CULTURAL VALUES AND INTERNET BANKING IN EUROPE. MODERATING

EFFECT OF GENDER

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Abstract

This study analyses how national culture influences the use of Internet banking (IB) in Europe while considering the moderating effect of gender. Using Hofstede's cultural model, we posit six hypotheses and we predict a different relationship between cultural values and IB in men and women. A sample of 19,255 individuals residing in 27 European Union countries was used. The results demonstrate that the cultural values of European countries can explain the use of IB. Specifically, the results highlight that the greatest use of IB is found in countries that have an individualistic culture and low levels of masculinity, along with varying intensity levels between men and women. Regarding indulgence, it exerts a positive influence on IB, but only for men. Conversely, high scores for uncertainty avoidance reduce IB usage for women. Furthermore, using protective measures partially offsets the negative effect of high levels of uncertainty avoidance, but only for women.

1. INTRODUCTION

One of the main technological innovations that has emerged in the recent decades - especially in the field of information and communication technology - is the performance of financial transactions through the Internet, which has been coined as Internet banking (IB) (Shanmugam et al., 2015). IB consists of customers using technology to conduct banking services and transactions on digital devices, personal computers, laptops, tablets and smartphones (Alkhowaiter, 2020; Hoehle et al., 2012). IB ensures cost savings in terms of reducing the investment in offices and staff that traditional banking requires (Giovanis et al., 2019). Furthermore, to improve customer services and the banks' ability to respond to heightened customer expectations, IB provides banks with a great competitive tool to enhance customer satisfaction (Shanmugam et al., 2015). From the customer's perspective, IB facilitates transactions by enabling clients to operate from anywhere and at any time, reducing time and effort, increasing customers' control over their banking information, and providing service at low cost (Laukkanen & Kiviniemi, 2010a). However, many bank customers remain reluctant to use IB for several reasons (Khan et al., 2017). First, there is a perceived risk and uncertainty with regards to the security of IB (Giovanis et al., 2019; M. C. Lee, 2009; Littler & Melanthiou, 2006).

Hofstede (Hofstede, 1981) asserts that culture is 'the collective programming of the human mind that distinguishes the members of one human group from those another' (p. 24). The social norms and beliefs of a country shape the perception, disposition and behavior of its people (Steenkamp et al., 1999). Thus, the characteristics of a national culture does affect consumer decision-making by shaping the perceptions of and

preferences for products, services and innovations (Hofstede et al., 2010). In this regard, several authors argue that culture influences the utilization of information systems (Im et al., 2011; Srite & Karahanna, 2006).

Among the existing proposals in the literature, Hofstede´s cultural model is the most widely accepted (Chu et al., 2019; Sent & Kroese, 2022). Initially, Hofstede put forward a model composed of four cultural dimensions - namely, *uncertainty avoidance*, *individualism*, *masculinity* and *power distance*. Later, two additional dimensions were added to this framework: *long-term orientation* and *indulgence* (Hofstede et al., 2010). Numerous studies have analyzed some of the incidences of these cultural dimensions in certain constructs, and thereby in IB. These studies are based on models for the adoption of technological innovations based on the technology acceptance model (e.g., Hassan & Wood, 2020; Mortimer et al., 2015; Nor et al., 2010; Sukkar & Hasan, 2005) and its extensions - that is, the first and second versions of the unified theory of acceptance and use of technology (e.g., Baptista & Oliveira, 2015a; Khan et al., 2017; Picoto & Pinto, 2021; Yuen et al., 2015). Among the variables analyzed in various studies that address their effect on the use of IB are perceived ease of use, perceived usefulness, perceived risk, social influence, and trust. However, none of these studies consider the direct effect of cultural dimensions on the decision to use IB.

From the perspective of gender, Eagly & Wood, (2012) argue that gender differences in behavior are reflective of the social roles conceptualized for men and women in their specific communities. In previous decades, the progressive incorporation of women into higher studies and the workforce indicated an important change in social roles, although these changes occurred at different rates worldwide. In this sense, these differences

may be associated with the culture of a country (Yeganeh & May, 2011). In this vein, Stedham & Yamamura (2004) analyzed the effect on the cultural perceptions of women and men and asserted that both sexes perceive cultural dimensions differently.

Research in various fields has concentrated on the moderating effect of gender (e.g., (Hsiao et al., 2020; Kaur et al., 2022; Yang et al., 2019) and on the use of mobile banking (e.g., Merhi et al., 2020; Riquelme & Rios, 2010), electronic payment technology (Alshurideh et al., 2021) and mobile commerce technology (Faqih & Jaradat, 2015). Therefore, as Kaur et al. (2022) assert, 'gender has become a social construct intertwined with all facets of human behavior since males and females have divergent behavioral patterns'. Megheirkouni et al. (2020) stated that no uniformity in gender differences across cultures; however, the debate on gender differences affects all countries, sectors and fields. In this sense, research considers the relationship between gender and culture through the specific perspective stemming from different topics (e.g., Ayman & Korabik, 2010; Megheirkouni et al., 2020; Mueller, 2004).

