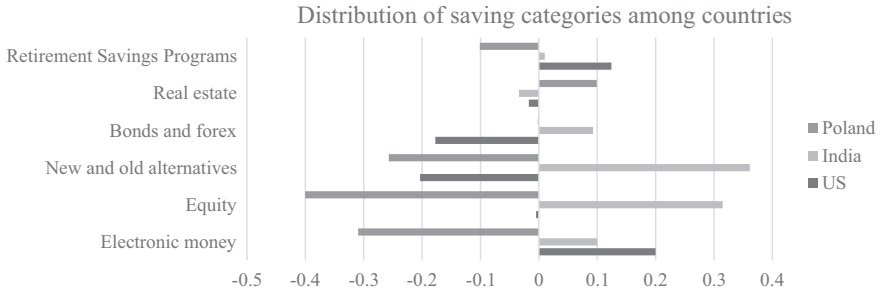
Distribution of saving categories among countries

Figure 4.5 Average values of savings categories among countries

Source: Own elaboration.

the lack of confidence in the national currency and in the country's financial system, perceptions that affected the following decades (Kulińska-Sadłocha and Kotliński, 2010). Looking at the Equity factor, Americans seem to choose at the average level of investment in stocks, Indians invest more, and Poles less. The markets under discussion are at different levels of development and with different levels of capital accumulation, as well as with different operating models. The Indian capital market is relatively developed and continues to grow rapidly with the developing Indian economy. The US market is an example of a capital-based market where companies issue shares rather than borrowing from a bank as in the European universal system. The Financial Market Development Index (FMDI) operated by the European Bank for Reconstruction and Development (EBRD) is a new index, introduced in 2022. It covers conditions supporting the sustainable development of financial markets, such as the macroeconomic environment, legal and regulatory frameworks, market infrastructure, and the investor base. It also tracks market outcomes in terms of the depth, liquidity, and diversification of markets across various asset classes. According to the EBRD report, the values of the FMDI were India with 0.42, the US with 0.81, and Poland with 0.54 (EBRD, 2022). These values indicate that the US has the most developed financial market among the three countries, followed by Poland and India. The American market is the one with the largest capitalization according to data from the World Federation of Exchanges (2023), with a market capitalization of all 4,266 domestic publicly traded companies in 2020 at 44,719,661 (mil. US$) or 194.5% of American GDP. In India, the number of domestic listed companies is 5,215, and their value stood at 2,595,465 million US$ or 97.3% of GDP. The Polish market is the smallest, with 782 companies listed on the Polish stock exchange and the value of the market in 2020 at 177,508 (mil. US$) or 29.9% of GDP.

Regarding New and old alternatives, Indians dominate while Poles and Americans are below average. Gold plays a central role in Indian culture, considered a store of value, a symbol of wealth and status, and a fundamental

part of many rituals (World Gold Council, 2023). India is the world's second largest consumer of gold, after China. This reflects the huge role of gold in India in the investment context, as gold is seen to be an investment that offers stability and security worldwide and also plays an important cultural role in India, with Panda and Sethi (2016) noting that every year, during the wedding or holiday season, demand for gold increases significantly. In the category of Bonds and forex investment, Poland has an average result, while the US is below average and India is above. Poland and India show relatively higher interest from individuals with bonds and forex than the US, which can be explained by the investment characteristics of domestic currencies. The US dollar is the most frequently traded currency on Forex, followed by Euro (EUR), Japanese yen (JPY), pound sterling (GBP), and renminbi (CNY). The Indian rupee (INR) functions as a partially convertible currency, allowing limited exchange at market, larger transactions require approval from the Reserve Bank of India (RBI), or certain restrictions may apply. Generally, the Indian rupee (INR) and the Polish zloty (PLN) are outside the top Forex currencies. Indians and Poles are more interested in investing in currencies than Americans, who have the most traded currency in the world (BIS, 2022). Real estate market dominates in Poland as investments in real estate are very popular among Poles, especially in times of high inflation. This has been an observed trend for years in reports by the Polish National Central Bank and in surveys by market research agencies (MyCompanyPolska, 2022). Only Retirement Savings Programs have a higher share of investment portfolios in the US, while in Poland it is below the average. The pension system in Poland has been undergoing radical reconstruction in recent years with various parts within the institutional structures have been modified and adapted to changes in the demographic, social, and economic environments. Nonetheless, authors such as Jurek (2021) argue that Poland is one of the countries with the most unstable pension system in Europe. Of the three markets surveyed, according to the Global Pension Index (Mercer, 2020), the American pension system is the most stable. The US had a score of 60.3 in 2020 and was 18th in the ranking of 39 countries surveyed in the GPI, Poland was 25th with a score of 54.7, and India 34th with a score of 45.7.

Investing in the capital market is a complex process, the first step of which is the selection of the form of investment and the selection of securities listed on the market. Such decisions should be supported by a rational analysis of all information and market data. In this process, however, people are influenced by heuristics and are boundedly rational. In line with bounded rationality, people do not analyze all variables, but one or few factors that determine our decision. Therefore, choice is based primarily on an assessment of the profitability of a particular form of investment, and the most common choice of companies is the one considered most profitable. In research conducted for this book, respondents were asked the question: "What do you think is the most profitable way to save?" with the list of 11 categories. Answers are shown in Figure 4.6, and they are significantly statistically different ($\chi^2(18)=668.857$, $p<0.001$).
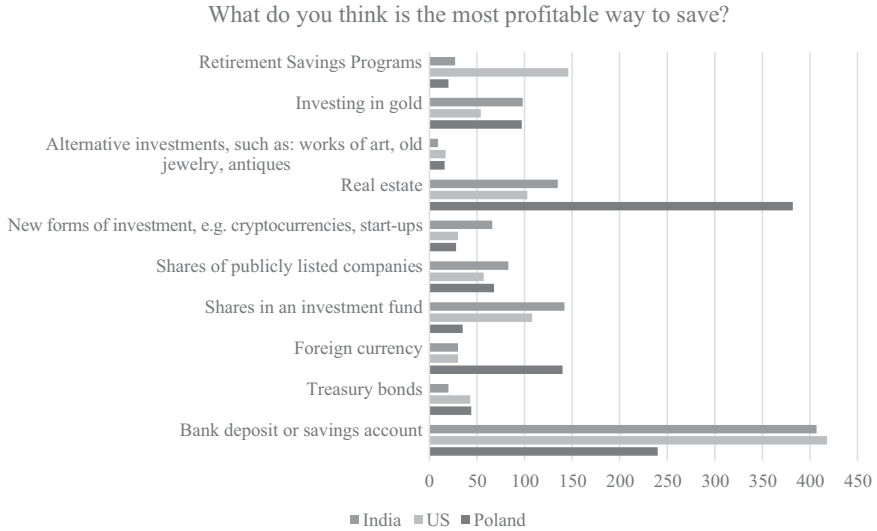
What do you think is the most profitable way to save?

Retirement Savings Programs
Investing in gold
Alternative investments, such as: works of art, old jewelry, antiques
Real estate
New forms of investment, e.g. cryptocurrencies, start-ups
Shares of publicly listed companies
Shares in an investment fund
Foreign currency
Treasury bonds
Bank deposit or savings account

0   50   100   150   200   250   300   350   400   450

■ India ■ US ■ Poland

Figure 4.6 Average responses by country to the question on portfolio selection
Source: Own elaboration.

As the most profitable forms of saving, respondents considered what they mainly invest in and what they have experience with. Therefore, bank deposits are indicated by both Americans and Indians, with Americans additionally participating in Retirement Savings Programs and Indians also engaging in profitable investments through shares. In turn, Poles indicate foreign currencies and real estate as the most profitable form of saving. Such results for countries, based on convergence of experience and assessment, lead to biased opinions. Respondents may consider bank deposits and Retirement Savings Programs as the most profitable, even though they may not offer the highest returns compared to other investment forms. In the responses to this question, the endowment effect mechanism is visible (Kahneman, Knetsch and Thaler, 1991). The impact of experience is very important and may suggest that ratings are linked to acceptable levels of risk, and the question can be narrowed only to the range of forms of investment that are acceptable in terms of acceptable risk. It can also be explained by the confirmation bias mechanism (Beattie and Baron, 1988) under which people confirm the accuracy of their decisions, as they want to believe that they made the right decision. Another explanation could be the self-justification hypothesis, according to which people are stuck with their resolutions because they feel the need to justify or rationalize the decisions they made earlier. Decision-makers become prisoners of their own choices because they don't want to admit that their prior decisions, including the placement of money or time, were wrong. Authors such as Staw (1976) and Brockner (1992) point out that people do not like to admit to making incorrect decisions and, by confirming the validity of those decisions, they become even more committed to them in front of others.
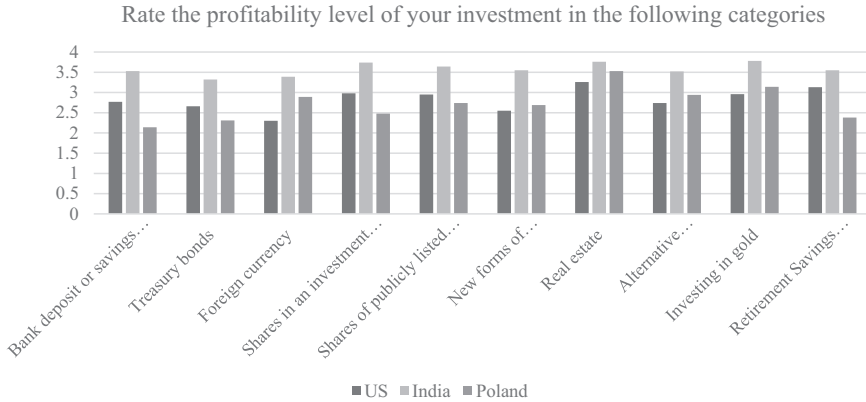
Rate the profitability level of your investment in the following categories

Figure 4.7 Average responses by country to the question: *Rate the profitability level of your investment in the following categories*

Source: Own elaboration.

Investing, in addition to profit, always involves risk, regardless of the object of investment, whether it is stocks, bonds, art, real estate, or even bank deposits. There is always a risk of loss, and the greater the possible expected profit, the greater the risk. In the classical view of financial markets theories, such as the Markowitz portfolio theory presented in Chapter 2, the following principle applies – the higher the risk of the investment, the higher the return the investor expects. To verify perceptions of profitability and risk, respondents were asked to "Rate the profitability level of your investment in the following categories" and "Assess the risk level of your investment in the following categories", regarding all 11 categories on an ordinal scale of 1 to 5, where 1 was a very low profit/risk level, and 5 was a very high profit/risk level.

Overall, Indians rate the profitability of various securities highest at an average of 3.578 (SD=1.717), Americans at 2.83 (SD=1.225), and Poles rate the lowest at 2.724 (SD=1.033). Figure 4.7 shows that a Bank deposit or savings account and Treasury bonds, stocks, and Retirement Savings Programs are rated relatively high by Americans while Poles rate Real estate and Alternative investments high. The differences between countries are statistically significant in all categories (p<0.001). Respondents overall rate Real estate the highest (M=3.52, SD=1.173) than Investing in gold (M=3.29, SD=1.187) and shares of publicly listed companies (M=3.11, SD=1.175). The lowest perceived profitability is in the case of Bank deposit or savings account (M=2.8, SD=1.399) and Treasury bonds (M=2.76, SD=1.173).

