Entrepreneurial Business and Economics Review

2025, Vol. 13, No. 3

10.15678/EBER.2025.130309

Determinants of the perception of FinTech companies as environmentally friendly: European consumers' perspective

Dariusz Piotrowski, Anna Iwona Piotrowska

ABSTRACT

Objective: The aim is to identify the determinants of the perception of FinTech companies as environmentally friendly institutions.

Research Design & Methods: The empirical base used in the work comprises data obtained in a survey conducted using computer-assisted web interviews of 2 000 respondents from the United Kingdom, Germany, Poland, and Ukraine. We used the ordinary logit models in the data analysis.

Findings: We identified the perceived benefits of using artificial intelligence (AI) technology in the financial sector and personal values and beliefs regarding sustainable development as the key factors determining whether FinTech companies are perceived as environmentally friendly institutions. Moreover, we found that education and financial knowledge are significant determinants.

Implications & Recommendations: For FinTech companies to be perceived as environmentally friendly, decision-makers must take actions supporting environmental sustainability and implement an appropriate communication policy. Building a green institutional image is supported by educating consumers about finance, promoting ecological responsibility, and encouraging more frequent use of financial applications. It is also important to highlight environmental initiatives while avoiding greenwashing, as individuals engaged in environmental protection are particularly sensitive to manipulation in this area. The findings of the study can also serve to increase the effectiveness of communication between FinTech companies and market participants in the area of environmental protection. Considering the importance of the variable related to the AI use in finance, the messaging should emphasise the positive environmental impact of digital technologies employed by FinTech companies.

Contribution & Value Added: The study significantly contributes to the development of green FinTech research, as it is the first to address how FinTech companies come to be regarded as environmentally friendly. Identifying the determinants of the relevant perceptions is particularly important since the literature shows that most consumers are not convinced of the beneficial impact of banks and FinTech companies on the environment. The study's particular contribution is the identification of universal determinants independent of the respondents' country of origin, which FinTech company managers should consider when designing services and communicating with consumers. Empirical evidence also indicates that the value-belief-norm theory contributes to explaining the perception of FinTech companies as green. We should associate the uniqueness of the work with the use of data obtained in a survey of respondents from several European countries with different levels of financial market development and different degrees of implementation of the UN Sustainable Development Goals.

Article type:	research article
Keywords:	green FinTech; digital financial services; sustainable development goals (SDGs); artificial intelligence in finance; value-belief-norm (VBN) theory
JEL codes:	G23, O44, Q55

Received: 1 October 2024 | Revised: 5 May 2025 | Accepted: 12 May 2025

Suggested citation:

Piotrowski, D., & Piotrowska, A.I. (2025). Determinants of the perception of FinTech companies as environmentally friendly: European consumers' perspective. *Entrepreneurial Business and Economics Review,* 13(3), 171-186. https://doi.org/10.15678/EBER.2025.130309

INTRODUCTION

In recent decades, the development of the global economy has been largely uneven, unfair, and to the detriment of the environment and future generations. The international community has responded by adopting a plan of action for people, planet, and prosperity. The 2030 Agenda for Sustainable Development (United Nations, 2015) contains 17 Sustainable Development Goals (SDGs) that are directly or indirectly related to environmental sustainability (Mishra *et al*., 2024; Scharlemann *et al*., 2020). Financial institutions are seen as vital to achieving the SDGs, and their involvement in environmental protection is reflected in the development of green finance (Ronaldo & Suryanto, 2022; Alieksieiev *et al*., 2021; Tsai, 2024; Chaudhry & Hussain, 2023; Feridun & Talay, 2023). The services offered include support in financing pro-ecological investments, selecting projects based on the degree of harmfulness of their impact on the environment, and shaping environmentally friendly consumer behaviours and attitudes (Oanh, 2024; Bakry *et al*., 2023; Saeed Meo & Karim, 2022).

The increase in the use of digital technologies in the financial sector has led to efficiency improvements among banks and other intermediaries, contributing to progress in achieving the SDGs (Kashif *et al*., 2024; Bhuiyan *et al*., 2024; Mertzanis, 2023; Carè *et al*., 2023; Arner *et al*., 2020). The literature refers to the use of advanced digital technologies, such as big data, artificial intelligence (AI), and cloud computing, to improve the efficiency of financial services provided as FinTech (Jiang, 2023; Knewtson & Rosenbaum, 2020; Chen *et al*., 2019). The term also serves to refer to the new financial industry and innovative companies and start-ups that provide financial services using advanced digital technologies (Haddad & Hornuf, 2019; Schueffel, 2016). Krupa and Buszko (2023) indicate that in this latter approach, we should define FinTech concerning non-banking financial institutions.

We may apply an analogous classification to the phenomenon of green FinTech analysed in this study. The term may refer to the use of modern digital technologies to achieve beneficial results in the field of environmental sustainability (Liu *et al*., 2024; Macchiavello & Siri, 2022; Deng *et al*., 2019; Green Digital Finance Alliance and Swiss Green FinTech Network, 2022). It may also refer to FinTech companies and start-ups focusing their offer on green financial services (Ashta, 2023; Puschmann *et al*., 2020).

One may achieve the beneficial environmental effect of FinTech through two channels: by changing the way financial institutions operate (Qin *et al*., 2024; Awais *et al*., 2023; Yang *et al*., 2021) and by expanding and increasing the attractiveness of the financial services provided. In this case, the reduction in gas and dust emissions and the increase in energy efficiency occur among the clients of these institutions (Siddik *et al*., 2023; Liu & Li, 2022; Liu *et al*., 2023; Dorfleitner & Braun, 2019; Xue *et al*., 2022).

Statista data (2024) indicates the growing importance of FinTech companies and start-ups in the international financial market. These companies have also exhibited a growing interest in the green aspects of financial services. Moreover, FinTech has a broad impact on businesses, the environment, and consumer behaviour. Thus, the activity of FinTech companies in the area of environmental sustainability is important from a scientific point of view and requires in-depth analysis.

Creating an image of FinTech companies as environmentally friendly requires taking action to protect the environment alongside effective communication of these efforts. Consumers' perceptions of FinTech companies as green may have beneficial implications for the business of these entities and, in a broader sense, for achieving the SDGs. With this in mind, we aimed to identify the determinants of the perception of FinTech companies as environmentally friendly institutions.

The scarce literature on green FinTech currently focuses on FinTech's impact on gas and dust emissions. Moreover, FinTech is commonly understood as the use of advanced digital technologies in finance, and existing analyses tend to focus on the Chinese market. There is almost no research addressing consumer assessments of the activities of FinTech companies in relation to the natural environment. Against this background, the advantage of this study is that it employs survey data from several European countries that vary in their level of financial market development and the degree to which they have met the SDGs.

Digital technologies have been successfully used by the financial sector for many decades. In fact, FinTech companies have built their operations entirely around them. Recently, the attention of busi-

nesses, academia, and consumers has increasingly focused on AI development. It is therefore worth investigating whether consumers perceive the potential of such technologies being used by financial institutions to support environmental protection. In turn, based on the value-belief-norm (VBN) theory (Canlas & Karpudewan, 2023; Chen, 2015), we can expect that consumer engagement with environmental issues will foster a positive assessment of FinTech companies' sustainability efforts. With this in mind, we asked the following research questions:

RQ1: Does emphasising the business application of AI help create the image of FinTech as an institution supporting environmental protection?

RQ3: Are consumers' values and beliefs about sustainable development important factors influencing the perception of FinTech companies as institutions supporting environmental protection?

The remainder of the study is structured as follows. Section 2 sets out a literature review addressing the impacts of FinTech on the natural environment. Section 3 presents the material and research methods used in the analysis. Section 4 contains the results of the logit model estimation and a discussion on the determinants of the perception of FinTech as environmentally friendly financial institutions. The final section contains the research conclusions and recommendations.