Moreover, studies on gender demonstrate that such differences are reflected in perception, processing of information and the use of information technology, such as computers and the Internet (Cai et al., 2017; Goh & Sun, 2014). In addition, a consensus emerged in the literature that women are more risk-averse than men (e.g., (Bannier & Neubert, 2016; Fisher & Yao, 2017; Hallahan et al., 2004). Therefore, national culture may influence both topics - the use of technology and risk perception - (e.g., Bagchi et al., 2004; Bontempo et al., 1997; Frijns et al., 2013; Leidner & Kayworth, 2006), and the rate at which cultural values impact on the use of IB differing due to gender is also possible.

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In this context, the current study focuses on determining the direct impact of national culture on the use of IB in Europe, with a consideration of the moderating effect of gender. The existence of differences in cultural values, as well as in the use of IB among European countries, offers an opportunity for analyzing this topic. On the one hand, according to data published by Eurostat in 2019, the use of IB ranges from a low of 9% in Romania to a high of 91% in Finland. Nordic and Central European countries demonstrate above-average usage rates, whereas Southern and many Eastern European countries exhibit below-average values. On the other hand, significant differences are noted in cultural values between countries. For example, the degree of risk aversion ranges from 23 out of 100 points in Denmark to 90 in Romania based on the cultural dimensions established by (Hofstede, 2001, 2011).

Based on Hofstede (Hofstede et al., 2010), the study proposes six hypotheses that are related to each of the cultural dimensions, which, in turn, are related to IB use. The arguments are based on the predisposition of consumers' acceptance of technological innovation and risk assumption entailed by such innovation. In addition, we present hypotheses about the moderating effect of gender in the relationship between cultural dimensions and IB use. The results obtained from a sample of 19,255 individuals across 27 European Union (EU) countries reveal the direct impact of cultural values on the use of IB, the importance of using protective measures and the moderating effect of gender in the relationship between certain cultural values and IB use.

This work presents several contributions. First, this study is the first to analyze the moderating effect of gender in the relationship between cultural values and IB use. Second, the study provides a comprehensive overview of Hofstede's cultural model and

considers the full scale of the values presented in them. In this sense, Tam & Oliveira (2019) and Sampaio et al. (2017) pointed out the need to include all cultural dimensions in Hofstede´s model in future studies on IB. Third, in contrast to the majority of studies that focus on the indirect effect, the current study addresses the direct effect of cultural dimensions on the use of IB; this investigation is crucial (Souiden et al., 2021; Zhang et al., 2018). Fourth, this study is the first study to analyze the degree to which national culture influences the use of IB in the EU given the characteristics of individuals[1], as well as risk perception regarding the use of IB, which was rendered possible by employing a cybersecurity survey. To the best of our knowledge, only Takieddine & Sun 2015 analyzed the effect of cultural values on IB diffusion in Europe. However, the study was conducted at the national level and without the consideration of users' characteristics. Finally, the fact that such a large sample with various demographic characteristics was used has enabled this research to overcome the limitations indicated by previous studies regarding the representativeness of results (Khan, 2022; Merhi et al., 2019; Tam & Oliveira, 2019). Moreover, to control for the *individual* and *national* levels, this study applies a multilevel regression technique for the model estimation.

The remainder of the paper is structured as follows. After the introduction, the theoretical arguments and hypotheses are put forward. The third section deals with the methodological aspects, while the fourth one contains the results. Finally, the results are discussed and the main conclusions, implications, limitations and possible extensions of the study presented.

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[1] Although Hofstede´s cultural dimensions were designed for national-level analysis, many studies confirmed its use at individual level too (Faqih & Jaradat, 2015)

2. RESEARCH HYPOTHESES

National cultural characteristics can influence consumer decision-making by shaping perceptions of and preferences for products, services and innovations (Steenkamp et al., 1999; Veiga et al., 2001). Among the various methodological proposals related to culture, the most widely-used model is Hofstede's cultural model and its national culture dimensions, which have been used in numerous studies in a broad number of fields (Khlif, 2016; Kirkman et al., 2006). The application of Hofstede's model to studies on national culture has been subject to criticism (Shenkar, 2001) or revision (Minkov, 2018). However, numerous studies confirm the validity of Hofstede's cultural framework and it remains the dominant model in cross-cultural research (Chu et al., 2019). Therefore, the current study presents theoretical arguments regarding each of the cultural dimensions and the use of IB. These dimensions are *uncertainty avoidance*, *individualism*, *masculinity*, *power distance*, *long-term orientation* and *indulgence*. In terms of gender, social role theory suggests that individuals hold different behavioral expectations that are consistent with their culturally-defined gender roles (Ng et al., 2016). Consequently, we propose a hypothesis on the moderating effect of gender on the relationship between cultural dimensions and the use of IB.

Uncertainty Avoidance Index (UAI) and Internet Banking

Uncertainty avoidance indicates a society's level of tolerance towards ambiguity or concern when addressing unknown situations (Hofstede, 2001, 2011). High scores for uncertainty avoidance indicate that individuals feel threatened by high levels of uncertainty and ambiguity and, thus, tend to minimize risk (Dinev et al., 2009). Previous research illustrates that cultures that seek to avoid uncertainty tend to avoid the use of

innovations related to information technology (e.g., al Kailani & Kumar, 2011; Im et al., 2011; Png et al., 2001; Thatcher et al., 2003) unless such innovations reduce this uncertainty (Bagchi et al., 2004; Lu et al., 2017). In addition, the use of any innovation, especially IB, faces a considerable perception of risk for consumers (e.g., Laukkanen & Kiviniemi, 2010b; M. C. Lee, 2009; Littler & Melanthiou, 2006; Martins et al., 2014; Roy et al., 2017)).