The results of factor analysis for profitability evaluation indicated three factors (Table 4.5). Four items loaded onto Factor 1, labeled Profitability of alternative investments. The items are connected with traditional forms

Table 4.5 Obliquely rotated component loadings for 9 survey items of the question: *Rate the profitability level of your investment in the following categories on a scale of 1 to 5*

Rate the profitability level of your investment in the following categories on a scale of 1 to 5	Component			Communalities
	Profitability of alternative investments	*Profitability of shares and new forms of investments*	*Profitability of bank account and bonds*	
Investing in gold	0.816			0.782
Real estate	0.789	0.327		0.734
Alternative investments, such as works of art, old jewelry, antiques	0.768			0.761
Foreign currency	0.533	0.368	0.45	0.622
Shares of publicly listed companies	0.308	0.846		0.832
Shares in an investment fund		0.793	0.334	0.799
New forms of investment, for example, cryptocurrencies, start-ups	0.389	0.677		0.663
Bank deposit or savings account			0.908	0.858
Treasury bonds		0.464	0.69	0.764
Eigenvalues	5.079	1.03	0.706	
% of variance	56.431	11.439	7.847	
Cumulative %	56.431	67.87	75.716	

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Source: Own elaboration.

of alternative investments: Investing in gold, Real estate, Alternative investments, such as works of art, old jewelry, antiques, and Foreign currency. Three items: Shares of publicly listed companies, Shares in an investment fund, and New forms of investment, for example, cryptocurrencies, start-ups, loaded onto Factor 2, labeled Profitability of shares and new forms of investments. The last factor combines Bank deposit or savings account and Treasury bonds and is labeled Profitability of bank account and bonds.

Opinions on the profitability of asset classes in researched countries differ from the average in the entire sample. In the case of Profitability of bank account and bonds and Profitability of shares and new forms of investments, the pattern is similar: Indians rank high on these factors, Americans rank close to average, and Poles rank the lowest. For the factor Profitability of

Figure 4.8 title: Assess the risk level of your investment in the following categories

Figure 4.8 Average responses by country to the question: *Assess the risk level of your investment in the following categories*

Source: Own elaboration.

alternative investments, both Indians and Americans rate relatively high while Poles rate the Profitability of alternative investments relatively low.

Responses to the question "Assess the risk level of your investment in the following categories on a scale of 1 to 5" (Figure 4.8) do not differ as much between countries as they do in assessing profitability. Indians rated the risk of investment the highest, with an average value of 3.18 (SD=1.288), but Americans and Poles at a similar level, with Americans at 2.98 (SD=1.198) and Poles at 2.95 (SD=1.086). The differences between countries are statistically significant in all categories (p<0.001) with the exception of one category, New forms of investment, for example, cryptocurrencies, start-ups, where differences are at tendency level (p=0.068). The responses are shown in Figure 4.8. Comparing responses between asset classes for all respondents together, the highest rates of perceived risk were for Shares in an investment fund (M=3.35, SD=1.087), Shares of publicly listed companies (M=3.52, SD=1.13), and New forms of investment, for example, cryptocurrencies, start-ups (M=3.74, SD=1.207). The lowest perceived risk is in the case of Bank deposit or savings account (M=2.36, SD=1.415) and Treasury bonds (M=2.72, SD=1.253).

The results of factor analysis for risk evaluation indicated three factors, with the results shown in Table 4.6. It is worth noting that factors are combining the same items as with profitability assessment, that is, Shares of publicly listed companies, New forms of investment, for example, cryptocurrencies, start-ups, and Shares in an investment fund load on first factor Risk of shares and New forms of investments, while Investing in gold, Alternative investments, such as works of art, old jewelry, antiques, Real estate, and Foreign currency factor load on Risk of alternative investments, and the remaining combines to Risk of bank account and bonds.

Table 4.6 Obliquely rotated component loadings for 9 survey items of the question: *Assess the risk level of your investment in the following categories on a scale of 1 to 5*

Assess the risk level of your investment in the following categories on a scale of 1 to 5.	Component			Communalities
	Risk of shares and new forms of investments	Risk of alternative investments	Risk of bank account and bonds	
Shares of publicly listed companies	0.857			0.777
New forms of investment, for example, cryptocurrencies, start-ups	0.836			0.766
Shares in an investment fund	0.809			0.766
Investing in gold		0.823		0.762
Alternative investments, such as works of art, old jewelry, antiques		0.803		0.741
Real estate		0.77		0.66
Dollars, Euros, or other currency – foreign currency	0.455	0.459	0.317	0.519
Bank deposit or savings account		0.316	0.841	0.813
Treasury bonds			0.828	0.803
Eigenvalues	4.15	1.603	0.855	
% of variance	46.113	17.809	9.497	
Cumulative %	46.113	63.922	73.42	

Source: Own elaboration.

Indians rate the risk factors above the average for the whole group, just as in the case of many other questions. Americans rate the Risk of bank account and bonds at the lowest level, while Poles slightly below the average. The Risk of alternative investments is rated by Americans higher than by Indians, but those two nations rank risk above the average. The lowest and below the average assessment of Risk of alternative investments is observed in the case of Poles, which may be due to the evaluation of real estate as a very safe investment. In the case of Risk of shares and alternative investment, Americans rate the lowest, Poles and Indians above the average, but Indians give higher rates for risk in this risk category factor.

The three factors identified in the analysis, based on assessment of profitability and risk of 11 items representing various forms of saving, align with the three layers of behavioral portfolio theory (Shefrin and Statman, 2000). The

first layer represents investments with the lowest level of security, including Bank accounts and bonds, that is the layer of Basic financial needs and products. The second layer, Additional financial needs and products, can involve Alternative investments such as real estate and gold, which are considered as safe investments vehicles. Lastly, the highest layer, known as the High aspiration layer, focuses on novel and emerging investment opportunities that entail both risk and return considerations. This layer encompasses investments in new forms of investment, for example, cryptocurrencies, start-ups as well stocks and investment funds. This seems to be a revolution in the perception of individual investors; there is evidence that stocks and cryptocurrencies and start-ups merged into a single factor, while assessing profitability and risk. Meanwhile, treasury bonds, typically considered safe investments, joined bank accounts to form the lowest layer, basic financial needs and product. In the intermediate layer, we find traditional alternatives such as gold and real estate. Gold, in particular, is widely recognized in high inflation periods as a safe haven for investment.

The ratio of the evaluation of profit to risk for different classes of financial instruments, according to the theory of finance, should be increasing, which means that for taking additional risk investors expect an additional rate of return. Table 4.7 presents correlation coefficients between risk and return assessments for different asset classes and different countries. Overall, for all asset classes, we observe statistically significant values of positive correlation coefficient across the three-country samples all together. This means that respondents correctly assess the risk and return of assets, expecting a higher premium for taking the risk. This pattern is very strong in the responses of Indians and Americans, but there is an anomaly of negative or zero correlation in the responses of Poles.

Polish respondents assessed the relationship between risk and return only for bank deposit or savings account and treasury bonds. Correlation coefficients are insignificant or negative for the other categories. For classic alternative investments: Real estate, works of art, old jewelry, antiques and gold, Poles believe that the higher the risk the lower the return, which is the realization of the risk/return paradox (Fiegenbaum and Thomas, 1988). It suggests that in those domains Poles have a risk-seeking attitude, and they are willing to accept lower return in higher risk conditions, if they are aware of risk. On the other hand, they may perceive investments as exceptionally safe, as *safe havens*, and misperceive risk or they do not take it into account at all. The aforementioned classes of investments are characterized by the physical dimension of the investment, which is perceived as extremely safe by Poles. This is also an example of the anomaly in preferences shown in research by Shefrin (2005), where professionals in financial institutions linked high expected returns to low risk while they considered those with low expected returns to be riskier. Ganzach (2000) points to another factor that could explain the negative correlation, namely the lack of knowledge about the assets. When assets referred to as *unfamiliar* are placed on a continuum from

Table 4.7 Correlation coefficients between the answers to the questions on assessing profitability and risk, that is, *Rate the level of profitability of investments in the following categories on a scale of 1 to 5* and *Rate the level of risk of investments in the following categories on a scale of 1 to 5*

	US	India	Poland	Total
Bank deposit or savings account	0.542**	0.513**	0.382**	0.468**
Treasury bonds	0.384**	0.450**	0.171**	0.351**
Dollars, Euros, or other currency – foreign currency	0.253**	0.301**	0.016	0.203**
Shares in an investment fund	0.289**	0.303**	-0.047	0.229**
Shares of publicly listed companies	0.317**	0.340**	0.058	0.236**
New forms of investment, for example, cryptocurrencies, start-ups	0.049	0.208**	0.028	0.113**
Real estate	0.116**	0.148**	-0.216**	0.042*
Alternative investments, such as: works of art, old jewelry, antiques	0.231**	0.247**	-0.108**	0.147**
Investing in gold	0.195**	0.209**	0.100**	0.114**
Retirement Savings Programs	0.263**	0.291**	0.016	0.161**

Source: Own elaboration.

Notes: Nonparametric correlation coefficient – Spearman;
** statistically significant coefficient at 0.001 level; * statistically significant coefficient at 0.05 level.

good to bad, individual investors associate the so-called *good assets* with a high rate of return and, at the same time low risk, while *bad assets* are interpreted as highly risky and having a low rate of return, which, as a result, can lead to a negative correlation between profitability and risk assessments in evaluations.

4.3 Factors determining saving and investment decisions

Financial literacy is a vital factor determining saving and investment decisions. The research, taking into consideration recent pandemic effects and subsequent spreading of digitalized services, analyzed perception of changes in financial and other spheres of life, including trust in different forms of payment. To measure financial literacy, six questions presented in Chapter 2 were used. They were introduced and explored by Lusardi and Mitchell (Lusardi and Mitchell, 2007; Lusardi, 2008; Lusardi and Tufano, 2014) and are commonly used in numerous FINRA studies in the US and worldwide. The questionnaire consists of questions on specific components of financial literacy, for example, the capacity to do calculations of compound interest (Question 1), understanding of inflation (Question 2), or understanding of risk diversification (Question 3). Across different studies, a range of three to seven

questions are used, and correct answers are the main subject of interest. If the score of correct answers is above the median, then individuals are identified as financially literate. However, several studies have also reported results regarding "I don't know" responses, showing the distribution of answers on the set of all given questions in the financial literacy test. In a similar vein, the approach adopted in this book considered all variables, including the number of correct answers, the number of "I don't know" responses, and the number of erroneous responses, as a complete financial literacy profile. Respondents from the three analyzed countries differed in their financial literacy, as measured by three indices: objective knowledge, illusory knowledge, and admitted ignorance. Figure 4.9 shows the results of research conducted for this book, where Poles scored significantly higher than Americans and Indians, on correct knowledge and admitted ignorance indices (p<0.001, p<0.001, respectively) and at the same time scored the lowest on illusory financial knowledge (p<0.001, p<0.001, Americans and Indians respectively). Indian and American respondents do not differ in their objective knowledge but differ in illusory knowledge (Indians significantly higher, p<0.001) and admit ignorance (Americans significantly higher, p<0.001). All three groups of respondents differ significantly in their illusory knowledge, with Indians scoring the highest and Poles scoring the lowest on the index of illusory financial knowledge (all p<0.001). Results of the comparison of objective financial knowledge are in line with earlier research results presented in Chapter 3. As seen in various reports (GPFI, 2021; FINRA, 2018), the scores of Poles were higher than average or equal to average, while the scores of Indians or Americans were lower or equal to average on the scales used for the measurement.