LITERATURE REVIEW

The literature review in this work focuses on the impact of FinTech on environmental sustainability. There are several approaches to presenting the phenomenon, and they differ in terms of the type of data obtained and the possibility of determining the impact of FinTech on the environment.

Presentation of Green FinTech Companies and Services

Puschmann *et al*. (2020) analyse the offer of green FinTech services in Switzerland by companies such as Carbon Delta, Energy Web, Greenmatch, and Raizers. However, their study data do not indicate the degree of use of these services, focusing only on the potential impact of FinTech on the environment. Ashta (2023) compares the impact on the natural environment of two groups of FinTech entities operating on a global scale (PayPal, Mastercard, Ant Group, Fiserv) and those operating on a smaller scale (Treecard, Raise Green, Trine, MioTech, Aspiration) based on data that are mainly drawn from official company reports. The results indicate the advantage of large FinTech companies in terms of the quality of data, showing the impact on the environment and social impact. However, various company initiatives have reduced this impact. Carè *et al*.'s (2023) case study of FinTech companies CNote, Doconomy, Ando Money, and Tred consider their impact with respect to achieving the SDGs. The study uses data from news articles, websites, and project reports; information important for understanding the essence of FinTech functioning was also obtained through interviews with employees of these institutions. The results show the types of activities undertaken by these FinTech companies in the area of environmental protection and offer a method of measuring the environmental impact of each financial transaction.

The Impact of FinTech on the Environment as Assessed by Respondents

In their study of 30 Alipay users, Zhao and Abeysekera (2024) found a positive impact of the Alipay Ant Forest platform on consumer behaviour in the area of environmental protection. The analysis of Aboalsamh *et al*. (2023) also focuses on the impact of green FinTech technology on consumer behaviour and business activity. Their study, in which eight individual respondents from the Middle East with green FinTech experience participated, shows the positive impact of FinTech. This study also identifies the need to increase consumer awareness of green FinTech technologies and their impact on consumer behaviour. In the final study analysed here, 302 employees of the banking sector in Bangladesh indicated the positive effects of digital technologies in banks in the area of green financing and green innovation and the measurable environmental benefits (Guang-Wen & Siddik, 2023).

Determining the Impact of FinTech on the Environment Based on Statistical Data

The literature review shows that most studies using econometric analyses identify a positive impact of FinTech on environmental quality (Liu *et al*., 2024; Macchiavello & Siri, 2022; Deng *et al*., 2019). Specifically, FinTech's impact on the environment manifests in reduced pollution and greenhouse gas emissions, more efficient use of resources (Muhammad *et al*., 2022; Tao *et al*., 2022; Vergara & Agudo, 2021) and the increased energy efficiency of economies (Liu *et al*., 2022). Studies showing the impact of FinTech on the environment mostly employ data presenting changes in the levels of gas and dust emissions (Ma *et al*., 2023; Xu *et al*., 2023; Delina, 2023; Tao *et al*., 2022; Coffie *et al*., 2022). A limitation of the studies in the literature is that they usually consider digital technologies used in finance rather than FinTech in the sense of innovative companies in the financial services sector. Moreover, the data for levels of CO2, SO2, PM2.5 and dust emissions, as well as the use of digital technologies in finance, are most often for a single country, usually China (Udeagha & Muchapondwa, 2023; Liu *et al*., 2023; Zhou *et al*., 2022; Muganyi *et al*., 2021).

Consumers' Awareness and Perception of Financial Institutions in the Field of Environmental Protection

Consumer awareness of green finance practices most often refers to the banking sector. Numerous studies indicate a lack of consumer knowledge regarding green financial services provided by banks. This is manifested by the dominance of negative responses or answers indicating a lack of awareness of the phenomenon, compared to affirmative responses. The findings presented in the literature concern the banking sector in India (Yasmin & Ahamed, 2024), Pakistan (Ellahi *et al*., 2023), Nepal (Rai *et al*., 2019), and Brazil (Rocha *et al*., 2025). Only one article refers to the environmental impact of FinTech companies (Piotrowska & Piotrowski, 2025). The results of this study indicate that, regardless of the country included in the analysis and whether FinTech applications are used, respondents show a very low level of knowledge about the environmental initiatives undertaken by FinTech companies. Several studies also identified determinants and examined the relationships between variables analysed in the area of green finance. The study by Sharma *et al*. (2025) demonstrated a positive relationship between the level of awareness of banks' green practices and the adoption of advanced digital technologies supporting green finance. The research by Rocha *et al*. (2025) identified a positive correlation between consumers' awareness of pro-environmental activities of banks and variables such as green loyalty, green trust, and green attitude. In turn, the studies by Alshebami (2021) and Gazi *et al*. (2024) highlight a positive link between green banking practices and the green image of banks.

In summary, the literature review confirms the conclusions of Liu *et al*. (2024), Galeone *et al*. (2024), Kwong *et al*. (2023), Xu *et al*. (2023), and Liu *et al*. (2023) that green FinTech is a new and poorly covered research area. Moreover, thus far, studies have focused on FinTech as the application of advanced digital technologies in finance, not innovative financial institutions. Most studies use statistical data on pollution, and few include analyses based on survey data. We identified only one article that determined the respondents' level of knowledge regarding the environmental impact of FinTech companies' services. Most importantly, however, the studies show a gap in research on the determinants of consumers' perception of FinTech institutions as environmentally friendly. Previous work on perception and image focused on the banking sector. Therefore, the article is the first to examine the drivers of perception of FinTech companies as institutions involved in the area of environmental protection.

RESEARCH METHODOLOGY

We obtained the data used in this study in a survey involving 2 000 respondents aged 21-60. The research sample included 500 respondents from four countries, *i.e.*, Ukraine, Poland, Germany and the United Kingdom (UK). We chose these countries because of several considerations. Firstly, previous studies involving respondents tended to overlook the European market. This article helps to address that gap. Secondly, the similarities and differences between the analysed countries allow for meaningful comparisons and the potential to generalise the conclusions. The United Kingdom and Germany are

geographically and culturally regarded as Western European countries, while Poland and Ukraine as Central and Eastern European countries. In terms of financial sector development, the United Kingdom and Germany lead. Ukraine, by contrast, lags significantly behind the other countries, both in this respect and in terms of implementing the Sustainable Development Goals in its economy.

We obtained empirical data using computer-assisted web interviews. This method was appropriate due to the study's target group, *i.e.*, active users of the Internet or mobile banking. We developed the questionnaire in separate language versions for each group of respondents, and at least two native speakers verified it. This action and the use of plain language ensured that the content of the questionnaire was understood in the same way in each country. Moreover, the survey questionnaire included an introduction that explained the essence of FinTech companies and listed examples of their services. We conducted pilot studies before the actual survey.

The authors obtained the consent of the Research Ethics Committee of the Faculty of Economic Sciences and Management (decision number: 10/2023/FT). The Committee expressed their positive opinion on the concept of the study and the survey questionnaire. We retained a professional research agency, Interactive Research Center, to ensure the quality of the empirical data; the agency has extensive experience in the field of international survey research. Based on the questionnaire developed by the authors, the agency prepared an electronic survey and was responsible for obtaining an appropriate research sample. The agency conducted its activities reliably and following ethical principles, observing the provisions of the ICC/ESOMAR International Code on Market, Opinion and Social Research and Data Analytics.

The study participants were people who were part of the research panels in the individual countries. Efforts were made to ensure that the samples were representative in terms of gender, age and place of residence. This was achieved by first assessing the basic socio-demographic characteristics of the participants who responded to the survey invitation. In the case of positive verification, the respondent proceeded to the next part of the survey concerning the use of digital technologies in finance. Each respondent had the opportunity to interrupt the study at any time, with the possibility of returning to complete it by a specified date. Participation in the study was voluntary, and we obtained the data anonymously. Table 1 presents basic characteristics of the respondents.