A relative consensus that women are more financially risk-averse than men exists in the literature on gender (e.g., Bannier & Neubert, 2016; Fisher & Yao, 2017; Hallahan et al., 2004). Moreover, (Mueller, 2004) empirically revealed the gap in risk-taking between men and women, which is greater in cultures where high uncertainty avoidance characterizes the national culture.

Based on the abovementioned arguments, the current study conjectures that low levels of use of this type of banking is expected in countries with a high UAI, and this effect will be greater in women than in men. Consequently, we present the following hypotheses:

> *H1a: In cultures that rank the highest in the uncertainty avoidance index, the level of Internet banking use is low.*

> *H1b: In cultures that rank the highest in the uncertainty avoidance index, the level of Internet banking use by women is lower than by men.*

In the consumer context, the risks perceived by consumers - security and privacy of financial transactions conducted electronically - play an important role in IB use (e.g., (Laukkanen & Kiviniemi, 2010a; M. C. Lee, 2009; Littler & Melanthiou, 2006; Martins et al., 2014; Roy et al., 2017). Specifically, with IB, the perceived risk is associated with

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potential losses resulting from deficiencies in the operating systems and misappropriation of funds through illegal access (Grabner-Kräuter & Faullant, 2008).

To address these threats, different protective measures have emerged that are collectively known as cybersecurity[2] and aim to protect against the risks arising from Internet use (von Solms & von Solms, 2018). Given the significance of the risks and the uncertainty involved in any decision concerning information security, it would seem reasonable to predict that individuals socialized in different national cultures, with different tolerances for uncertainty, would have different protection motivations and risk-adoption rates (Aurigemma & Mattson, 2018). The adoption of protective measures can have a moderating effect on the relationship between uncertainty avoidance and the use of IB. Thus, this study proposes a third sub-hypothesis under H1:

> *H1c: In cultures that rank the highest in uncertainty avoidance index, the existence of protective measures helps to increase the level of Internet banking use.*

Individualism versus Collectivism (IDV) and Internet Banking

This dimension measures society's degree of integration into groups (Hofstede, 2011) - that is, the extent to which people prefer to act as individuals rather than as members of a group (Straub et al., 1997). In individualistic cultures, consumers tend to focus on themselves and worry about their well-being, whereas a greater concern for the group is notable in collectivist societies (Khan et al., 2017, 2022; Srite & Karahanna, 2006). Thus, in a collectivist society, consumers will adopt a new technology only if the group accepts it (Hassan & Wood, 2020). However, in individualistic societies, consumers are

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[2] Cybersecurity as the 'preservation of the confidentiality, integrity and availability of information in Cyberspace' (ISO/IEC 27032: 2012)

expected to make decisions on technology adoption independently (Im et al., 2011). In this sense, previous literature inclines towards reporting a positive relationship between individualism and technological innovation (Bagchi et al., 2004; Straub et al., 1997), particularly in electronic communication methods, such as IB (Takieddine & Sun, 2015). Other authors report a positive association between the individual degree of risk tolerance (financial risk-taking) and individualism, since the latter is associated with overconfidence and over-optimism (Breuer et al., 2014). Therefore, the current study expects individualistic societies to make greater use of information technology in general and IB in particular.

Regarding gender, previous studies confirm that men exhibit a more favorable attitude towards technology than women (Cai et al., 2017)[3], although evidence varies in terms of IB (Goswami & Dutta, 2016). Collectivistic/traditional societies insist on different gender roles, whereas gender roles are less distinct in individualistic societies. Thus, the associations between collectivism as a cultural dimension and gender gap and between individualism and gender equality are seemingly plausible (Yeganeh & May, 2011). According to Stedham & Yamamura (2004), however, women tend to orient their relationships with a strong emphasis on interaction and communication, which renders them less individualistic than men. Moreover, in line with Mueller (Mueller, 2004), the gender gap is greater in individualistic than collectivist cultures.

On the basis of these arguments, the study puts forward the following hypotheses regarding collectivism:

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[3] These authors find that this favourable attitude is especially on the dimensions of belief (e.g., believing in the societal usefulness of technology) and self-efficacy (e.g., self-confidence in one's ability to learn and use technology effectively)

H2a: Individualistic cultures make greater use of Internet banking.

H2b: In individualistic cultures, the level of Internet banking use by women is lower than by men.

Masculinity versus Femininity (MAS) and Internet Banking

Hofstede et al. (Hofstede et al., 2010) defined this dimension as follows:

A society is called masculine when emotional gender roles are clearly distinct: men are supposed to be assertive, tough and focused on material success, whereas women are supposed to be more modest, tender and concerned with the quality of life. A society is called feminine when emotional gender roles overlap: both men and women are supposed to be modest, tender and concerned with the quality of life (p. 140).