If financial illiteracy was measured by incorrect answers without distinguishing between a lack of knowledge people are willing to admit and a lack

Figure 4.9 Scores in FINRA quiz of respondents from three countries: the US, India, and Poland

Source: Own elaboration.

of knowledge they are not aware of, financial illiteracy of American and Indian respondents would be very similar. However, if different components of financial illiteracy are distinguished, these two samples differ significantly, with Indians being much more overconfident about their financial knowledge. Also, overconfidence has a different impact on behavior than just a lack of knowledge since it leads to, for example, excessive optimism and increased risk-taking (Broihanne, Merli and Roger, 2014). Moreover, the illiteracy of Polish respondents, unlike that of Americans and Indians, is composed more of admitted ignorance than illusory knowledge, which indicates a lack of confidence.

Further, Twostep Cluster Analysis was applied to data from three representative samples (N=3,093) to identify different types of participants based on their three indices of financial literacy – objective knowledge, illusory knowledge, and admitted ignorance. The three-cluster solution was chosen, supported by the silhouette measure of cohesion and separation (Bacher, Wenzig and Vogler, 2004) and the ratio of sizes = 2.51 (Figure 4.10).

The profiles of participant financial literacy types are presented in Figure 4.11. The biggest cluster (N=1,652) consisted of respondents whose illusory knowledge (as measured by the number of incorrect answers in the quiz) was bigger than their objective knowledge. Those respondents were unwilling to admit their ignorance leading to the labeling of this cluster as
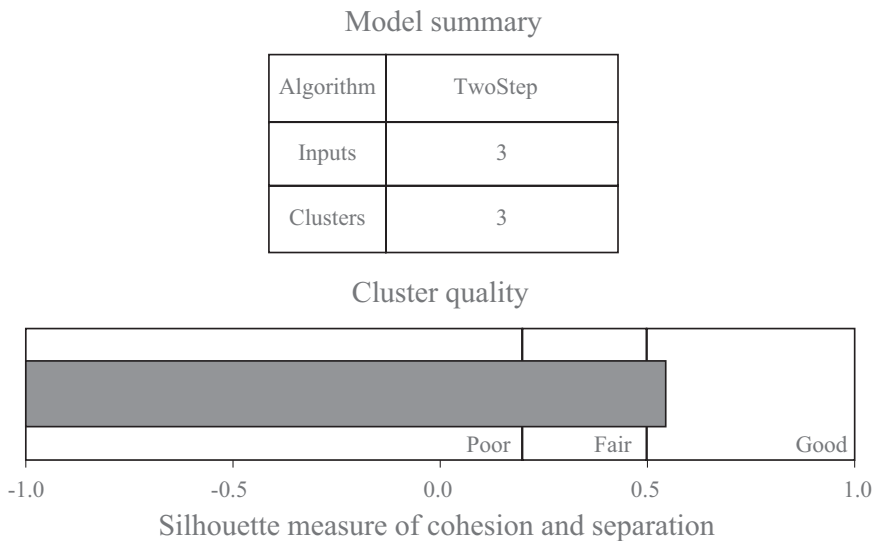

Figure 4.10 Silhouette measure of cohesion and separation of the different clusters
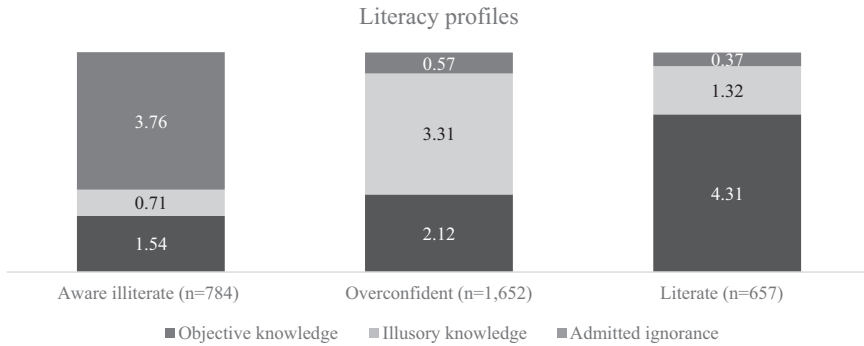
Source: Own elaboration.

Figure 4.11 Characteristics of members of three clusters obtained in TwoStep Cluster Analysis

Source: Own elaboration.

Overconfident. The second cluster (N=784) consisted of respondents whose knowledge was rather small, and they were willing to admit their ignorance. They were labeled Aware illiterate. The last cluster (N=657) consisted of respondents with substantial financial knowledge and was labeled Literate. If illiteracy is treated as a uniform variable, without distinguishing between a lack of knowledge that people are aware and are not aware of, those labeled Aware illiterate and Overconfident should not differ considerably since their objective knowledge does not differ much (or at least not as much as Overconfident and Literate). However, the nature of their ignorance is very different, and they differ significantly in their financial behavior, as seen, for example, in saving behavior – percentage of income set aside monthly or level of diversification of their savings. The significance of overconfidence in financial decision-making is well-documented. For example, according to Odean (1998), investors with overconfidence tend to increase transaction volume and market depth, but the expected utility decreases. Camerer and Lovallo (1999) stated that overconfident individuals are more likely to enter into competitive markets and games. Research by Grinblatt and Keloharju (2009) showed that a unit increase in overconfidence corresponds to a 4% rise in the number of stock market transactions. Despite the fact that overconfidence is often described as one of the reasons for the financial crisis, research by Wang (2001) showed that overconfidence can be also beneficial, because moderate overconfidence or optimism can survive and dominate events, particularly when the fundamental risk is large.

Results of the Chi-square test showed that the frequency of different literacy profiles differed across the three analyzed countries with X^2 (4, N=3,039)=554.55, p<0.001). As shown in Figure 4.12, in the US and India, the most prevalent was the Overconfident type, while in Poland all three types were relatively equally represented.
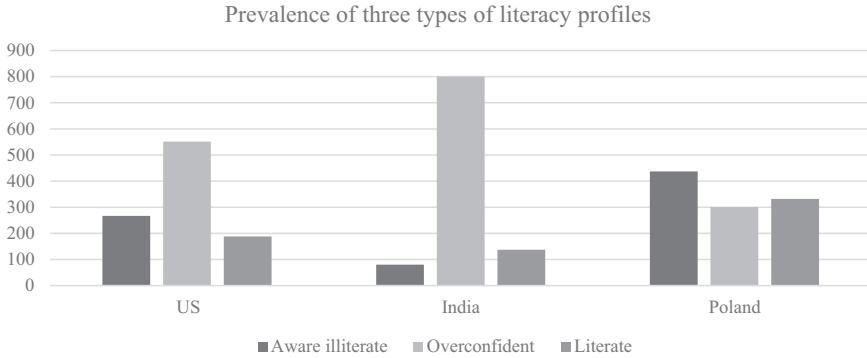
Prevalence of three types of literacy profiles

Figure 4.12 The prevalence of different literacy profiles in the US, India, and Poland
Source: Own elaboration.

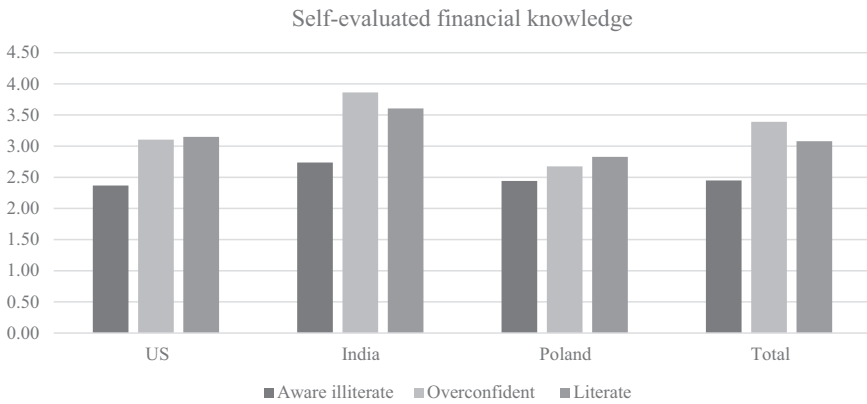Self-evaluated financial knowledge

Figure 4.13 Average responses to the question: *How do you assess your financial knowledge?* among respondents with different literacy profiles in the US, India, and Poland

Source: Own elaboration.

Two-way ANOVA 3 (types of literacy profile) × 3 (country) revealed a significant interaction effect of the type of literacy profile and the country of respondents ($F(4, 3,084)=14.38$, $p<0.001$) in respondent self-evaluation of their financial knowledge. Respondents labeled Overconfident evaluated their knowledge higher than Literate or Illiterate, and Illiterate evaluated their knowledge lower than Overconfident or Literate (all $p≤0.001$). However, across countries, Indian respondents evaluated their knowledge higher than Americans or Poles (both $p<0.001$), independent of their literacy profiles. Literate and Overconfident Poles evaluated their knowledge lower than Literate or Overconfident Americans (both $p< 0.001$) (Figure 4.13). Poles are

Table 4.8 Correlation coefficients between percentage of income respondents declare
to set aside monthly and three indices of financial literacy and self-evaluated
financial knowledge

	US	India	Poland
Objective knowledge	–0.081[*]	0.033	0.088[**]
Illusory knowledge	0.272[**]	0.185[**]	0.112[**]
Admitted ignorance	–0.226[**]	–0.221[**]	–0.170[**]
Self-evaluated knowledge	0.371[**]	0.361[**]	0.220[**]

Source: Own elaboration.

Notes: Nonparametric correlation coefficient – Spearman;
[**] statistically significant coefficient at 0.001 level;
[*] statistically significant coefficient at 0.05 level.

less sure of their knowledge, even those of them whose objective knowledge is
quite good. Self-evaluated financial knowledge of Polish Literate respondents
is significantly lower than that of American and Indian Literate respondents.
One consequence of that could be smaller participation in risky financial
markets since risky market participation is affected by underestimation of
one's knowledge (European Union/OECD, 2022; Huang et al., 2023).

As shown in Table 4.8, the propensity to save is more related to what
a respondent thinks about their financial knowledge rather than what they
really know. In all three analyzed countries, declared monthly savings are
strongly, positively correlated with self-evaluated financial knowledge and
illusory knowledge. At the same time, in all three countries, it is unequivo-
cally negatively correlated to the strength of financial ignorance that respond-
ents are willing to admit to. In turn, no clear pattern of relationship was
observed for objective knowledge and declared monthly savings. Objective
knowledge is not correlated with saving propensity in the Indian sample, and
it was weakly negatively correlated in the American sample and positively
correlated in the Polish sample.