Table 1. Frequency distributions of the socio-demographic variables in the samples

Variable	Poland	Ukraine	Germany	United Kingdom
	%	%	%	%
Gender				
Female	49.0	51.0	49.4	50.0
Male	51.0	49.0	50.6	50.0
Age				
21-25	10.0	9.4	8.2	11.2
26-35	27.2	27.0	24.0	26.4
36-45	29.4	27.6	23.4	24.6
46-55	23.8	23.8	28.2	25.4
56-60	9.6	12.2	16.2	12.4
Place of residence				
Rural area	20.6	17.4	19.2	20.4
City up to 20 000 residents	12.6	15.6	17.4	15.4
City between 20 001 and 50 000 residents	13.0	10.2	15.4	11.0
City between 50 001 and 100 000 residents	15.2	8.4	10.8	11.6
City between 100 001 and 200 000 residents	10.8	3.0	8.2	10.0
City between 200 001 and 500 000 residents	9.8	19.0	8.8	9.8
City above 500 000 residents	18.0	26.4	20.2	21.8
Number of observations	500	500	500	500

Source: own study.

Table 2 presents the variables used in the study. The dependent variable was Green FinTech perception (GFT). We divided the explanatory variables into the following categories: socio-demographic characteristics, technological advancement, and personal beliefs and values.

Due to the lack of research on the perceptions of FinTech companies as environmentally friendly, we completed the selection of explanatory variables with reference to the results of research in the areas of green finance, pro-environmental behaviour, and the adoption of financial innovations. Ellahi *et al*. (2023) found that socio-demographic characteristics, such as age and gender, determine green banking awareness, and Song *et al*. (2023) indicate that mobile payments are more likely to be accepted and used by younger, better-educated consumers. The results of Nguyen (2022) suggest that perceived financial knowledge increases the use of FinTech services. According to Serdarusic *et al*. (2024), the adoption of FinTech has a significant impact on banking sustainability, and users' familiarity with specific technologies and previous experience in using them are important factors in their adoption (Hino, 2015; Bauer *et al*., 2005). The above-mentioned results justify the use of variables relating to socio-demographic and technological characteristics in our study.

Moreover, the literature demonstrates that there is a relationship between environmental concern and individual behaviour (Stern, 2001). According to the VBN theory, people who hold pro-ecological values and believe that their actions can help restore threatened values feel a personal obligation to take pro-ecological action (Stern *et al*., 1999). This approach has proven effective in explaining, among other things, the choice to use sustainable travel modes (Lind *et al*., 2015) and green consumption behaviours (Hong *et al*., 2024). Previous studies indicated that pressure from consumers (Bukhari *et al*., 2022), especially those with high levels of environmental awareness (Choudhury *et al*., 2013), was an important factor in the implementation of green banking practices. Pro-environmental attitudes were also a significant factor in the adoption of green financial products (Iqbal *et al*., 2024; Ellahi *et al*., 2023). This suggests that respondents' pro-ecological beliefs and personal norms may influence their assessment of pro-ecological actions taken by FinTech entities. For this reason, we included variables related to personal beliefs and values.

Table 2. Characteristics of the study variables

Variable group	Variable description
Dependent variable	
Green FinTech perception (*GFT*)	FinTech companies operating in the UK/Poland/Germany/Ukraine* provide services taking into account the needs of the natural environment: 1—Strongly disagree, 2—Disagree, 3—Somewhat disagree, 4—It's hard to say, 5—Somewhat agree, 6—Agree, 7—Strongly agree
Explanatory variables	
Socio-demographic characteristics	
Gender (*GEN*)	Gender: 1—female, 2—male
Age (*AGE*)	Age of respondent in years in the range of 21 to 60
Residence (*RES*)	Size of the respondent's place of residence: 1—Rural area 2—City up to 20 000 residents 3—City between 20 001 and 50 000 residents 4—City between 50 001 and 100 000 residents 5—City between 100 001 and 200 000 residents 6—City between 200 001 and 500 000 residents 7—City above 500 000 residents
Education (*EDU*)	Level of education of the respondent: 1—Incomplete primary, primary, secondary education 2—Vocational education 3—Further education 4—Higher education—bachelor's degree 5—Higher education—master's degree and higher
Financial knowledge—	Respondent's assessment of their financial knowledge: 1—Very poor, 2—Poor, 3—

Variable group	Variable description
subjective assessment (*KNW*)	Rather poor, 4—It's hard to say, 5—Rather good, 6—Good, 7—Very good
Technological advancement	
FinTech application use (*APP*)	Respondent uses financial applications from technology companies: 1—No, 2—Hard to say, 3—Yes
AI improve the quality of customer service (*AIQ*)	Artificial intelligence allows financial institutions to improve the quality of customer service (elimination of human errors and mistakes, greater accuracy and speed of transactions/operations): 1—Strongly disagree, 2—Disagree, 3—Somewhat disagree, 4—It's hard to say, 5—Somewhat agree, 6—Agree, 7—Strongly agree
Personal beliefs and values	
Supporting the financially weaker (*SFW*)	I believe financially weaker people should be supported: 1—Strongly disagree, 2—Disagree, 3—Somewhat disagree, 4—It's hard to say, 5—Somewhat agree, 6—Agree, 7—Strongly agree
Decision's impact on the environment (*ENV*)	The impact of my decisions on the natural environment is important to me: 1—Strongly disagree, 2—Disagree, 3—Somewhat disagree, 4—It's hard to say, 5—Somewhat agree, 6—Agree, 7—Strongly agree
Save more and consume less (*SAV*)	I believe that we should save more and consume less: 1—Strongly disagree, 2—Disagree, 3—Somewhat disagree, 4—It's hard to say, 5—Somewhat agree, 6—Agree, 7—Strongly agree

Note: *appropriate country name displayed in each language version.
Source: own study.

We employed the ordinary logit model to identify the determinants of the perception that FinTech companies support environmental protection. Logit models are versatile research tools widely used in various contexts for analysing preferences (Cramer, 2003). The application of the ordered logit model was required since the dependent variable took the form of seven ordered values. Opinion surveys such as ours frequently employ Likert-type scales that provide a clear rating between categories, ranging from 'strongly disagree' to 'strongly agree.' Because this logit model specification allows for the use of all information available in a variable, it is often used in the social sciences (Liao, 1994).

The following represents the ordered logit model for the ordinal variable Y and K independent variables:

$$\log\left(\frac{P(Y\leq j|x)}{1-P(Y\leq j|x)}\right) = \mu_j - \sum_{k=1}^{K}\beta_k x_k, j = 1, 2, \ldots, J-1 \quad (1)$$

in which (Liao, 1994):

$\mu_1, \mu_2, \ldots, \mu_{J-1}$ - are threshold parameters;

$\beta_1, \beta_2, \ldots, \beta_K$ - are the coefficients;

J - is the number of ordered categories.

RESULTS AND DISCUSSION

The ordered logit model allowed us to identify variables that significantly affected the perception of FinTech companies as environmentally friendly. Table 3 presents the estimation results.

The two key variables from the perspective of answering the research questions – AIQ and ENV – significantly affected the perception of FinTech companies as environmentally friendly (GFT) for respondents in all analysed countries. The results of estimations also showed that EDU and KNW were statistically significant for Germany, Poland and the UK, while SFW in the case of Ukraine, Poland and the UK. The relationship between GFT and GEN, AGE, RES, and APP was significant only in the case of Ukraine. The likelihood of FinTech companies being perceived as environmentally friendly increased with respondents' sense of their own financial literacy, their belief that the use of AI has a positive impact on the quality of financial services, their experience using FinTech applications, and the need to help the vulnerable and be aware of the environmental impact of their decisions. In contrast, the likelihood of

perceiving FinTech companies as environmentally friendly decreases with a respondent's age, the size of their place of residence, level of education and whether they are a man.