Consequently, high scores (masculinity) indicate that the concept of achieving personal targets is predominant, whereas low values (femininity) indicate that greater emphasis is placed on personal relationships, care, quality of life or cooperation (e.g., Bagchi et al., 2004; Dinev et al., 2009; Hofstede, 2011; Srite & Karahanna, 2006; Waarts & van Everdingen, 2005).

In the consumer context, previous studies indicate that cultures with high levels of masculinity are more willing to adopt innovations based on the increased motivation for achievement; their consideration as a potential means to outperform a competitor, the perception of economic benefits, or the increased trust found in such cultures (e.g., (Hassan & Wood, 2020; Steenkamp et al., 1999; Sundqvist et al., 2005; Thatcher et al., 2003; Waarts & van Everdingen, 2005). Regarding IB, Bankole et al. (2011) suggested

and found that high levels of masculinity are associated with increased utility and effort expectancy of this type of banking, specifically, mobile banking.

In terms of gender, Hofstede (Hofstede, 2011) argues that men and women in feminine societies exhibit the same modest and caring values but women in masculine countries are relatively assertive and competitive, although not as much as men are, such that these countries present a gap between the values of men and women. Along the same line, Stedham & Yamamura (2004) and Png et al. (2001) assert that gender roles are extremely distinct and separated in masculine countries in which material success, competitiveness and strength are highly valued. On the contrary, gender roles in feminine countries overlap, and men and women may be assertive and tender. Therefore, the conclusion that masculinity as a cultural dimension is related to masculine values and increases the gender gap is possible (Yeganeh & May, 2011).

Based on the abovementioned arguments, the study presents the following hypotheses:

> *H3a: In cultures with high levels of masculinity, the level of Internet banking use is high.*

> *H3b: In cultures with high levels of masculinity, the level of Internet banking use by women is lower than by men.*

Power Distance Index (PDI) and Internet Banking

PDI is defined as 'the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally' (Hofstede et al., 2010); high levels of this dimension indicate that people in a country readily accept social inequality (Dinev et al., 2009). Consumers in high-PDI societies are less open to accepting innovations, whereas low-PDI cultures motivate individuals to

take an interest in technological innovations (e.g., Bagchi et al., 2004; Im et al., 2011; Png et al., 2001; Sundqvist et al., 2005; Thatcher et al., 2003; Waarts & van Everdingen, 2005). Consequently, the adoption of technological innovations is perceived as a means for assimilating with the most powerful individuals.

In addition, Lu et al. (Lu et al., 2017) state that mistrust is always more present in high-PDI countries. Therefore, individuals in these countries do not easily accept new ideas and innovations, unless the leaders of these cultures first adopt such innovations (Hassan & Wood, 2020; Picoto & Pinto, 2021). However, individuals that belong to cultures with low-PDI levels display greater independence levels and innovative behaviors than those in high-PDI cultures (Akhtar et al., 2019; Im et al., 2011; Takieddine & Sun, 2015); in the case of IB, several authors claim that the increased use of IB is more likely in such countries (Akhtar et al., 2019; Takieddine & Sun, 2015).

Cultures with high-PDI levels are economically less developed and less democratic and exhibit traditional gender roles inside and outside the family (Hofstede et al., 2010). Thus, people in hierarchical cultures may cherish the gender gap (Yeganeh & May, 2011). Based on the incorporation of women into the labor market and the social changes that occurred in recent decades, 'women will believe that power should be equally distributed, while men are likely to be satisfied with the status quo, i.e., inequality in power distribution' (Stedham & Yamamura, 2004). In this sense, Guimond et al. (2006) revealed that the difference between men and women is more prominent in intra-group social comparisons, which is more common in high-PDI societies, where inequality is perceived as a natural status (Megheirkouni et al., 2020).

On the basis of these arguments, the study presents the following hypotheses:

H4a: In cultures with high-power distance levels, a lower level of Internet banking use is expected.

H4b: In cultures with high-power distance levels, the level of Internet banking use by women is lower than by men.

Long-Term Orientation (LTO) and Internet Banking

This cultural dimension is linked to the choice of focus for people's efforts - that is, the future, present or past (Hofstede, 2011). High-LTO societies attach great importance to savings, persistence and long-term alliances. Individuals in a society with high–LTO levels have strong beliefs that enable them to take risks in situations of uncertainty (Yoon, 2009). Previous studies have suggested a positive relationship between LTO and the adoption of innovation based on the characteristics of these cultures, such as persistence, adaptation of traditions to new circumstances, personal adaptability or belief that the most important events will occur in the future (Waarts & van Everdingen, 2005).

As previously discussed, women are more averse to taking financial risks than men. Given that LTO is associated with a propensity for risk, the study expects that the effect of this cultural dimension on IB use is less for women than for men, even in societies with high-LTO levels.

Thus, the study puts forward the following hypotheses:

H5a: In cultures with a higher long-term orientation rate, individuals are more likely to use internet banking.

H5b: In cultures with a higher long-term orientation rate, the use of Internet banking by women is lower than by men.