Such a result is difficult to explain. Different forms of financial ignorance
that participants were aware of and that they were not aware of are associ-
ated with saving behavior in the same way. It is objective knowledge that is
differently associated with saving behavior in three countries. It might sug-
gest a different role of financial knowledge in a developed country with a
stable economy versus a developed country but with an economy in the stage
of transition from communist, central-based economy.

Two-way ANOVA 3 (types of literacy profile) ×3 (country) revealed
a significant interaction effect between the type of literacy profile and the
country of respondents $F(4, 3,084)=14.38$, $p<0.001$ in respondents' declared
percentage of income set aside monthly. Overconfident Americans and
Indians declared setting aside a higher percentage of their income than did
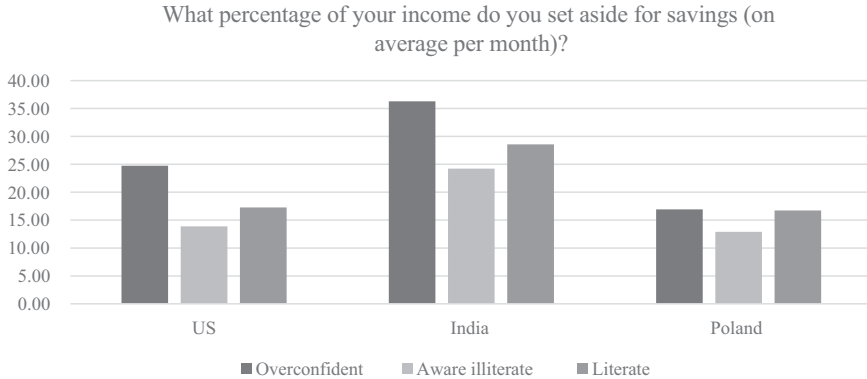
What percentage of your income do you set aside for savings (on average per month)?

Figure 4.14 Average responses to the question: *What percentage of your income do you set aside for savings (on average per month)?* among respondents with different literacy profiles in the US, India, and Poland

Source: Own elaboration.

respondents from their countries characterized by different literacy types – Aware Illiterate and Literate. Moreover, Aware Illiterate and Literate American and Polish respondents are quite similar to each other in their saving propensity, however, Overconfident Americans set aside a higher percentage of their income than do Overconfident Poles (Figure 4.14).

Similar to the saving propensity, the tendency to diversify one's savings was more clearly correlated with one's perceived and illusory knowledge than with objective financial knowledge (Table 4.9). Also, it was unequivocally negatively correlated with respondents admitting financial ignorance.

Two-way ANOVA 3 (types of literacy profile) × 3 (country) revealed significant interaction effects of the type of literacy profile and the country of respondents $F(4, 3,084)=9.75$, p<0.001 in respondent propensity to diversify their forms of saving. As shown in Figure 4.15, in the whole sample, people with different literacy profiles declared different diversification of their savings. Overconfident report significantly higher diversification than Literate (p<0.001) and Aware illiterate (p<0.001), and Literate report higher diversification than Aware illiterate (p<0.001). Across countries, the diversification of Overconfident and Literate did not differ significantly and was significantly higher than the diversification reported by Aware illiterate (all p≤0.001). Moreover, the diversification propensity of people with different financial literacy profiles was similar in the US and Poland for two types: Overconfident and Literate. However, Aware illiterate Americans reported smaller diversification of their forms of saving than Poles (p<0.001) and Indians (p<0.001). Interestingly, the differences between Aware illiterate Indians and Poles ceased to be significant (p=0.056).

Table 4.9 Correlation coefficients between the number of indicated different forms of saving (without cash, bank account) and three indices of financial literacy, self-evaluated financial knowledge

	US	*India*	*Poland*
Objective knowledge	0.194**	0.044	0.128**
Illusory knowledge	0.249**	0.252**	0.193**
Admitted ignorance	−0.367**	−0.331**	−0.266**
Self-evaluated knowledge	0.346**	0.388**	0.179**

Source: Own elaboration.

Notes: Nonparametric correlation coefficient – Spearman;
** statistically significant coefficient at 0.001 level;
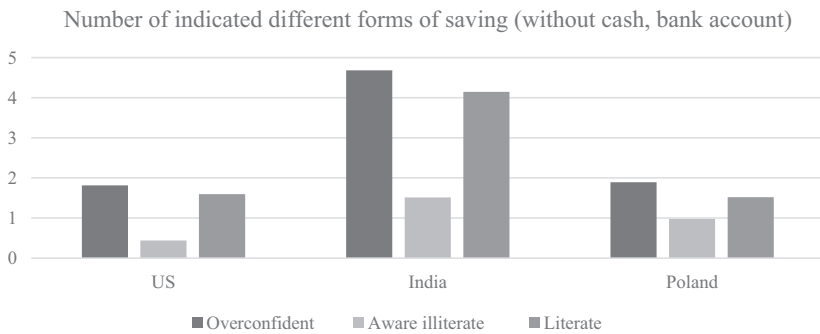* statistically significant coefficient at 0.05 level.

Number of indicated different forms of saving (without cash, bank account)

■ Overconfident ■ Aware illiterate ■ Literate

Figure 4.15 Average responses to the question about *Number of indicated different forms of saving (without cash, bank account)* among respondents with different literacy profiles in the US, India, and Poland

Source: Own elaboration.

As shown in Figure 4.16, respondents from the three analyzed countries reported different levels and directions of influences of the COVID-19 pandemic on their lives. Indian respondents reported solely positive impact of the pandemic – improvement in all examined spheres of life, while American and Poles reported more diverse impacts. A series of one-sample t tests revealed that in all spheres of life, respondent lives improved, in comparison to the pre-pandemic time. In the case of US respondents, in six spheres: Contacts with friends and acquaintances, Feeling satisfied with life, Banking/financial service, Income level, Feeling satisfied with professional work, and Mental health status. There were no differences in neither positive or negative direction, compared to the pre-pandemic time. However, in the case of Financial situation of respondent households and Ability of the household to meet financial obligations, a small but significant deterioration was observed ($t(1005)=-7.12$, p<0.001 and $t(1005)=-2.79$, p=0.005, respectively). Whereas
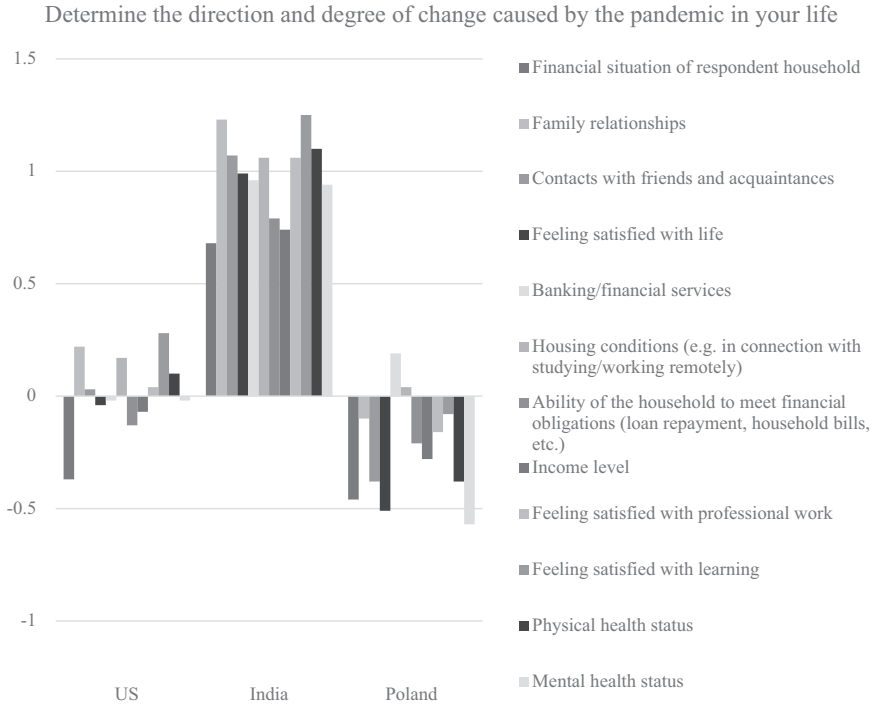
Determine the direction and degree of change caused by the pandemic in your life

■ Financial situation of respondent household

■ Family relationships

■ Contacts with friends and acquaintances

■ Feeling satisfied with life

■ Banking/financial services

■ Housing conditions (e.g. in connection with studying/working remotely)

■ Ability of the household to meet financial obligations (loan repayment, household bills, etc.)

■ Income level

■ Feeling satisfied with professional work

■ Feeling satisfied with learning

■ Physical health status

■ Mental health status

Figure 4.16 Direction and the degree of changes caused by the COVID-19 pandemic in different spheres of life

Source: Own elaboration.

in the case of Family relationships, Housing conditions, Feeling satisfied with learning, and Physical health status, respondents declared improvement, in comparison to the pre-pandemic time ($t(1005)=5.22$, p 0.001; $t(1005)$ 6.84, p<0.001; $t(1005)=2.28$, p=0.023 respectively). In the case of Polish respondents, every sphere of life changed due to the COVID-19 pandemic. Changes were mostly negative. Poles reported that Financial situation of the household, Family relationships, Contacts with friends and acquaintances, Housing conditions, Ability of the household to meet financial obligations, Income level, Feeling satisfied with professional life, Feeling satisfied with learning, Physical health status, and Mental health status deteriorated, in comparison to the pre-pandemic time ($t(1069)=-12.61$, p<0.001; $t(1069)=-3.12$, *p*<0.001; $t(1069)=-11.17$, p=<0.001; $t(1069)=-13.91$, p=<0.001; $t(1069)=-7.37$, p<0.001; $t(1069)=-8.38$, p<0.001; $t(1069)=-5.01$, p<0.001; $t(1069)=-2.93$, p=0.002; $t(1069)=-11.57$, p<0.001; $t(1069)=-16.10$, p<0.001 respectively). However, in the case of Banking/Financial services and Housing conditions, respondents reported improvements ($t(1069)=7.59$, p<0.001; $t(1069)=-2.12$, p=0.017 respectively).

Compared to the pre-pandemic period, your trust in the following forms of payment
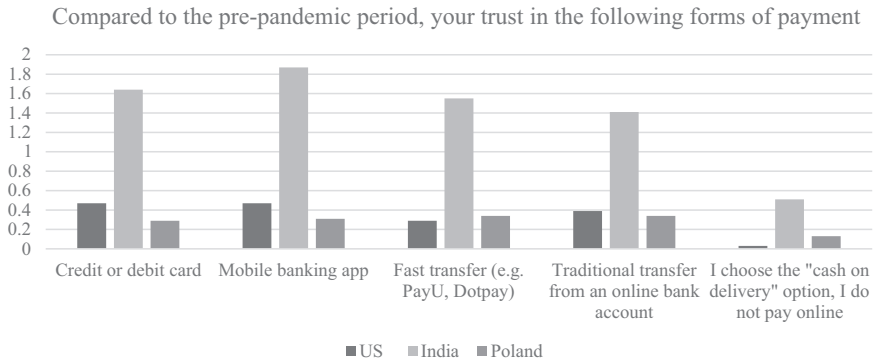

Figure 4.17 Average responses to the question: *Compared to the pre-pandemic period, assess your trust in the following forms of payment*? in relation to five forms of payment

Source: Own elaboration.