Most studies on green FinTech show that the use of digital technologies in finance positively impacts the environment. These conclusions are usually based on econometric analyses using statistical data on the levels of FinTech development, gas and dust emissions, and energy efficiency. We take a different approach, focusing on consumers and their opinions. We assume that the business of FinTech companies and SDGs implementation would benefit from consumers noticing and positively evaluating their efforts in the area of environmental sustainability.

Unlike existing studies, our previous analysis (Piotrowska & Piotrowski, 2025) indicates that the beneficial impact of FinTech on the environment is not clear. A lack of awareness or knowledge about the impact of FinTech companies on the environment was reported. In this situation, FinTech companies that care whether consumers perceive them as environmentally friendly institutions should increase their environmental sustainability activities and ensure proper information is communicated about these. The message should be easy for consumers to notice and understand. In this respect, the results of the ordered logit model estimation may prove helpful. However, we cannot directly relate these results to the literature as there are no existing studies on the determinants of FinTech companies being perceived as supporting environmental protection.

The estimation results (Table 3) indicate that with an increase in a respondent's level of education, the probability of perceiving FinTech companies as institutions supporting environmental protection decreases. We may explain this phenomenon by the fact that more educated people are more critical of the claims made regarding sustainable development in the financial sector. They see a discrepancy between the slogans proclaimed by financial institutions and the practical efforts made to support environmental protection. The literature presents this phenomenon as an opposition to greenwashing practices (Marko & Kusá, 2023; Meet *et al*., 2024).

Another important factor is the subjective assessment of financial knowledge. The positive relationship between a respondent's proclaimed level of knowledge of financial issues and their perception of FinTech companies as environmentally friendly may be because their financial knowledge also includes awareness of green finance. Consumers with extensive financial literacy may be more aware of the environmental activities of financial institutions. Scientific research conducted over the last several decades in the UK, Germany, Poland (Ringel & Mjekic, 2023; Akomea-Frimpong *et al*., 2021; Dziawgo, 2014), and relatively recently also in Ukraine (Zapotichna, 2024) shows that environmental protection is strongly emphasised by financial sector institutions. These sources also help explain the difference in the importance of green finance factors between Ukraine and the other countries analysed. The higher level of financial market development and social awareness of green issues justify the importance of the EDU and KNW variables for the UK, Germany, and Poland. Due to a less developed offer of financial services and less emphasis on environmental protection issues, the Ukrainian society acquires the belief in the environmental friendliness of the services offered by FinTech companies through direct use of them (APP).

Apart from financial issues, FinTech also emphasises the importance of digital technologies. The modelling results indicate a positive relationship between the perceived benefits of using AI technology in the financial sector and the perception of FinTech companies as environmentally friendly. Those convinced that AI can positively impact the quality of financial services may also see the benefit of greater use of advanced digital technologies for environmental sustainability. Many previous studies of FinTech emphasise that AI, big data, and cloud computing increase access to green finance by expanding the range of services and reducing information asymmetry and financing costs (Tao *et al*., 2022; Zhou *et al*., 2022; Lv & Xiong, 2022; Dynan *et al*., 2006). In turn, Si Mohammed *et al*. (2024) identified a positive relationship between the use of AI and FinTech and promoting eco-friendly investments and non-greenwashing practices. On the other hand, Altarawneh (2025) showed that integrating Big Data analytics into environmental activities increases FinTech brand visibility. This approach is consistent with the broader concept of data-driven sustainability, which postulates the integration of artificial intelligence and advanced data analysis in environmentally conscious decision-making (Addy *et al*., 2024). Therefore, we may assume that the results of our study allow for a positive answer to the

Table 3. The results of the estimated ordered logit models

Variables / Statistics	Dependent variable: Green FinTech perception (GFT)											
	(1)				(2)				(3)			
	UA	PL	DE	UK	UA	PL	DE	UK	UA	PL	DE	UK
GEN	−0.310*	−0.160	−0.113	−0.090	−0.379**	−0.160	−0.222	−0.223	−0.411**	−0.122	−0.209	−0.217
	(0.172)	(0.175)	(0.167)	(0.173)	(0.173)	(0.176)	(0.169)	(0.175)	(0.177)	(0.178)	(0.169)	(0.178)
AGE	−0.021**	0.001	−0.024***	−0.025***	−0.016*	0.007	−0.013	−0.013*	−0.019**	−0.003	−0.015*	−0.011
	(0.008)	(0.008)	(0.008)	(0.007)	(0.009)	(0.008)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.008)
RES	−0.104***	−0.055	0.039	0.089**	−0.101***	−0.062	0.005	0.071*	−0.095**	−0.062	0.005	0.046
	(0.039)	(0.040)	(0.038)	(0.040)	(0.039)	(0.040)	(0.039)	(0.040)	(0.039)	(0.041)	(0.040)	(0.041)
EDU	−0.091	−0.270***	−0.098	−0.138*	−0.092	−0.256***	−0.148**	−0.188**	−0.049	−0.253***	−0.162**	−0.209***
	(0.077)	(0.086)	(0.068)	(0.075)	(0.077)	(0.087)	(0.069)	(0.076)	(0.078)	(0.088)	(0.070)	(0.077)
KNW	0.178**	0.480***	0.246***	0.266***	0.133	0.413***	0.166**	0.192***	0.079	0.315***	0.147**	0.166**
	(0.087)	(0.080)	(0.068)	(0.072)	(0.089)	(0.082)	(0.070)	(0.074)	(0.091)	(0.084)	(0.070)	(0.075)
APP	–	–	–	–	0.240**	0.178*	0.093	0.044	0.273***	0.125	0.081	0.059
					(0.096)	(0.095)	(0.094)	(0.096)	(0.097)	(0.097)	(0.094)	(0.097)
AIQ	–	–	–	–	0.281***	0.277***	0.434***	0.464***	0.227***	0.212***	0.409***	0.397***
					(0.077)	(0.070)	(0.069)	(0.063)	(0.078)	(0.071)	(0.070)	(0.063)
SFW	–	–	–	–	–	–	–	–	0.276***	0.156**	−0.044	0.229***
									(0.088)	(0.071)	(0.066)	(0.073)
ENV	–	–	–	–	–	–	–	–	0.162**	0.407***	0.193***	0.312***
									(0.080)	(0.076)	(0.067)	(0.063)
SAV	–	–	–	–	–	–	–	–	0.075	0.012	−0.039	−0.001
									(0.073)	(0.070)	(0.070)	(0.076)
Observations	500	500	500	500	500	500	500	500	500	500	500	500
Number and percentage of cases 'correctly predicted'	265 (53.0%)	239 (47.8%)	217 (43.4%)	235 (47.0%)	265 (53.0%)	249 (49.8%)	220 (44.0%)	238 (47.6%)	268 (53.6%)	258 (51.6%)	226 (45.2%)	246 (49.2%)

Note: coefficients and standard errors in parentheses; *p<0.1; **p<0.05; ***p<0.01; UA: Ukraine, PL: Poland, DE: Germany, UK: United Kingdom.
Source: own study.

first research question. Putting emphasis on the business application of AI by FinTech companies appears to be a useful tool in shaping their image as institutions supporting environmental protection. This finding is in line with previous studies indicating the beneficial impact of using AI in green finance (Omri *et al*., 2025; Hassanein & Tharwat, 2024; Yang *et al*., 2025).