Indulgence versus Restraint (IVR) and Internet Banking

Indulgence reflects a society that enables a relatively free gratification of basic and human desires related to enjoying life and leisure. However, restraint reflects a society that controls the benefit of needs and regulates this aspect through strict social standards (Hofstede, 2011; Hofstede et al., 2010). According to Hofstede (Hofstede et al., 2010), people in indulgent cultures are more likely to remember positive emotions, whereas those in restraint-oriented cultures are more likely to remember negative emotions. In the second group, negative and pessimistic feelings and a lack of trust prevail (Hofstede et al., 2010).

Few studies analyze this dimension in relation to technological innovations. Other studies refer to hedonic motivation regarding the use or acceptance of such innovations (Venkatesh et al., 2012) and may serve as an approach to this cultural dimension. Referring to the hedonic motivation derived from the use of technology (related to indulgent cultures), Khan et al. (2022) indicate that 'consumers prefer technology not only to complete their tasks, but also as a valuable entertainment' (p. 8); the authors believe that a positive association exists between hedonic motivation and intention to use IB. Baptista & Oliveira (2015b), Merhi et al. (2019) or more recently Andalib Touchaei & Hazarina Hashim (2023) also consider the positive effect of hedonic motivation on the behavioral intention towards mobile banking, which is underpinned by the entertainment value that this type of banking can provide.

For gender, other authors assert that men attribute more importance to hedonism than women (Schwartz & Rubel, 2005). Additionally, studies demonstrate that women generally tend to have less trust in web-based activities (Al-Gahtani, 2011; Rodgers &

Harris, 2003; van Slyke et al., 2002). Cultures with high levels of indulgence are associated with hedonic behavior and high-trust levels. Thus, women in these cultures are less likely to be predisposed to use IB.

Based on these arguments, the study presents the final hypotheses as follows:

H6a: In cultures with high levels of indulgence, individuals are more likely to use internet banking.

H6b: In cultures with high levels of indulgence, the use of internet banking by women is lower than by men.

Figure 1 summarizes the conceptual framework of the study.

Figure 1. Conceptual model
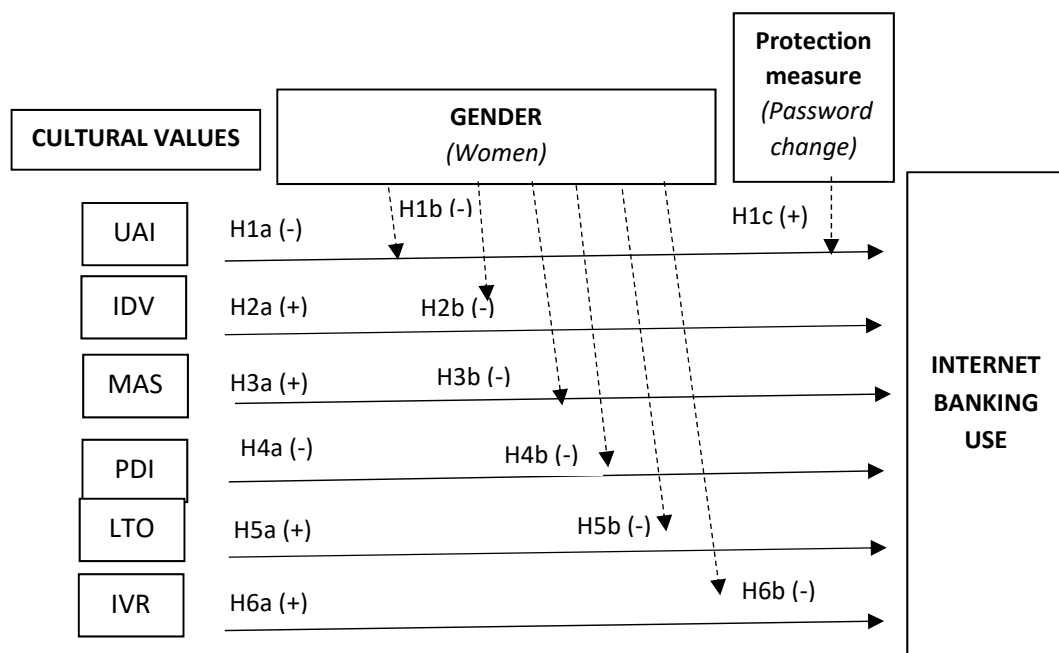
Source: own elaboration

3. METHODOLOGICAL ASPECTS

3.1. Sample and Sources of Information

The study employed different sources of information. First, we obtained data on IB use at the individual level, demographics and socio-economics, and security concerns from the Special Eurobarometer 499, a cyber-security survey (Communication European Union. Directorate-General for, 2019) conducted in 2019 and published in 2020 by the Directorate-General for Communication[4]. This database contains information on 27,607 individuals aged 15 years and over who reside in the 28 countries in the EU[5]. Respondent selection is based on a sample of around 1000 individuals from each member country, except for Germany (1,506), and Cyprus, Luxemburg and Malta (approximately 500 respondents each)[6].

Given the objective of the study, respondents who say they never use or do not have access to the Internet were omitted from the sample, which reduced the sample to 22,166 observations. In addition, we first omitted 353 observations from Cyprus because the cultural values for that country were not available; finally, 2,911 observations were removed because they lacked valid answers for several of the demographic or socio-economic variables used. In summary, the final sample consists of 19,255 observations from 27 EU countries at the end of 2019. Data on cultural values was derived from the Hofstede website[7], which provides access to the six cultural dimensions of each country.