In line with significantly bigger positive changes in all spheres of life observed in the Indian sample, Indian respondents also reported a bigger than American or Polish respondents' increase in their trust for all forms of payment in comparison to the pre-pandemic period. As shown in Figure 4.17, Poland was the country with the smallest increase in trust for different forms of payment, still quite similar to the US – in the case of three forms of payment: fast transfer, traditional transfer, and cash on delivery option, differences were not statistically significant.

Multiple comparisons within countries revealed that in the case of India, there is one type of payment associated with the highest increase in trust. It is a mobile banking app form of payment, which is in line with GPFI data (2021) that shows a 5p.p. increase between 2017 and 2021 in the share of people making digital payment in India. In the case of the US or Poland, there is no single type of payment that differed noticeably in the increase of trust in comparison to pre-pandemic times. In the US, there was the same level of trust increase in three forms of payment: credit or debit card, mobile banking app, and traditional payment from an online account with significantly lower increase in the case of fast transfer payment and cash on delivery option (which actually did not increase in comparison to pre-pandemic period). In Poland, increase of trust in four digitally mediated forms of payment was of the same level and significantly higher than increase in cash on delivery form of payment.

Factor analysis on the declared changes in trust for different forms of payment revealed a one-factor solution that explained 60.01% of variance (Cronbach's α=0.82). Value of the standardized factor for India is 0.73, for the US –0.33, and for Poland –0.38 (Figure 4.18).

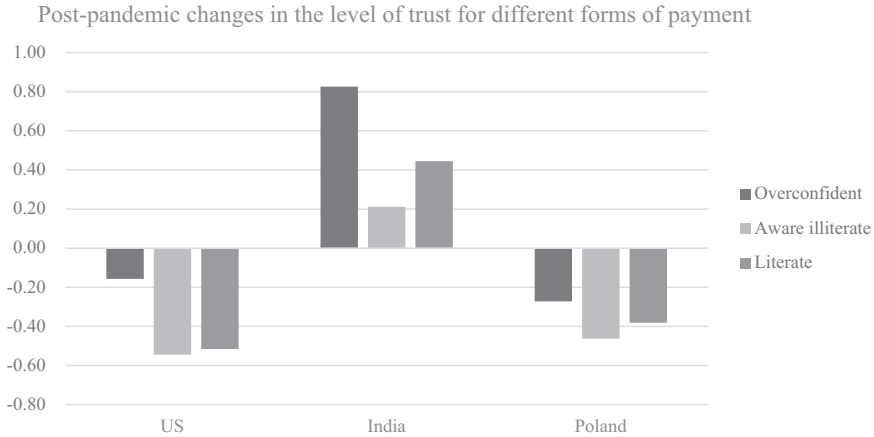Post-pandemic changes in the level of trust for different forms of payment

Figure 4.18 Standardized factor responses to the question: *Compared to the pre-pandemic period, assess your trust in the following forms of payment*?

Source: Own elaboration.

Technological revolution increased the number of people who gained access to digitally mediated forms of payment, and pandemic enforced faster transition to digital transactions, which subsequently led to the increase in trust in different forms of such transactions. Interestingly, among the three analyzed countries the strongest increase in the level of trust for different forms of payment was found in the Indian sample.

4.4 Attitudes to digital finance and robo-advisory

Attitudes toward digital finance can be moderated by many variables, including exposure to digital financial services and as cultural or individual differences. In the research for this book, respondents were asked about the forms of payment preferences, usage of banking services, familiarity of robo-advisory tools, and preferences toward financial recommendations given by artificial intelligence versus humans. The factor analyses enabled distinguishing dominant groups of respondents' preferences and behaviors according to payment forms and bank services usage. Furthermore, to deepen the analysis of the nature and strength of the relationship between the attitudes toward digital finance and robo-advisory as dependent variables, logistic regression was applied to analyze the nature of dependencies. In seeking to determine the form of the logit model adequately describing the relationships, a deductive approach to model construction was used, applying the general-to-specific modeling procedure. In the first step, estimation of the parameters of the model containing all independent (explanatory) variables referring to saving and investment was conducted. All independent variables (saving and investment decisions and factors influencing them) were described earlier. Next, the
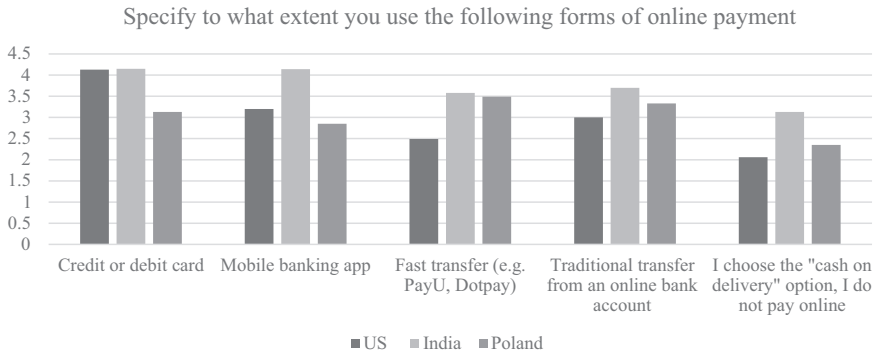
Specify to what extent you use the following forms of online payment

Figure 4.19 The extent of usage of different forms of online payment

Source: Own elaboration.

logistic models were estimated with the use of stepwise backward elimination based on the results of the reliability quotient test (with a chi-square distribution) allowing the sequential removal of individual independent variables using a critical level of significance (p=0.05). The final model was obtained when the influence of each explanatory variable was statistically significant at the p≤0.05 level.

The estimation of logit model parameters for the dependent dummy variable was carried out to assess the influence of selected variables on the use of various forms of online payments. In research for this book, respondents were asked about their experiences with digital finance by identifying the use of online payment forms and the use of banking systems, and their answers were contrasted with their demographics (Figure 4.19). While paying online with a credit or debit card is the most popular in the US, in Poland the dominant form of online payment is fast transfer. In India, on the other hand, credit and debit cards and mobile banking apps dominate.

Based on respondent answers, a factor analysis was conducted, which distinguished three dominant grouping factors: Digital payment, Traditional payment and Credit and debit card (Table 4.10). The Digital payment factor included fast transfers and mobile banking apps, while the items constituting the Traditional payment factor were the cash-on-delivery option and traditional transfer from an online bank account. The last highlighted factor constituting a separate category was Credit and debit card payments. Due to standardization, for the credit and debit card factor, answers were dominated by Americans, then Indians, and with Poles the least. For the traditional payment factor, Indians dominate, Poles use at a medium level, and Americans use the least. On the other hand, for the digital payment factor, India uses the most and the US the least.

Factors represent three levels of development in different types of financial payment services. Digital payment factor represents the newest forms

Table 4.10 Factors of online payment forms

Observed variable	Factor 1	Factor 2	Factor 3	Communalities
	Digital payment	Traditional payment	Credit or debit card	
1 Fast transfer (e.g., PayU, Dotpay)	0.881			0.828
2 Mobile banking app	0.687		0.436	0.663
3 I choose the "cash on delivery" option, I do not pay online		0.911		0.835
4 Traditional transfer from an online bank account	0.395	0.601		0.57
5 Credit or debit card			0.953	0.917
Eigenvalues	2.003	1.068	0.742	
% of Variance	40.053	21.356	14.844	
Cumulative %	40.053	61.409	76.253	

Source: Own elaboration.

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 4 iterations.

of services utilized via smartphones. Traditional payment factor represents forms that are either non-digital or refers to traditional online payments. Finally, the Credit or debit card factor represents cashless forms of payment that require some infrastructure besides access to the internet.

With the aim of assessing the influence of different variables and exploring predictors for preferred forms of payment, estimation of logistic regression parameters showed that age significantly predicts the differentiation of the use of digital payment ($p<0.001$) and traditional payment ($p=0.003$) (Table 4.11). As the respondent's age increases, the probability of using digital payment forms decreases by 2.3% (OR=0.977), while the use of traditional forms of payment increases by 1.2% (OR=1.012). However, in the case of payments by debit or credit card, no significant differences were related to the age of respondents.

On the other hand, in the case of differences between countries, in Poland compared to the US there is about 1.5 times greater probability (OR=2.497) of using digital payment forms and almost twice as much chance of using traditional form of payment (OR=1.964). In India, on the other hand, there is about 50% more chance of using traditional forms of payment (OR=1.508) and about 60% less chance of using debit or credit card in payment (OR=0.391), compared to the US.

In addition, the use of digital payment and traditional payment is related to the assessment of the profitability of individual forms of saving. It turns

Table 4.11 Logistic regression for digital payment, traditional payment, and credit and debit card usage

Predictor	Digital payment			Traditional payment			Credit and debit card		
	B	Sig.	Exp(B)	B	Sig.	Exp(B)	B	Sig.	Exp(B)
Age	−0.024	<0.001	0.977	0.012	0.003	1.012			
Country – US		<0.001			0.001			<0.001	
Country – India				0.411	0.019	1.508	−0.938	<0.001	0.391
Country – Poland	0.915	<0.001	2.497	0.675	<0.001	1.964	−2.471	<0.001	0.085
Percentage of income set aside for savings (average per month)				0.005	0.051	1.005			
Profitability of alternative investments	0.202	0.002	1.224	0.165	0.015	1.179			
Profitability of shares and new forms of investments	0.277	<0.001	1.319						
Profitability of bank account and bonds				0.422	<0.001	1.524			
Risk of shares and new forms of investments							0.161	0.031	1.175
Risk of alternative investments	−0.315	<0.001	0.73	0.187	0.001	1.206	−0.231	0.002	0.793
Risk of bank account and bonds	−0.175	0.005	0.84	0.315	<0.001	1.371	−0.592	<0.001	0.553
Electronic money	0.13	0.032	1.139	−0.255	<0.001	0.775			
Equity				−0.221	0.004	0.802			
New and old alternatives							−0.222	0.018	0.801
Post-pandemic changes in the level of trust for different forms of payment	0.403	<0.001	1.496	0.597	<0.001	1.817			
Self-assessment of financial knowledge									
Financial Literacy_objective knowledge	0.102	0.028	1.107						
Constant	−2.774	<0.001	0.062						

Source: Own elaboration.

out that the higher respondents assess the profitability of alternative investment, the more often they use digital payment forms by 22.4% (OR=1.224), and about 18% more often they choose traditional payment (OR=1.179). Similarly, the higher the profitability of shares and new forms of investments rating, the chance of using digital payment increases by 31.9% (OR=1.319). In addition, respondents who rate the profitability of bank account and bonds higher are 52.4% more likely to choose the traditional form of payment (OR=1.524). However, these variables do not affect the use of debit and credit cards.

On the other hand, the use of debit and credit cards explains the assessment of the riskiness of individual forms of investment, as it turns out that the higher the risk of shares and new forms of investments, the greater the 17.5% chance of using credit and debit cards (OR=1.175). On the other hand, this relationship is negative in the case of risk of alternative investments, because as the perceived risk increases, the chance of using credit and debit cards decreases by about 20% (OR=0.793), and similarly the use of digital forms of payment decreases by 27% (OR=0.73). There is also a negative relationship in the case of risk of bank account and bonds, because the higher it is, the lower the use of credit and debit card is by approximately 45% (OR=0.553) and by 16% (OR=0.84) are less likely to use digital payment forms. On the other hand, the higher the risk rating of these forms of savings, the greater the chances of using the traditional form of payment by 20.6% (OR=1.206), and the most with the perception of higher risk of bank account and bonds, because by 37.1% higher (OR=1.371).