The last two variables considered – respondents' beliefs and values regarding social and environmental issues – support the VBN theory. Our study indicates that those most interested in the environmental aspects of FinTech are people who value sustainable development, manifested in their care for others (seeing a need to support those in difficult financial circumstances) and for the environment (awareness of the impact of individual decisions). These individuals more easily perceive the ecological dimension of FinTech companies' activities, which may translate into the adoption of green FinTech services. Our findings are consistent with the results of previous research. Hong *et al*. (2024) reported the positive relationship between the variables of the VBN theory and the adoption of green consumption behaviours, highlighting the importance of personal norms and environmental awareness. Numerous other studies also indicate that people supporting sustainable development values are more sensitive to phenomena occurring in their environment, have a higher propensity for pro-environmental behaviour (Chen, 2015; Hiratsuka *et al*., 2018), and adopt pro-environmental solutions (Hilale & Chakor, 2024; Vorobeva *et al*., 2022; Bockarjova & Steg, 2014) and consumer engagement (Mehta & Handriana, 2024). Furthermore, several studies show that the perceived benefits for the environment of having and using a sustainable innovation and the ability to signal their positive features motivate people to adopt these innovations (Korcaj *et al*., 2015; Noppers *et al*., 2014; Noppers *et al*., 2015). Therefore, the results of our study allow for answering the second research question. It has been demonstrated that personal values and beliefs regarding sustainable development are important determinants of the perception of FinTech companies as institutions supporting environmental protection.

CONCLUSIONS

The few studies to date indicate that many respondents are unaware of the environmental protection efforts of banks and FinTech companies. This observation is extremely valuable for the managers of these institutions and should motivate intensified efforts toward environmental sustainability and increase the effectiveness of their communications concerning the environment. From a business point of view and due to the expected benefits for humanity and the planet, it is important that environmental activities are accompanied by a proper message. The logit estimations may be useful for companies presenting their financial services offerings and achievements in the area of green FinTech to establish an image of FinTech as environmentally friendly.

The results of our study indicate that consumers' values and beliefs regarding sustainable development are important factors determining the perception of FinTech companies as institutions supporting environmental protection. This finding provides empirical support for the value-belief-norm theory. It also indicates that promoting environmental awareness by offering green financial services, and in particular, encouraging their use, can positively influence the perception of FinTech companies as environmentally friendly. However, presenting actual activities and their effects on the environment should consider ethical issues. This is particularly the case for educated people who are more sceptical about green FinTech and sensitive to greenwashing practices. The above recommendations provide valuable guidelines for decision-makers in promoting green FinTech in Europe, but also more broadly, worldwide.

Empirical evidence also shows the potential of building the image of a green institution based on the message about the AI use in financial services. FinTech companies should emphasise the benefits for the environment resulting from the implementation of advanced digital technologies in their communications with consumers. This conclusion is a step forward in relation to previous studies, which were usually limited to identifying the beneficial impact of using digital technologies in finance on the environment. Noteworthy, incorporating this recommendation significantly broadens the target audience of the message and may contribute to increasing its effectiveness.

While the research conducted for this article provides insight into consumer perceptions of FinTech players, it is somewhat general in nature. A future case study could consider several FinTech companies that are assessed as environmentally friendly. In particular, these should consider environmental sustainability success factors relating to green FinTech activities and communications. It is also advisable to conduct in-depth research to identify differences between countries in the factors that significantly influence consumers' perception of FinTech companies as green. Research in this area should also cover countries outside Europe.

REFERENCES

Aboalsamh, H.M., Khrais, L.T., & Albahussain, S.A. (2023). Pioneering Perception of Green Fintech in Promoting Sustainable Digital Services Application within Smart Cities. *Sustainability*, *15*, 11440. https://doi.org/10.3390/su151411440

Addy, W.A, Ofodile, O.Ch., Adeoye, O,B., Oyewole, A.T., Okoye, Ch.Ch., Odeyemi O., & Ololade, Y.J. (2024). Data-driven sustainability: how fintech innovations are supporting green finance. *Engineering Science & Technology Journal*, *5*(3), 760-773. https://doi.org/10.51594/estj.v5i3.871

Akomea-Frimpong, I., Adeabah, D., Ofosu, D., & Tenakwah, E.J. (2021). A review of studies on green finance of banks, research gaps and future directions. *Journal of Sustainable Finance & Investment*, *12*(4), 1241-1264. https://doi.org/10.1080/20430795.2020.1870202

Alieksieiev, I., Mazur, A., & Storozhenko, O. (2021). Implementing the sustainable development goals in Ukraine: financing framework. *Financial and Credit Activities: Problems of Theory and Practice*, *5*(40), 399-409. https://doi.org/10.18371/fcaptp.v5i40.245191

Alshebami, A.S. (2021). Evaluating the relevance of green banking practices on Saudi Banks' green image: The mediating effect of employees' green behaviour. *Journal of Banking Regulation*, *22*, 275-286. https://doi.org/10.1057/s41261-021-00150-8

Altarawneh, H.A.K. (2025). The Impact of Big Data Analytics on Fintech Brand Awareness: The Mediating Role of Sustainability in Green Financial Products. *Pakistan Journal of Life and Social Sciences*, *23*(1), 8126-8139, https://doi.org/10.57239/PJLSS-2025-23.1.00633

Arner, D.W., Buckley, R.P., Zetzsche, D.A., & Veidt, R. (2020). Sustainability, FinTech and Financial Inclusion. *European Business Organization Law Review, 21*, 7-35. https://doi.org/10.1007/s40804-020-00183-y

Ashta, A. (2023). How Can Fintech Companies Get Involved in the Environment?. *Sustainability*, *15*, 10675. https://doi.org/10.3390/su151310675

Awais, M., Afzal, A., Firdousi, S., & Hasnaoui, A. (2023) Is fintech the new path to sustainable resource utilisation and economic development?. *Resources Policy*, *81*, 103309. https://doi.org/10.1016/j.resourpol.2023.103309

Bakry, W., Mallik, G., Nghiem, X-H., Sinha, A., & Vo, X.V. (2023). Is green finance really "green"? Examining the long-run relationship between green finance, renewable energy and environmental performance in developing countries. *Renewable Energy*, *208*, 341-355. https://doi.org/10.1016/j.renene.2023.03.020

Bauer, H.H., Barnes, S.J., Reichardt, T., & Neumann, M.M. (2005). Driving consumer acceptance of mobile marketing: A theoretical framework and empirical study. *Journal of Electronic Commerce Research*, *6*(3), 181-192.

Bhuiyan, M.A., Rahman, M.K., Patwary, A.K., Akter, R., Zhang, Q., & Feng, X. (2024). Fintech Adoption and Environmental Performance in Banks: Exploring Employee Efficiency and Green Initiatives. *IEEE Transactions on Engineering Management*, *71*, 11346-11360. https://doi.org/10.1109/TEM.2024.3415774

Bockarjova, M., & Steg, L. (2014). Can Protection Motivation Theory predict pro-environmental behavior? Explaining the adoption of electric vehicles in the Netherlands. *Global Environmental Change*, *28*, 276-288. https://doi.org/10.1016/j.gloenvcha.2014.06.010

Bukhari, S.A.A., Hashim, F., & Amran, A. (2022), Pathways towards Green Banking adoption: moderating role of top management commitment. *International Journal of Ethics and Systems*, *38*(2), 286-315. https://doi.org/10.1108/IJOES-05-2021-0110

Carè, R., Boitan, I.A., & Fatima, R. (2023). How do FinTech companies contribute to the achievement of SDGs? Insights from case studies. *Research in International Business and Finance*, *66*, 102072. https://doi.org/10.1016/j.ribaf.2023.102072

Canlas, I.P., & Karpudewan, M. (2023). The continuum of pro-environmental behaviour in the context of the value-belief-norm theory of environmentalism: implications towards sustainable development. *International Journal of Sustainable Development*, *26*(1), 22-50. https://doi.org/10.1504/IJSD.2023.129143

Chaudhry, N.I., & Hussain, M. (2023). Nexus of renewable energy, green financing, and sustainable development goals: an empirical investigation. *Environmental Science and Pollution Research*, *30*, 58480-58492. https://doi.org/10.1007/s11356-023-26653-7

Chen, M., Wu, Q., & Yang, B. (2019). How valuable is FinTech innovation?. *Review of Financial Studies*, *32*(5), 2062-2106. https://doi.org/10.1093/rfs/hhy130

Chen, M-F. (2015). An examination of the value-belief-norm theory model in predicting pro-environmental behaviour in Taiwan. *Asian Journal of Social Psychology*, *18*(2), 145-151. https://doi.org/10.1111/ajsp.12096

Choudhury, T.T, Salim, M, Bashir, M., & Saha, P. (2013) Influence of stakeholders in developing green banking products in Bangladesh. *Research Journal of Finance and Accounting*, *4*(7), 67-77.