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[4] Among the studies that have used the Eurobarometer are (C. S. Lee & Kim, 2020; Martínez Guerrero et al., 2007; Rughiniş & Rughiniş, 2014; Sun, 2011).

[5] This includes the United Kingdom, whose official departure from the EU took place on 31 January 2020.

[6] The Special Eurobarometer 499 Report contains the exact number of respondents in each country (European commission, 2020).

[7] Hofstede insights: https://www.hofstede-insights.com/country-comparison/ (Retrieved 17 April 2019).

3.2. Variables

Dependent variable

The use of IB is a dichotomous variable (*Internet banking)* that takes a value of 1 if the respondent claims to use IB; otherwise, it is 0.

Explanatory variables

Cultural values. According to the hypotheses, Hofstede's six cultural dimensions are regarded as explanatory variables: uncertainty avoidance index *(UAI)*, individualism/collectivism *(IDV)*, power distance index *(PDI)*, masculinity/femininity *(MAS)*, long-term orientation *(LTO),* and indulgence/restraint *(IVR)*. All dimensions can adopt values between 1 and 100. In the case of the duality dimensions, high scores are designated to the first term. Hofstede's cultural model is widely used in related literature (Kutan et al., 2020; Zhang et al., 2018). To ensure robustness, we considered three of Schwartz's bipolar dimensions - namely, mastery/harmony *(MAT)*, embeddedness/autonomy *(EMB)*, and hierarchy/egalitarianism *(HIE)*, which are associated with masculinity, collectivism and power distance, respectively (Schwartz, 2006).

Gender is proxied by the *Woman* variable, which takes values of 1 or 0 if a respondent is female or male, respectively. To analyze the moderating effect of gender, the study estimated the model for the sub-samples for women and men.

To test H1c, according to which, peoples' use of protective measures may affect UAI, and following previous studies (Lu et al., 2017), the current study employs the product-indicator approach. In this sense, we created the *UAIxpassword* variable as a product between the aforementioned cultural dimension *(UAI)* and the dichotomous variable

password, which takes a value of 1 if respondents claim to have changed the password for their internet access on their bank accounts in the previous 12 months; otherwise, it takes a value of 0. The combination of username and password has long been used as a form of authentication and has remained a dominant option despite numerous password-related problems (Bonneau & Shutova, 2012). Studies that highlight password change as a protective measure include (Ali, 2019; Shimna M.S & Sangeetha P.S., 2013).

Control variables

Following previous studies (Dinev et al., 2009; Hassan & Wood, 2020; Laukkanen & Cruz, 2012), the current study considered demographic and socio-economic characteristics, such as age, educational level, marital status, household income, and employment status. Age was categorized into four groups - namely, *Age15_24, Age25_44, Age45_64* and *Age65_more*. Educational level refers to the maximum academic level achieved by the respondents and corresponds with the three dichotomous variables - *secondary*, *baccalaureate* and *higher education*[8]. The *Married/Partner* dichotomous variable takes a value of 1 if the respondent is married or living in a civil partnership; otherwise, it is 0 (i.e., single, divorced and widow[er]). Three dichotomous variables denote employment status - namely, *Unemployed, Self-employed* and *Employed.* Finally, three dichotomous variables represent household income at three levels - namely, *low-income*, *middle-income* and *high-income*.

Estimation model and method

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[8] Based on the Eurobarometer, these levels correspond to those who leave school before they are 15 years old, between 16 and 19 years old, or 20 years old and over, respectively.

To contrast the assumptions made, the study specifies the following econometric model wherein the dependent variable *(IB)* is dichotomous and takes a value of 1 if individuals claim to be users of IB; otherwise, it is 0.

$$Internet\ Banking_j$$
$$= \beta_0 + \beta_1 UAI_j + \beta_2 IDV_j + \beta_3 PDI_j$$
$$+ \beta_4 MAS_j + \beta_5 LTO_j + \beta_6 IVR_j + \beta_7 Password_{j\ j}$$
$$+ \beta_8 UAIxpassword_j \quad + \beta_{9-20}\ Control\ variables_j + \varepsilon_j$$

We use multilevel logit regression due to the dichotomous nature of the dependent variable, as well as the two other levels of variables (individual and national). This modelling technique is appropriate given that the study is examining cross-national samples in which individual respondents are 'nested' within countries (Gu et al., 2022)[9]. We estimated the models using a conventional pooled approach, where the error terms at the individual and national levels are estimated simultaneously. In this type of non-linear model, coefficients are useful for interpreting the sign, whereas the odd ratio (OR) refers to the magnitude of the impact and is a result of dividing the probability that an event will occur by the probability that it will not occur. Odd ratios range from 0 to infinity. An odd ratio of 1 indicates the absence of association between variables. Values greater than 1 represent a positive association between variables, where a high score of the factor is associated with a high frequency of the event occurring. Values less than 1 indicate a negative association between variables; to facilitate interpretation in these cases, the inverse is calculated (1/OR)[10].