The obtained results show that having savings in the form of electronic money increases the likelihood of using digital forms of payments by about 14% (OR=1.139) and reduces the use of traditional forms by 22.5% (OR=0.775). Also, investing in equity reduces the use of traditional forms by about 20% (OR=0.802). On the other hand, investing in new and old alternatives reduces the chances of using credit and debit cards by about 20% (OR=0.801).

It can be seen that the usage of different forms of payment is also related to the perception of post-pandemic changes in the level of trust for different forms of payment, because with the increase in trust in various forms of payment, the chance of using digital forms of payment increases by about 50% (OR=1.496), and the probability of traditional payment increases by over 80% (OR=1.817). On the other hand, the use of digital payment forms is related to the actual level of objective financial literacy measured by the correct answers in the quiz, because the higher the level of objective financial knowledge, then approximately 11% greater the chances (OR=1.107) of using digital forms of payment.

A person who prefers digital payments is typically relatively young. Age decreases the likelihood of using traditional payment methods. In the case of a country-level predictor, being Polish specifically increases the probability of

using digital payments. When evaluating the profitability of new investment forms and banking accounts, it has a more positive impact on the likelihood of using digital payment. Perceived risk, on the other hand, decreases the probability of using digital payment. These individuals are profit-oriented and consider new investment forms, but they also have concerns about risk. Respondents using digital payments are likely to have savings in the form of bank deposits or electronic money. They also have a positive perception of post-pandemic changes in the case of trust toward different forms of payment. Additionally, having objective knowledge supports the usage of digital payment.

In contrast, a person who prefers traditional payment methods is typically relatively older. Age increases the likelihood of using traditional payment methods. Traditional payments are more popular in Poland and India compared to the US. In the case of traditional payments, they are primarily associated with savings, and, the more savings individuals have, the more likely they are to use traditional payment methods. Evaluations of the profitability and riskiness of different payment methods have a positive influence. The more individuals perceive profitability and recognize higher risk, the more likely they are to use traditional payment methods. Possessing a bank deposit decreases the probability of using traditional payment methods, and owning stocks is also negatively associated with traditional payments usage. In terms of trust perception toward different payment methods after the pandemic, it has a positive impact on traditional payment usage.

The usage of credit and debit cards, however, is not dependent on age. Age does not have any impact on favoring this form of payment. Results show that Americans use credit and debit cards most frequently while being Polish or Indian reduces the likelihood of using credit and debit cards. The evaluation of profitability of different investment forms has no influence on the tendency to use credit and debit cards while perception of risk does. The perception of risk regarding stocks and new investment forms has a positive influence on using credit and debit cards, since the more individuals perceive risk in these areas, the more inclined they are to use credit and debit cards. However, the risk associated with bank accounts and alternative investments has a negative impact. The more individuals perceive risk in these areas, the less likely they are to use credit and debit cards. Respondents who use credit and debit cards do not invest in various alternative forms, both old and new. Possessing savings in this form reduces the likelihood of using credit and debit cards.

Respondents generally use online banking services more often than traditional forms (Figure 4.20). However, there is variation between countries in this respect. In Poland, the use of online services through internet browser and mobile phone apps dominates at a level close to that in the US. In India, on the other hand, the use of banking mobile phone apps prevails.

In order to see what are the predictors of preferred usage of banking services, logistic regression was performed (Table 4.12). The dependent dummy
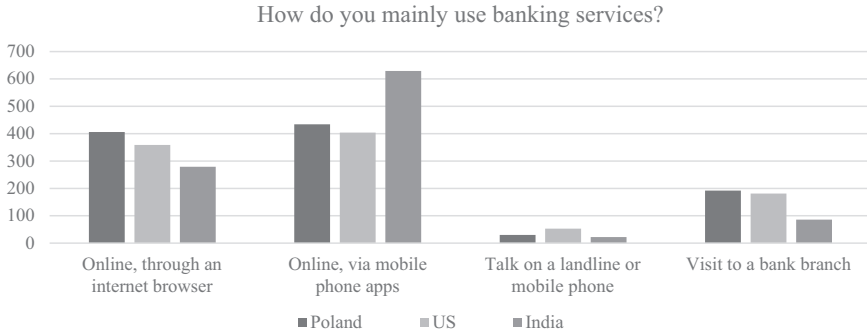
How do you mainly use banking services?

Figure 4.20 Main forms of using banking services

Source: Own elaboration.

Table 4.12 Logistic regression of main usage of banking services – traditional versus online

Predictor	Main usage of banking services – traditional versus online		
	B	*Sig.*	*Exp(B)*
Age	−0.022	<0.001	0.978
Profitability of alternative investments	0.12	0.042	1.128
Risk of bank account and bonds	−0.193	0.002	0.825
Electronic money	0.204	<0.001	1.227
New and old alternatives	−0.208	<0.001	0.812
Self-assessment of financial knowledge	−0.148	0.021	0.862
Post-pandemic changes in the level of trust for different forms of payment	0.486	<0.001	1.626
Financial Literacy_objective knowledge	0.251	<0.001	1.286
Constant	2.492	<0.001	12.088

Source: Own elaboration.

Note: Dependent variable is a dummy variable, where 0=traditional and 1=online.

variable that describes the main usage of banking services was defined as 1, if the respondent pointed to online banking services (browser and app), and otherwise it meant traditional banking services (phone call or visit at bank branch). Estimation of logistic regression parameters showed that age significantly affects the way of using banking services, because the older the person, then they are 2.2% less likely to use online banking services (OR=0.978). Another predictor of this variable is the assessment of profitability of alternative investments; the higher it is, the greater the chance of using online banking services (OR=1.128). The assessment of the riskiness of individual forms of investment is also important, as it turns out that the higher the

risk of bank account and bonds, the higher the probability of using bank-
ing services in a traditional way (OR=0.825). Another factor reducing the
chances of using banking services online by about 14% is the increase by a
unit on a scale of 1–5 self-assessment of financial knowledge (OR=0.862).
However, in the case of objective financial knowledge, the higher its level,
the higher the probability of using online banking services by approximately
30% (OR=1.286).

The results show that having forms of savings in the form of electronic
money increases the likelihood of using online banking services by about
23% (OR=1.227). On the other hand, investing in new and old alterna-
tives reduces the use of online banking services by approximately 19%
(OR=0.812).

The best predictor of the use of online banking services was that of post-
pandemic changes in the level of trust for different forms of payment, because
with an increase in trust the chances to choose an online service also grew by
60% (OR=1.626).

The profile of respondents who use online banking services is similar to
those who use digital payment methods. Age has a negative impact while
the perceived profitability of alternative investments has a positive influence.
Positive perceptions of risk associated with bank accounts have a negative
impact. However, possessing funds in electronic form in a bank account has
a positive influence. Utilizing and investing in new and alternative forms of
investment has a positive impact, while self-assessed knowledge has a nega-
tive influence. Changes in trust for different forms of payment due to the
pandemic and financial literacy measured by the level of objective knowledge
have a positive impact on using banking services online.

Not only preferences of form of payments or banking services are con-
nected with attitudes toward digitalization of finance but also the increasing
presence of robo-advisory systems. In the context of using robo-advisory ser-
vices, respondents were asked how familiar they are with automated financial
advisory tools. Responses varied across countries, but the dominant answer
(41.45%) was a very low level of knowledge (Table 4.13). In Poland and the
US, two groups of people dominate – those who defined their knowledge
as very low and people who declared an average level of financial literacy.
In India, on the other hand, the responses were very diverse. However, the
majority of people stated that they have between average and very high level
of knowledge.

To determine the factors that influence being familiar with automated
financial advisory tools, the predictors were examined within the logistic
regression (Table 4.14). Estimation of logistic regression parameters showed
that age indeed predicts diversity of familiarity with automated financial
advisory tools, and as respondent age increases, the chance of being familiar
decreases by 1.2% (OR=0.988). In turn, the size of the place of residence
proved to be an important predictor, because being a resident of a very large
city (over 500,000 inhabitants) increases the chances of being familiar by

Table 4.13 Familiarity with automated financial advisory tools across the countries

	Poland	US	India	Total	%
1 Very low level of knowledge	644	490	148	1,282	41.45%
2 Rather small level of knowledge	121	161	128	410	13.26%
3 Average level of knowledge	239	204	274	717	23.18%
4 Rather high level of knowledge	47	69	228	344	11.12%
5 Very high level of knowledge	19	82	239	340	11%
Total	1,070	1,006	1,017	3,093	100%

Source: Own elaboration.

Table 4.14 Logistic regression – familiarity with automated financial advisory tools

Predictor	Familiarity with automated financial advisory tools		
	B	Sig.	Exp(B)
Age	−0.012	0.049	0.988
Village		0.012	
Very large city (over 500,000 inhabitants)	0.535	0.06	1.707
Percentage of income set aside for savings (on average per month)	0.015	<0.001	1.015
Number of indicated different forms of saving	0.142	<0.001	1.152
Profitability of alternative investments	0.181	0.045	1.199
Profitability of shares and new forms of investments	0.307	0.001	1.359
Profitability of bank account and bonds	0.512	<0.001	1.668
Risk of alternative investments	0.151	0.051	1.163
Risk of bank account and bonds	0.412	<0.001	1.51
New and old alternatives	-0.19	0.031	0.827
Self-assessment of financial knowledge	0.966	<0.001	2.626
Post-pandemic changes in the level of trust for different forms of payment	0.639	<0.001	1.895
Constant	−5.603	<0.001	0.004

Source: Own elaboration.

70.7% (OR=1.707) compared to a village. In addition, the higher the percentage of income set aside for savings (on average per month) (OR=1.015) and the number of indicated different forms of saving (OR=1.152), the greater the familiarity by 1.5% in the case of savings and by 15% in the case of increasing the composition of the savings portfolio by one additional investment category. Being familiar with automated financial advisory tools is related to the assessment of the profitability of individual forms of saving – the higher

the respondents rate the profitability of alternative investment, the more familiar they are, by about 20% (OR=1.199). Similarly, with an increase of profitability of shares and new forms of investments, the familiarity increases by 36% (OR=1.359). In addition, people who rate the profitability of bank accounts and bonds higher are 67% more likely to be familiar with automated financial advisory tools (OR=1.668). Familiarity is also explained by assessing the riskiness of particular forms of investment. The higher the risk of alternative investments, the more familiar by 16.3% (OR=1.163) and in the case of a higher risk of bank account and bonds, higher by approximately 50% (OR=1.51). The results show that having forms of savings in the form of new and old alternatives reduces the use of online banking services by approximately 17% (OR=0.827).

A factor that increases the chances of being familiar with automated financial advisory tools is also self-esteem regarding financial knowledge – an increase by one unit on a scale of 1–5 increases familiarity by approximately 160% (OR=2.626). Familiarity is also related to the perception of post-pandemic changes in the level of trust toward different forms of payment, because with the increase of confidence in various forms of payment the chance of being familiar increases by approximately 90% (OR=1.895).