Coffie, C., Ahiabenu, K., Yeboah, F., & Darkwah, J. (2022). FinTech and CO2 Emission: Evidence from (Top 7) Mobile Money Economies in Africa. *Research Square*, July, 1-21. https://doi.org/10.21203/rs.3.rs-1831482/v1

Cramer, J.S. (2003). *Logit models from economics and other fields*. Cambridge: Cambridge University Press.

Delina, L.L. (2023). Fintech RE in a global finance centre: Expert perceptions of the benefits of and challenges to digital financing of distributed and decentralised renewables in Hong Kong. *Energy Research & Social Science*, *97*, 102997. https://doi.org/10.1016/j.erss.2023.102997

Deng, X., Huang, Z., & Cheng, X. (2019). FinTech and Sustainable Development: Evidence from China Based on P2P Data. *Sustainability*, *11*(22), 6434. https://doi.org/10.3390/su11226434

Dorfleitner, G., & Braun, D. (2019). Fintech, digitalization and blockchain: possible applications for green finance. In M. Migliorelli & P. Dessertine (Eds.), *The Rise of Green Finance in Europe*. Palgrave Macmillan, Cham, 207-237. https://doi.org/10.1007/978-3-030-22510-0_9

Dynan, K.E., Elmendorf, D.W., & Sichel, D.E. (2006). Can financial innovation help to explain the reduced volatility of economic activity?. *Journal of Monetary Economics*, *53*(1), 123-150. https://doi.org/10.1016/j.jmoneco.2005.10.012

Dziawgo, L. (2014). Greening financial market. *Copernican Journal of Finance & Accounting*, *3*(2), 9-24. https://doi.org/10.12775/CJFA.2014.014

Ellahi, A., Jillani, H., & Zahid, H. (2023). Customer awareness on Green banking practices. *Journal of Sustainable Finance & Investment*, *13*(3), 1377-1393. https://doi.org/10.1080/20430795.2021.1977576

Feridun, M., & Talay, I. (2023). Principles for responsible banking and sustainable development goals: an empirical investigation on European wholesale and retail banks. *Applied Economics Letters*, 1-4. https://doi.org/10.1080/13504851.2023.2210810

Gazi, M.A.I., Al Masud, A., Islam, S., Hossain, M.A., Hossain, M.S., & Senathirajah, A.R. (2024). The Effect of Green Banking Practices on Banks' Sustainability Performance and Green Brand Image: An Empirical Study of an Emerging Economy. *Journal of Sustainability Research*, *6*(4), e240074, https://doi.org/10.20900/jsr20240074

Galeone, G., Ranaldo, S., & Fusco, A. (2024). ESG and FinTech: are they connected?. *Research in International Business and Finance*, *69*, 102225. https://doi.org/10.1016/j.ribaf.2024.102225

Green Digital Finance Alliance & the Swiss Green Fintech Network (2022). Green Fintech classification. Retrieved from https://drive.google.com/file/d/1jhYybC5aF9qHYb36_OT4rfmx0aoriieh/view?pli=1 on June 9, 2024.

Guang-Wen, Z., & Siddik, A.B. (2023). The effect of Fintech adoption on green finance and environmental performance of banking institutions during the COVID-19 pandemic: the role of green innovation. *Environmental Science and Pollution Research*, *30*, 25959-25971. https://doi.org/10.1007/s11356-022-23956-z

Haddad, C., & Hornuf, L. (2019). The emergence of the global fintech market: economic and technological determinants. *Small Business Economics*, *53*, 81-105. https://doi.org/10.1007/s11187-018-9991-x

Hassanein, A., & Tharwat, H. (2024). Artificial Intelligence (AI) and Green Finance. In A.I. Hunjra & J.W. Goodell, (Eds.), *The Palgrave Handbook of Green Finance for Sustainable Development*. *Palgrave Studies in Impact Finance*. Palgrave Macmillan, Cham, 859-890. https://doi.org/10.1007/978-3-031-65756-6_32

Hilale, H., & Chakor, A. (2024). Do users' pro-environmental personal norms hold significance in electronic payment adoption context?. *Journal of Financial Services Marketing*. https://doi.org/10.1057/s41264-024-00286-4

Hino, H. (2015). Assessing factors affecting consumers' intention to adopt biometric authentication technology in e-shopping. *Journal of Internet Commerce*, *14*(1), 1-20. https://doi.org/10.1080/15332861.2015.1006517

Hiratsuka, J., Perlaviciute, G., & Steg, L. (2018). Testing VBN theory in Japan: Relationships between values, beliefs, norms, and acceptability and expected effects of a car pricing policy. *Transportation Research Part F: Traffic Psychology and Behaviour*, *53*, 74-83. https://doi.org/10.1016/j.trf.2017.12.015

Hong, Y., Mamun, A.A., Masukujjaman, M., & Yang, Q. (2024). Significance of the environmental value-belief-norm model and its relationship to green consumption among Chinese youth. *Asia Pacific Management Review*, *29*(1), 127-140. https://doi.org/10.1016/j.apmrv.2023.10.002

Iqbal, U.P., Jose, S.M., & Tahir, M. (2024). Examining the demand side factors of green banking adoption – a study exploring the case of Oman. *International Journal of Islamic and Middle Eastern Finance and Management*, *17*(1), 213-231. https://doi.org/10.1108/IMEFM-12-2022-0483

Jiang, B. (2023). Does fintech promote the sustainable development of renewable energy enterprises?. *Environmental Science and Pollution Research*, *30*(24), 65141-65148. https://doi.org/10.1007/s11356-023-27030-0

Kashif, M., Pinglu, C., Ullah, S., & Zaman, M. (2024). Evaluating the influence of financial technology (FinTech) on sustainable finance: a comprehensive global analysis. *Financial Markets and Portfolio Management*, *38*(1), 123-155. https://doi.org/10.1007/s11408-023-00439-w

Knewtson, H.S., & Rosenbaum, Z.A. (2020). Toward understanding FinTech and its industry. *Managerial Finance*, *46*(8), 1043-1060. https://doi.org/10.1108/MF-01-2020-0024

Korcaj, L., Hahnel, U.J.J., & Spada, H. (2015). Intentions to adopt photovoltaic systems depend on homeowners' expected personal gains and behavior of peers. *Renewable Energy*, *75*, 407-415. https://doi.org/10.1016/j.renene.2014.10.007

Krupa, D., & Buszko, M. (2023). Age-dependent differences in using FinTech products and services—Young customers versus other adults. *PLoS ONE*, *18*(10), e0293470. https://doi.org/10.1371/journal.pone.0293470

Kwong, R., Kwok, M.L.J., & Wong, H.S.M. (2023). Green FinTech Innovation as a Future Research Direction: A Bibliometric Analysis on Green Finance and FinTech. *Sustainability*, *15*, 14683. https://doi.org/10.3390/su152014683