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[9] Among the studies that have used the multilevel hierarchical model in the context of cultural studies, specifically the Hofstede model, is Mihet (2013)

[10] The difference between odd ratio and probability is that the probability is the result of dividing the number of favourable cases by the total number of cases, while the odd ratio is the result of dividing the number of favourable cases by the number of unfavourable cases.

4. RESULTS

4.1. Descriptive analysis

First, the study analyzed the differences in IB use among various EU countries. Table A1 in the Appendix indicates that the average of the sample analyzed is 62 % with IB-use values ranging from 13 % in Romania to 94 % in Denmark. In general, Nordic countries, together with a few Eastern European countries, exhibited high rates (above 78 %). Other Central European countries are above average, but the majority of Central, Eastern and Southern European countries are below average (61%). These differences are statistically significant. Table A1 also illustrates the percentage of female and male IB users per country. The data reflected the differences that exist between genders in the majority of countries, although the gender gap is in favor of women in certain cases and of men in other cases. In the same manner, Table A1 presents Hofstede´s and Schwartz´s values of the six cultural dimensions for each country, which also provides evidence of significant differences amongst countries.

For IB users, Table 1 presents the average values of the cultural dimensions for the overall sample, as well as for the sub-samples of respondents who use and do not use IB. Specifically, IB users are mainly located in countries with low scores in UAI, PDI and MAS but high scores in IDV and IVR, whereas LTO is similar for users and non-users. In other words, countries characterized by less risk aversion, less acceptance of inequality, less masculinity, and greater individualism and indulgence have more IB users. This pattern is similar in the subsample of women and men. In all dimensions, the result of the t-test indicates significant differences between users and non-users, except for LTO in the subsample of men.

Table 1. Cultural dimensions, Internet banking and gender

(Average values)

	All	All sample			Women			Men		
		IB users	IB non-users	T-test	IB users	IB non-users	T-test	IB users	IB non-users	T-test
UAI	68.73	63.84	77.20	42.63***	63.80	77.60	33.56***	63.89	76.69	26.53***
IDV	59.90	63.68	53.35	-40.98***	63.62	53.17	-30.93***	63.75	53.57	-26.85***
MAS	45.62	42.37	51.24	24.47***	42.21	51.53	18.93***	42.57	50.87	15.51***
PDI	50.07	45.74	57.59	40.62***	46.04	57.81	29.80***	45.38	57.30	27.55***
LTO	58.07	58.47	57.39	-4.41***	59.02	57.10	-5.78***	57.82	57.74	-0.21
IVR	44.31	47.71	38.43	-32.93***	46.40	37.93	-22.03***	49.25	39.06	-24.71***

*** significant at 0.01%

Table 2 presents the descriptive statistics for gender, protection and the control variables. Moreover, the table points to a significant difference in password change between users and non-users of IB. In terms of demographic characteristics, IB users do not show significant differences in gender and marital status, unlike in education level, with the percentage of higher education for the IB users being higher than for non-users. Finally, IB users consist of a high percentage of both self-employed and employed workers and a high level of income.

Table 2. Gender, protection and control variables

Users and non-users of Internet banking

	All sample	Users	Non-users	Chi2-test
Women	0.5486	0.5414	0.5610	6.86***
Password	0.2851	0.3999	0.0861	0.002***
Age15_24	0.0428	0.0389	0.0497	12.51***
Age25_44	0.3444	0.3683	0.3031	83.86***
Age45_64	0.4019	0.3840	0.4328	44.12***
Age65_more	0.2106	0.2086	0.2142	0.859***
Secondary studies	0.0784	0.0445	0.1373	531.64***
Baccalaureate	0.4654	0.4013	0.5766	551.70***
Higher education	0.4560	0.5540	0.2859	0.001***
Married/Partner	0.7160	0.7200	0.7090	2.66*
Unemployed	0.3563	0.3203	0.4187	188.78***
Self-employed	0.0823	0.0956	0.0592	78.42***
Employed	0.5613	0.5840	0.5220	69.81***
Low_income	0.3796	0.3150	0.4919	593.55***
Middle income	0.5306	0.5642	0.4724	151.07***
High income	0.0896	0.1207	0.0356	396.66***
N observations	19.255	12.213	7.042	

Table A2 in the Appendix presents the correlations matrix between the variables. A few of the cultural dimensions produced correlation coefficients that exceed 0.5. This case is true for the correlations amongst individualism, uncertainty avoidance and power distance and between power distance and indulgence. However, variance inflation factors reached values below 2.16 (average = 1.46), which indicates that multicollinearity is not an issue.

4.2. Econometric Results

Table 3 presents the results of the multilevel logit model estimation. Model 1 corresponds to the complete sample, while models 2 and 3 are related to women and men, respectively.

In Model 1, four of the six variables of Hofstede´s cultural dimensions are significant. Specifically, UAI (p-value < 0.05) and MAS (p-value < 0.01) are negative, implying acceptance of H1a and rejection of H3a. IDV and IVR are positive (both p-value < 0.05), which supports H2a and H6a. LTO and PDI are statistically non-significant[11].

Regarding the economic interpretation, an increase of one unit in the UAI reduces the possibility of IB use by 4.76 points and also by 6.66 points in MAS (inverse of OR). On the contrary, an increase of one unit in the scores for IND and IRV is associated with an increase of 8.79 and 5.25 points in the possibility of IB use, respectively.