In the case of familiarity with automated financial advisory tools, like in other models, age has a negative influence. Older individuals are less likely to be familiar with these tools. However, there are several factors that positively impact the likelihood of familiarity. Residence in a large city with a population of over 500,000 and higher savings increase the probability of knowing about these methods. Additionally, having more diversified portfolios and a positive evaluation of the profitability and riskiness of different forms of investment increase the degree of familiarity with automated financial advisory tools. The inclusion of alternative forms of investment decreases the familiarity with automated financial advisory tools within this group. The last two factors, self-assessment of financial knowledge and post-pandemic changes in the level of trust for different forms of payment, also positively influence the familiarity with automated financial advisory tools. Interestingly, objective knowledge or ignorance did not matter in this case, but self-assessment of financial knowledge had a significant positive effect on increasing familiarity with automated financial advisory tools.

Respondents were also asked how they thought the introduction of automated financial advisory tools affect, if at all, clients of financial institutions, in the domain of costs, access to advice, product selection, quality of service, frequency of market fraud/incorrect sales (Figure 4.21). Respondents generally most often rated the impact of automated financial advisory tools positively on individual areas with the exception of predictions concerning frequency of market fraud. Indians hold a rather optimistic view, mainly expecting positive consequences, while Americans and Poles are more diverse in their expectations. In the Polish sample, the most frequently chosen response was "no opinion", which is compatible with Polish respondent

Figure 4.21 Impact of the introduction of automated financial advisory tools on clients of financial institutions

Source: Own elaboration.

results in the financial literacy quiz, where a high number of "I don't know" answers was provided.

Respondents were also asked in which domains of life they would prefer to listen to human recommendations and in which to listen to recommendations by artificial intelligence. Looking at the aggregate results, the preference for recommendations obtained from a human is dominant, but it depends on the field. Data in Figure 4.22 shows that, while Poles and Americans prefer human recommendations in every field to a greater or lesser extent, Indians
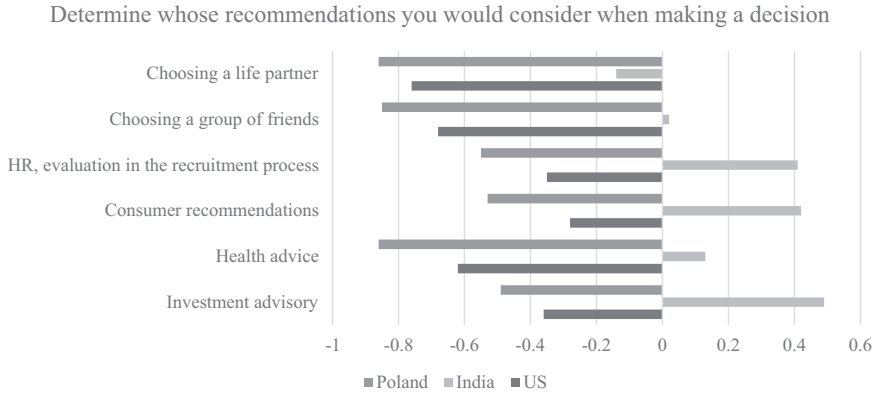
Determine whose recommendations you would consider when making a decision

Figure 4.22 Preferences of human versus AI recommendations in different life
domains

Source: Own elaboration.

prefer to listen to a person in terms of private life (choosing a life partner or
group of friends). However, they prefer AI recommendations in the case of
recruitment processes, consumer health, and, above all, investment. Answers
from Poles cover the tendency of American answers. On the other hand, they
are more inclined toward recommendations issued by a person.

In the context of preferences for recommendations regarding individual
forms of investment, Indians generally prefer AI recommendations. This is
most often the case when undertaking a new form of investment, purchasing
shares in an investment fund and foreign currencies (Figure 4.23). Poles, on
the other hand, in their answers cover the tendency of American answers.
On the other hand, they are more inclined toward recommendations issued
by a person, especially in the case of recommendations regarding alternative
investments and real estate. Americans show similar tendencies, because they
are more inclined toward recommendations issued by a human in the case of
recommendations on alternative investment and real estate but also Retire-
ment Savings Programs.

The logistic regression analysis presented in Table 4.15 was conducted to
identify the factors that influence individual preferences regarding recom-
mendations given by either humans or AI. Estimation of logistic regression
parameters showed that gender significantly affects the diversity of prefer-
ences for obtaining investment recommendations between humans and AI.
Results show that men are 38.3% more likely (OR=1.383) than women to
choose investment recommendations proposed by AI. Choice also depends
on age because the older the respondent the more likely they are (0.8%) to
prefer recommendations from humans (OR=0.992). In addition, preferences
for financial advisors being a human or AI are related to the assessment of the
profitability of individual forms of saving. The more the respondents assess

Specify whose recommendations you would consider when making an
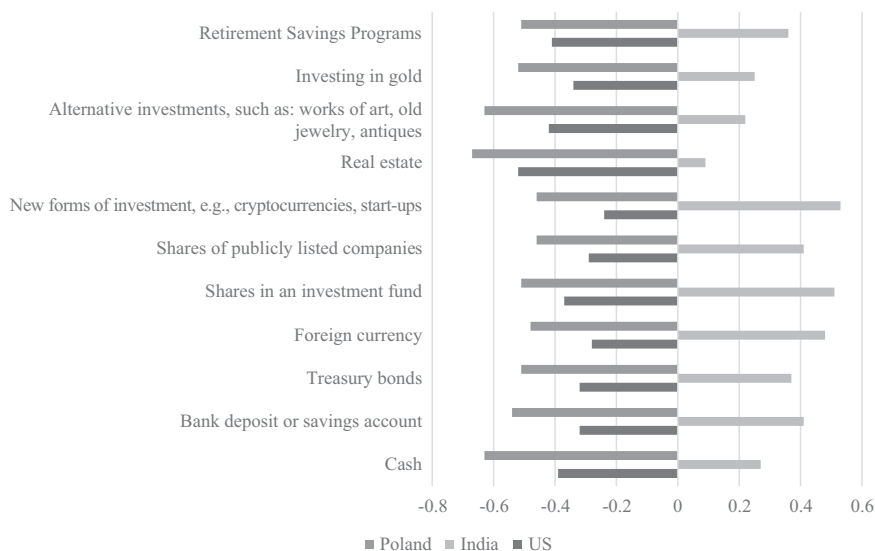investment decision (-2 human vs 2 AI recommendations)

Figure 4.23 Preferences of human versus AI recommendations in investment decisions

Source: Own elaboration.

Table 4.15 Logistic regression – investment advisory recommendation preferences:
human versus AI

Predictor	Investment advisory preferences: human versus AI		
	B	Sig.	Exp(B)
Female		0.013	
Male	0.324	0.004	1.383
Age	−0.008	0.054	0.992
Profitability of alternative investments	0.155	0.014	1.167
Profitability of shares and new forms of investments	0.2	0.003	1.222
Profitability of bank account and bonds	0.235	0.001	1.265
Risk of alternative investments	0.168	0.004	1.182
Risk of bank account and bonds	0.332	<0.001	1.394
Self-assessment of financial knowledge	0.162	0.017	1.176
Post-pandemic changes in the level of trust for different forms of payment	0.715	<0.001	2.044
Financial Literacy_objective knowledge	0.11	0.043	1.116
Financial Literacy_don't know answers	−0.13	0.015	0.878
Constant	−1.917	0.003	0.147

Source: Own elaboration.

Note: dependent variable is a dummy variable, where 0=human and 1=AI

the profitability of alternative investments, the chance of following AI recommendations is greater by 16.3% (OR=1,163). Similarly, the higher the rating of profitability of shares and new forms of investments, the chance of using AI advisors increases by 22% (OR=1.222). In addition, people who rate the profitability of bank account and bonds higher are more than 26% likely to choose the AI recommendation (OR=1.265).

The assessment of the riskiness of individual forms of investment is also important. The higher the risk of alternative investments, the chance of using AI recommendations is higher by 18.2% (OR=1.182). In addition, the higher the perceived risk of bank accounts and bonds, the probability of using AI recommendations is higher by 39.4% (OR=1.394). A factor that increases the chances of using an AI investment recommendation is also self-assessment of financial knowledge – an increase by a unit on a scale from 1 to 5, increases the chance of listening to AI recommendations by approximately 18% (OR=1.176). Similar meaning, although a weaker effect has objective financial literacy, because the higher by 12% (OR=1.116) the higher chance for follow-up to the AI recommendation. Interestingly, among respondents who were unsure of their knowledge and were inclined to say "I don't know" in the situation when they really had no knowledge or were unsure of it, the chances of following AI decreased by 12.2% in favor of recommendations from a human (OR=0.878).

The strongest predictor of following the AI recommendation turned out to be post-pandemic changes in the level of trust for different forms of payment, because the more trust has increased, the more than likely people are by over 100% (OR=2.044) to prefer AI recommendations.

When it comes to individuals who follow recommendations created by AI, compared to those created by humans, gender and age play a role. Men tend to prefer AI-generated recommendations more than women, whereas older individuals are less likely to follow AI recommendations. The perceived profitability and riskiness of different investment forms positively affect the adoption of AI recommendations. The greater level of trust for different forms of payment following the pandemic has a positive influence preference toward AI recommendations. Financial knowledge, both objective and subjective, increases the likelihood of following AI recommendations. The level of Aware ignorance, measured by the number of "I don't know" answers, has a negative influence on the preference for AI recommendations.

Financial literacy, taken more broadly than only correct answers, has proven to be highly significant in understanding attitudes toward automated financial advisory and financial recommendations offered by such tools. Financial literacy profiles allow to distinguish between different types of financial ignorance by revealing significant differences between people with similar level of objective knowledge but different structures of financial ignorance. The identification of three distinct profiles in a previous section has emerged as an effective approach, accounting for both conscious and unconscious ignorance, which greatly influences the financial decisions of

individuals. For instance, Figures 4.24 and 4.25 illustrate how these three profiles are related to familiarity with automated financial advisory tools and preferences for AI recommendations. Although countries differ, respondents with Overconfident profile in each country have higher scores than Aware illiterate and, quite surprisingly, Literate as well. The overconfident respondents possess a higher level of familiarity with new financial solutions and demonstrate a greater likelihood of following AI recommendations, regardless of their actual financial knowledge.
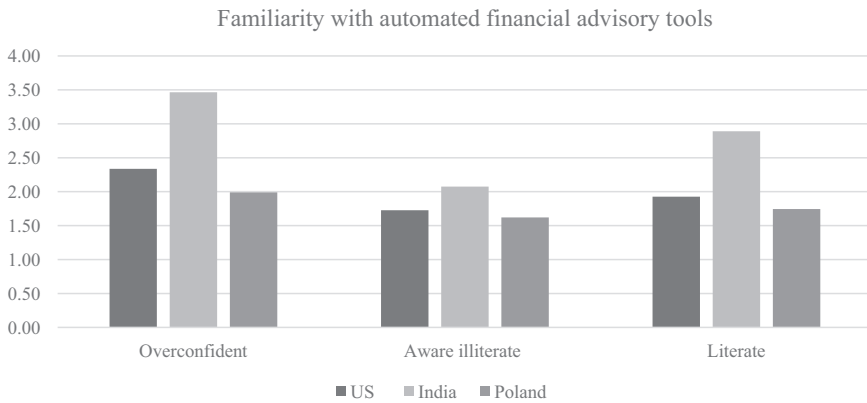

Figure 4.24 Average responses to the question about being familiar with automated financial advisory tools among respondents with different literacy profiles in the US, India, and Poland
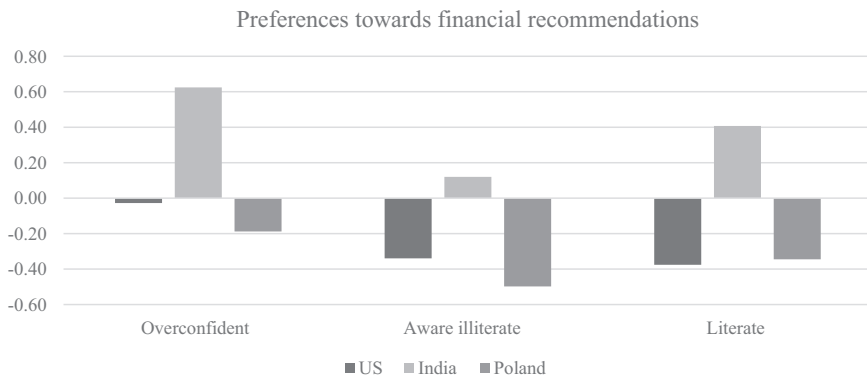
Source: Own elaboration.