Liao, T.F. (1994). *Interpreting probability models: logit, probit and other generalized linear models*. Sage Publications: Thousand Oaks. https://doi.org/10.4135/9781412984577

Lind, H.B., Nordfjærn, T., Jørgensen, S.H., & Rundmo, T. (2015). The value-belief-norm theory, personal norms and sustainable travel mode choice in urban areas. *Journal of Environmental Psychology*, *44*, 119-125. https://doi.org/10.1016/j.jenvp.2015.06.001

Liu, H., Chau, K.Y., Duong, N.T., & Hoang, N.-K. (2024). Fintech, financial inclusion, mineral resources and environmental quality. An economic advancement perspective from China and Vietnam. *Resources Policy*, *89*, 104636. https://doi.org/10.1016/j.resourpol.2024.104636

Liu, H., Yao, P., Latif, S., Aslam, S., & Iqbal, N. (2022). Impact of Green financing, FinTech, and financial inclusion on energy efficiency. *Environmental Science and Pollution Research*, *29*, 18955-18966. https://doi.org/10.1007/s11356-021-16949-x

Liu, J., Zhang, Y., & Kuang, J. (2023). Fintech development and green innovation: Evidence from China. *Energy Policy*, *183*, 113827. https://doi.org/10.1016/j.enpol.2023.113827

Liu, M., & Li, M. (2022). Environmental regulation and green innovation: Evidence from China's carbon emissions trading policy. *Finance Research Letters*, *48*, 103051. https://doi.org/10.1016/j.frl.2022.103051

Lv, P., & Xiong, H. (2022). Can FinTech improve corporate investment efficiency? Evidence from China. *Research in International Business and Finance*, *60*, 101571. https://doi.org/10.1016/j.ribaf.2021.101571

Ma, Y., Wei, X., Yan, G., & He, X. (2023). The Impact of Fintech Development on Air Pollution. *International Journal of Environmental Research and Public Health*, *20*, 3387. https://doi.org/10.3390/ijerph20043387

Macchiavello, E., & Siri, M. (2022). Sustainable Finance and Fintech: Can Technology Contribute to Achieving Environmental Goals? A Preliminary Assessment of 'Green Fintech' and 'Sustainable Digital Finance'. *European Company and Financial Law Review*, *19*(1), 128-174. https://doi.org/10.1515/ecfr-2022-0005

Marko, M., & Kusá, A. (2023). Greenwashing and the nature of education in relation to consumer trust in fast fashion marketing communication. *Communication Today*, *14*(1), 86-99. https://doi.org/10.34135/communicationtoday.2023.Vol.14.No.1.6

Meet, R.K., Kundu, N., & Ahluwalia, I.S. (2024). Does socio demographic, green washing, and marketing mix factors influence Gen Z purchase intention towards environmentally friendly packaged drinks? Evidence from

emerging economy. *Journal of Cleaner Production*, *434*, 140357. https://doi.org/10.1016/j.jclepro.2023.140357

Mehta, A.M., & Handriana, T. (2024). Analyzing CSR and customer engagement through green banking digitalization: with the mediating effect of perceived environmental value and moderation effect of customer's eco-consciousness. *Cogent Business & Management*, *11*(1), 2332502. https://doi.org/10.1080/23311975.2024.2332502

Mertzanis, Ch. (2023). FinTech finance and social-environmental performance around the world. *Finance Research Letters*, *56*, 104107. https://doi.org/10.1016/j.frl.2023.104107

Mishra, M., Desul, S., Santos, C.A.G., Mishra, S.K., Kamal, A.H.M., Goswami, S., Kalumba, A.M., Biswal, R., da Silva, R.M., dos Santos, C.A.C., & Baral, K. (2024). A bibliometric analysis of sustainable development goals (SDGs): a review of progress, challenges, and opportunities. *Environment, Development and Sustainability*, *26*, 11101-11143. https://doi.org/10.1007/s10668-023-03225-w

Muganyi, T., Yan, L., & Sun, H. (2021). Green Finance, Fintech and environmental protection: Evidence from China. Environmental Science and Ecotechnology, 7, 100107. https://doi.org/10.1016/j.ese.2021.100107

Muhammad, S., Pan, Y., Magazzino, C., Luo, Y., & Waqas, M. (2022). The fourth industrial revolution and environmental efficiency: The role of fintech industry. *Journal of Cleaner Production*, *381*(1), 135196. https://doi.org/10.1016/j.jclepro.2022.135196

Noppers, E.H. Keizer, K., Bockarjova, M., & Steg, L. (2015). The adoption of sustainable innovations: The role of instrumental, environmental, and symbolic attributes for earlier and later adopters. *Journal of Environmental Psychology*, *44*, 74-84. https://doi.org/10.1016/j.jenvp.2015.09.002

Noppers, E.H., Keizer, K., Bolderdijk, J.W., & Steg, L. (2014). The adoption of sustainable innovations: Driven by symbolic and environmental motives. *Global Environmental Change*, *25*, 52-62. https://doi.org/10.1016/j.gloenvcha.2014.01.012

Nguyen, T.A.N. (2022). Does financial knowledge matter in using Fintech services? Evidence from an emerging economy. *Sustainability*, *14*, 5083. https://doi.org/10.3390/su14095083

Oanh, T.T.K. (2024). Sustainable development: Driving force from the relationship between finance inclusion, green finance and green growth. *Sustainable Development*, *32*(3), 2811-2829. https://doi.org/10.1002/sd.2808

Omri, A., Hamza, F., & Slimani, S. (2025). The Role of Green Finance in Driving Artificial Intelligence and Renewable Energy for Sustainable Development. *Sustainable Development*. https://doi.org/10.1002/sd.3462

Piotrowska, A.I, & Piotrowski, D. (2025). Green FinTech: A Consumer Awareness Study. *Sustainability, 17*(8), 3701. https://doi.org/10.3390/su17083701

Puschmann, T., Hoffmann, Ch.H., & Khmarskyi, V. (2020). How Green FinTech Can Alleviate the Impact of Climate Change—The Case of Switzerland. *Sustainability*, *12*, 10691. https://doi.org/10.3390/su122410691

Qin, L., Aziz, G., Hussan, M.W., Qadeer, A., & Sarwar, S. (2024). Empirical evidence of fintech and green environment: Using the green finance as a mediating variable. *International Review of Economics & Finance*, *89*(Part A), 33-49. https://doi.org/10.1016/j.iref.2023.07.056

Rai, R., Kharel, S., Devkota, N., & Paudel, U.R. (2019). Customers Perception on Green Banking Practices: A Desk Review. *Journal of Economic Concerns*, *10*(1), 82-95.

Ringel, M., & Mjekic, S. (2023). Analyzing the Role of Banks in Providing Green Finance for Retail Customers: The Case of Germany. *Sustainability*, *15*(11), 8745. https://doi.org/10.3390/su15118745

Rocha, V., Viegas, C., Guerreiro, M., Viola, T.W., & Kluwe-Schiavon, B. (2025). Green banking awareness and its association with green attitude, green trust, and green loyalty. *Journal of Sustainable Finance & Investment*, *15*(1), 250-267. https://doi.org/10.1080/20430795.2024.2441207

Ronaldo, R., & Suryanto, T. (2022). Green finance and sustainability development goals in Indonesian Fund Village. *Resources Policy*, *78*, 102839. https://doi.org/10.1016/j.resourpol.2022.102839

Saeed Meo, M., & Karim, M.Z.A. (2022). The role of green finance in reducing CO2 emissions: An empirical analysis. *Borsa Istanbul Review*, *22*(1), 169-178. https://doi.org/10.1016/j.bir.2021.03.002

Scharlemann, J.P.W., Brock, R.C., Balfour, N., Brown, C., Burgess, N.D., Guth, M.K., Ingram, D.J., Lane, R., Martin, J.G.C., Wicander, S., & Kapos, V. (2020). Towards understanding interactions between Sustainable Development Goals: the role of environment–human linkages. *Sustainability Science*, *15*, 1573-1584. https://doi.org/10.1007/s11625-020-00799-6

Schueffel, P. (2016) Taming the beast: A scientific definition of fintech. *Journal of Innovation Management*, *4*(4), 32-54. https://doi.org/10.24840/2183-0606_004.004_0004

Serdarusic, H., Pancic, M., & Zavisic, Z. (2024). Green Finance and Fintech Adoption Services among Croatian Online Users: How Digital Transformation and Digital Awareness Increase Banking Sustainability. *Economies*, *12*(3), 54. https://doi.org/10.3390/economies12030054

Sharma, R., Vasishta, P., & Singla, A. (2025). Impact of green banking awareness on green FinTech adoption: a way towards profitable and sustainable practices. *Managerial Finance*, *51*(3), 377-394. https://doi.org/10.1108/MF-04-2024-0272

Siddik, A.B., Yong, L., & Rahman, M.N. (2023). The Role of Fintech in Circular Economy Practices to Improve Sustainability Performance: A Two-Staged SEM-ANN Approach. *Environmental Science and Pollution Research*. February, 1-22. https://doi.org/10.1007/s11356-023-25576-7

Si Mohammed, K., Serret, V., Ben Jabeur, S., & Nobanee, H. (2024). The role of artificial intelligence and fintech in promoting eco-friendly investments and non-greenwashing practices in the US market. *Journal of Environmental Management*, *359*, 120977. https://doi.org/10.1016/j.jenvman.2024.120977

Song, K., Wu, P., & Zou, S. (2023). The adoption and use of mobile payment: Determinants and relationship with bank access. *China Economic Review*, *77*, 101907. https://doi.org/10.1016/j.chieco.2022.101907

Statista. (2024). FinTech – Worldwide. Retrieved from https://www.statista.com/outlook/dmo/fintech/worldwide on June 9, 2024.

Stern, P.C. (2000). New Environmental Theories: Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, *56*(3), 407-424. https://doi.org/10.1111/0022-4537.00175

Stern, P.C., Dietz, T., Abel, T., Guagnano, G.A., & Kalof, L. (1999). A value-belief-norm theory of support for social movements: The case of environmentalism. *Human Ecology*, *6*, 81-97.

Tao, R., Su, C.W., Naqvi, B., & Rizvi, S.K.A. (2022). Can FinTech development pave the way for a transition towards low-carbon economy: a global perspective. *Technological Forecasting and Social Change*, *174*, 121278. https://doi.org/10.1016/j.techfore.2021.121278

Tsai, W.T. (2024). Green finance for mitigating greenhouse gases and promoting renewable energy development: Case study in Taiwan. *Green Finance*, *6*(2), 249-264. https://doi.org/10.3934/gf.2024010

Udeagha, M.Ch., & Muchapondwa, E. (2023). Striving for the United Nations (UN) sustainable development goals (SDGs) in BRICS economies: The role of green finance, fintech, and natural resource rent. *Sustainable Development*, *31*(5), 3657-3672. https://doi.org/10.1002/sd.2618

United Nations. (2015). Transforming our world: The 2030 agenda for Sustainable Development. A/res/70/1. Retrieved from https://sdgs.un.org/sites/default/files/publications/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf on June 8, 2024.

Vergara, Ch.C., & Agudo, L.F. (2021). Fintech and Sustainability: Do They Affect Each Other?. *Sustainability*, *13*, 7012. https://doi.org/10.3390/su13137012

Vorobeva, D., Scott, I.J., Oliveira, T., & Neto, M. (2022). Adoption of new household waste management technologies: The role of financial incentives and pro-environmental behavior. *Journal of Cleaner Production*, *362*, 132328. https://doi.org/10.1016/j.jclepro.2022.132328

Xu, J., Chen, F., Zhang, W., Liu, Y., & Li, T. (2023). Analysis of the carbon emission reduction effect of Fintech and the transmission channel of green finance. *Finance Research Letters*, *56*, 104127, https://doi.org/10.1016/j.frl.2023.104127

Xue, Q., Bai, C., & Xiao, W. (2022). Fintech and corporate green technology innovation: Impacts and mechanisms. *Managerial and Decision Economics*, *43*(8), 3898-3914. https://doi.org/10.1002/mde.3636

Yang, X., Chen, H., Li, B., Jia, D., & Ahmad, M. (2025). The relationship between artificial intelligence, geopolitical risk, and green growth: Exploring the moderating role of green finance and energy technology. *Technological Forecasting and Social Change, 217*, 124135. https://doi.org/10.1016/j.techfore.2025.124135

Yang, Y., Su, X., & Yao, S. (2021). Nexus between green finance, fintech, and high-quality economic development: empirical evidence from China. *Resources Policy*, *74*, 102445. https://doi.org/10.1016/j.resourpol.2021.102445

Yasmin, M., & Ahamed, F. (2024). Green Banking: Awareness of Customers in Environmental Protection. *International Journal of Science and Management Studies*, *7*, 156-161. https://doi.org/10.51386/25815946/ijsms-v7i1p123

Zapotichna, R. (2024). Green trend in international banking business: opportunities for Ukraine. *Economy of Ukraine*, *3*(736), 58-72. https://doi.org/10.15407/economyukr.2023.03.058

Zhao, M., & Abeysekera, I. (2024). The behaviour of FinTech users in the Alipay Ant Forest platform towards environmental protection. *Journal of Open Innovation: Technology, Market, and Complexity*, *10*(1), 100201. https://doi.org/10.1016/j.joitmc.2023.100201

Zhou, G., Zhu, J., & Luo, S. (2022). The impact of fintech innovation on green growth in China: Mediating effect of green finance. *Ecological Economics*, *193*. 107308. https://doi.org/10.1016/j.ecolecon.2021.107308

Authors

The contribution share of authors is as follows: Dariusz Piotrowski (40%) – conceptualisation, methodology, investigation, formal analysis, project administration, resources, supervision, writing – original draft preparation, writing – review and editing. Anna Iwona Piotrowska (60%) – conceptualisation, data curation, funding acquisition, methodology, investigation, formal analysis, resources, writing – original draft preparation, writing – review and editing.

Dariusz Piotrowski

PhD in economics (2004), works in the Faculty of Economic Sciences and Management at Nicolaus Copernicus University in Toruń, Poland. His research interests include financial aspects of sustainable development and the application of artificial intelligence in finance.

Correspondence to: Dr Dariusz Piotrowski, Nicolaus Copernicus University in Toruń, Faculty of Economic Sciences and Management, Gagarina 13a, 87-100 Toruń, Poland, e-mail: darius@umk.pl

ORCID https://orcid.org/0000-0001-8482-8064

Anna Iwona Piotrowska (corresponding author)

PhD in finance (2017). Assistant professor at the Department of Digital Economy and Finance, Nicolaus Copernicus University in Toruń, Poland. Her research interests include sustainable development, sustainable finance and digital technologies in the financial market.

Correspondence to: Dr Anna Iwona Piotrowska, Nicolaus Copernicus University in Toruń, Faculty of Economic Sciences and Management, Gagarina 13a, 87-100 Toruń, Poland, e-mail: anna.iwona.piotrowska@umk.pl

ORCID https://orcid.org/0000-0002-0571-0664

Acknowledgements and Financial Disclosure

Data collection underlying the studies presented in the manuscript was funded by Nicolaus Copernicus University in Toruń under the 'Excellence Initiative: Research University' programme for 2020-2026.

Use of Artificial Intelligence

The manuscript is free of AI/GAI usage.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright and License

Published by Krakow University of Economics – Krakow, Poland