Figure 4.25 Average responses to the question about preferences toward financial recommendations either given by human or AI, among respondents with different literacy profiles in the US, India, and Poland

Source: Own elaboration.

Notably, overconfident people are more optimistic and risk-taking (Broihanne et al., 2014), and as empirical evidence shows, their courage is often rewarded by the market, overconfident traders have demonstrated superior performance compared to purely rational traders, particularly in exploiting mispricing resulting from liquidity or noise traders (Luo, Guo and Hirshleifer, 2001). It occurs that being overconfident, rather than having objective financial knowledge, stimulates saving and investment behaviors. Moreover, being overconfident leads individuals to be more open to new solutions and take risks, compared to those financially literate or Aware illiterate. Results related to the Overconfident profile, in proposed financial literacy typology, appear contrary to the classic theories' expectations, where being informed and literate is crucial in optimal decision-making. However, those results confirm the behavioral approach that postulates that heuristic processing and biases should be included in explaining financial decision-making because they appear to be more important for predicting behavior.

Chapter summary

Chapter 4 presents the results of research on saving and investment decision-making focusing on behaviors and preferences in the digital environment exhibited by individuals from diverse cultural backgrounds. Research undertaken by the authors, and presented in this chapter, explores the relationship between economic and psychological factors in the realm of digital finance. It investigates various aspects such as propensity for saving, diversification of investment, portfolio selection, profit–risk relation, financial literacy typology, self-evaluated financial knowledge, post-pandemic changes in different spheres of life, post-pandemic changes in trust in different forms of payment, usage of digital forms of payment, familiarity with robo-advisory, preferences for following AI advisory in different spheres of life, and preferences for following saving and investment robo-advisory. The questionnaire included numerous detailed questions regarding saving and investment decisions while the analysis also included factor analysis giving standardized values for the whole dataset for all three countries. We derived factor variables, which provided a more comprehensive understanding about the inclinations of individuals toward saving or investment.

The study was carried out across three countries: the US, India, and Poland, which adds a country-diversity dimension to the examination of the economic and psychological perspectives. Indians save the most, Americans are the next group, while Poles save the least. There are observable differences in savings levels across residential areas, gender, and education level. For instance, individuals living in small villages in India tend to have higher savings, while Americans in large cities exhibit a higher propensity for saving. In Poland, individuals tend to prioritize safe savings options and invest in real estate, reflecting a preference for security and risk aversion. In India, there is a predominant focus on long-term investments and diversification,

emphasizing a future-oriented perspective. On the other hand, Americans tend to adopt a more short-term approach, driven by a desire for immediate liquidity and individualistic tendencies. The observed differences between countries in the level of savings and fund allocation align with the cultural differences described by the Hofstede Cultural Index. Poland, as a European country, shares similarities with Western countries in terms of individualism, masculinity, and uncertainty avoidance. India, as an Asian or Eastern country, emphasizes group harmony, has a long-term orientation, and a higher power distance, reflecting collectivist values and social hierarchies. The US, representing Western culture, emphasizes individualism, has a relaxed attitude toward indulgence, and a lower power distance, aligning with the Western tendency of prioritizing personal goals, achievements, and promoting equality.

The impact of age on saving and investment is aligned with the life-cycle hypothesis, people adjust their saving and spending patterns over their lifetime based on their income and consumption needs. According to this hypothesis, individuals tend to save more during their working years to prepare for retirement and other future financial needs, which was confirmed in the data presented for the three countries. The life-cycle hypothesis applies across different cultures and societies, indicating its cross-cultural validity.

Analyses show the diverse risk perceptions and profitability expectations among Americans, Indians, and Poles. Americans exhibit a relatively lower perception of risk and a more positive outlook on the profitability of different investment venues. Indians demonstrate optimism regarding higher risk and profitability, while Poles lean toward a more conservative risk approach and modest profitability expectations. The analysis identified layers of savings forms based on profitability and risk factors, aligning with behavioral portfolio theory. These layers include secure investments like bank accounts and bonds, traditional alternative investments like real estate and gold, and emerging investment opportunities such as stocks and investment funds. Stocks are perceived similarly to novel investment forms in terms of profitability and risk assessment.

The impact of financial literacy, measured objectively with the help of FINRA quiz, and subjectively as self-evaluation, was examined from different perspectives. First, taking a broader perspective of financial literacy, not only correct knowledge was analyzed. Special attention was given to deconstructing and analyzing the issue of financial illiteracy. Cluster analysis, enabling comparison of people with similar level of objectively measured knowledge but different structure of financial ignorance (being predominantly a form of misperception of one's knowledge or a form of admitted ignorance), proved to be a valuable tool for better understanding decisions concerning saving, investing, changes in the level of trust in different forms of payment after experiencing COVID-19 pandemic, and preferences for the source of recommendations while making investment decisions. In line with previous data, differences between countries were found regarding financial

literacy, measured both as objective and subjective evaluations. Countries differed, when comparisons of financial literacy levels were conducted on 3 indices individually (correct knowledge, illusory knowledge, and admitted ignorance), as well as when frequencies of different financial literacy types based on these indices or self-evaluated knowledge were compared.

In turn, the logistic regression models were estimated to determine predictors determining usage of different forms of payment, usage of online banking services, familiarity with robo-advisory, and preferences for following recommendations given by financial robo-advisory (Table 4.16 presents a summary of estimated models). This comparison allows for analyzing common predictors that influence examined respondent preferences and behaviors. The predictors that most often explained (with either positive or negative effect) the majority of surveyed preferences and behaviors (5 out of 6) were age, profitability, as well as risk assessment of alternative investments, risk assessment of bank accounts and bonds, and post-pandemic changes in the level of trust for different forms of payment.

It should be noted that predictors such as age, assessment of profitability of alternative investments, profitability of shares and new forms of investment, profitability of bank account and bonds, assessment of risk of alternative investment, as well as risk of bank account and bonds, all of which positively influence familiarity with automated financial advisory tools, go hand in hand with variables leaning toward a higher preference for AI as a financial advisor. Moreover, the increase of trust for different forms of payment after the pandemic had a positive effect on familiarity and preferences toward automated financial advisory tools. At the same time, it occurs that the higher respondents assess their financial knowledge, the more likely they are to be familiar with automated financial advisory tools and have a higher preference for financial robo-advisory. A similar result occurs in the case of objective knowledge, where the higher its level, the stronger preference to follow AI advice, whereas admitting not knowing the correct answer motivates people to turn to human rather than AI recommendations when considering investment decisions. In contrast, those with inflated views of their financial literacy (overconfident) turn to AI rather than human recommendations, revealing openness to new technological solutions.

The shape of the estimated logistic regression models indicates that, despite the respondent country of origin being important at the level of individual questions on attitudes and behaviors regarding saving and investment decisions, country of origin proved to be a significant predictor only in the case of preferences in the form of payment (digital, traditional, and credit and debit cards). In other cases concerning main usage of banking services (traditional or online), familiarity with automated financial advisory tools and preferences toward investment advisory recommendations given either by human or AI, other country independent predictors proved more significant.

Table 4.16 Summary of estimated logistic regression models from Section 4.4

Predictors	Preferred form of payment: digital payment	Preferred form of payment: traditional payment	Preferred form of payment: credit and debit card	Main usage of banking services: traditional versus online	Familiarity with automated financial advisory tool	Investment advisory preferences: human versus AI
Age	✓ (N)	✓ (P)		✓ (N)	✓ (N)	✓ (N)
Gender						✓ (P)
Place of residence					✓ (P)	
Country	✓ (P)	✓ (P)	✓ (N)		✓ (P)	
Percentage of an income set aside for savings (average per month)			✓ (P)			
Number of indicated forms of saving						
Profitability of alternative investments	✓ (P)	✓ (P)			✓ (P)	
Profitability of shares and new forms of investments	✓ (P)			✓ (P)	✓ (P)	✓ (P)
Profitability of bank account and bonds		✓ (P)			✓ (P)	✓ (P)
Risk of shares and new forms of investments	✓ (N)	✓ (P)	✓ (P)			
Risk of alternative investments	✓ (N)	✓ (P)	✓ (N)		✓ (P)	✓ (P)
Risk of bank account and bonds	✓ (P)	✓ (N)	✓ (N)		✓ (P)	✓ (P)
Electronic money		✓ (N)		✓ (P)		
Equity						
New and old alternatives			✓ (N)	✓ (N) ✓ (P)	✓ (N) ✓ (P)	
Post-pandemic changes in the level of trust for different forms of payment	✓ (P)	✓ (P)			✓ (P)	✓ (P)
Self-assessment of financial knowledge	✓ (P)				✓ (P)	
Financial Literacy_objective knowledge				✓ (N) ✓ (P)		✓ (P)
Financial Literacy_don't know answers						✓ (P) ✓ (N)

Source: Own elaboration.

P – positive effect; N – negative effect

Analyses of respondent familiarity with automated advisory and the strength of preferences toward AI rather than human recommendations while making investment decisions revealed significant effects of respondent country of origin and literacy profile. Indian respondents turned out to be much more willing than Americans or Poles to seek AI recommendations rather than that from a human while considering investment decisions. Still, in each country having an Overconfident profile is associated with stronger preferences for AI recommendations than their fellow citizens. Such a pattern of results matches previous research, suggesting that overconfidence is associated with a positive attitude toward financial risk and uncertainty, extending such an attitude to uncertainty associated with new financial innovations.

The evidence demonstrates that numerous factors affecting people's choices regarding saving and investment are universally applicable across cultures. This enables the development of a globally encouraged consumer choice framework. Simultaneously, understanding cultural backgrounds helps us comprehend the subtle intricacies that can positively impact individual saving and investment decisions during the era of digitalization.

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