With regard to the use of protective measures, password change is positive and significant at 0.01 %. Results concerning interaction (*UAIxPassword*) indicate that in countries with high UAI, where less use of IB occurs, the fact that customers use

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[11]To facilitate the interpretation of the results, we have rescaled the values, dividing by 100.

password change as a protective measure in their Internet operations increases the use

of IB. Specifically, for the same UAI value, individuals who use this protective measure

increase the possibility of using IB by 2.25 points. Therefore, H1c is accepted. It is

important to point out that the variable for women is not statistically significant, which

indicates that gender does not have a direct effect on the use of IB.

Table 3. Cultural values and Internet banking in Europe								
Dependent variable: Internet banking, dummi=1 if the respondent uses the Internet banking								
Estimation method: multilevel logit regression								
	Model 1			Model 2			Model 3		
Sample	All sample			Women			Men		
	β	OR	Z	β	OR	Z	β	OR	Z
UAI	-1.5201**	0.2186	-2.20	-2.0966***	0.1228	-2.64	-1.0203	0.3604	-1.55
IDV	2.1740**	8.7940	2.45	2.0254**	7.5795	1.99	2.3515***	10.2013	2.69
MAS	-1.9019***	0.1492	-3.67	-2.0387***	0.1301	-3.49	-1.7356***	0.1762	-3.62
PDI	-0.5660	0.5677	-0.71	-0.6617	0.5159	-0.74	-0.4746	0.6220	-0.64
LTO	0.8871	2.4282	1.03	1.0241	2.7847	1.06	0.6265	1.8710	0.80
IVR	1.6591**	5.2550	2.04	1.4743	4.3679	1.61	1.9032**	6.7075	2.54
Women	0.0502	1.0515	1.33	-	-	-	-	-	-
Password	1.2200***	3.3872	6.44	-0.8625***	2.3690	3.31	1.6234***	0.8616	5.78
UAIxPassword	0.8141***	2.2571	3.19	1.2613***	3.5301	3.55	0.3320	0.7465	0.89
Age25_44	Reference			Reference			Reference		
Age15_24	-0.2034**	0.8159	-2.20	-0.2378*	0.7883	-1.86	-0.1488	0.86166	-1.10
Age45_64	-0.3635***	0.6951	-8.29	-0.4503***	0.6373	-7.61	-0.2922***	0.7465	-4.39
Age65_more	-0.5054***	0.6032	-7.72	-0.6480***	0.5230	-7.31	-0.4554***	0.6341	-4.46
Baccalaureate	Reference			Reference			Reference		
Secondary studies	-0.5842***	0.5575	-8.36	-0.5918***	0.5532	-6.11	-0.5555***	0.5737	-5.47
Highest studies	0.4868***	1.6271	11.71	0.4499***	1.5682	7.92	0.5103***	1.6658	8.27
Married/Partner	0.0770*	1.0801	1.84	-0.0209	0.9792	-0.37	0.2006***	1.2222	3.13
Unemployed	Reference			Reference			Reference		
Self-employed	0.9585***	2.6078	11.93	1.1341***	3.1084	9.07	0.7850***	2.1926	7.10
Employed	0.5516***	1.7360	11.24	0.5993***	1.8209	9.62	0.4612***	1.5860	5.65
Lower-income	Reference			Reference			Reference		
Middle income	0.3530***	1.4233	8.71	0.3108***	1.3645	5.60	0.4088***	1.5051	6.83
High income	0.8337***	2.3018	9.28	0.8319***	2.2978	6.48	0.8615***	2.3667	6.84
Intercept	-0.6208	-	-0.61	0.1926	-	0.16	-1.2842	-	-1.30
N Observations	19,255			10,565			8,690		
Log-likelihood	-8,989.13			-4,904.03			-4,087.27		
Wald Chi2	2,493.07***			1,352.19***			1,197.59***		

*OR: Odd ratio. *, **, *** significant at 10%, 5% and 1%, respectively.*

The estimation of models 2 and 3 enables the analyses of possible differences in men

and women concerning the relationship between cultural dimensions and the use of IB.

The results of these models reveal two important differences in the incidence of cultural values according to gender. Thus, UAI maintains a negative sign in women but is not significant for men. In contrast, IVR loses significance in women, although the result is significant (at 5%) for men. PDI and LTO remain non-significant in both models. Only IND and MAS similarly explain the behavior regarding the use of IB in women and men, although differences are observed in the level of statistical significance and the magnitude of the effect in these dimensions.

Another important difference in both models is the result of the interaction between UAI and password change. This interaction remains significant for the sample of women but is not significant for the sample of men. This result may be related to the abovementioned result regarding the absence of statistical significance of UAI in the model for men, because password change as a protective measure maintains its positive sign. Therefore, the fact of living in a country with high scores for risk aversion does not significantly influence IB use in the case of men, such that their attitude remains the same by using a protective measure.

Thus, the results indicate support for H1b, H2b, H4b and H6b. On the contrary, H3b is rejected since a sign contrary to that predicted was obtained. Furthermore, H4b and H5b are rejected as the results did not reach the required statistical significance.

All control variables are significant at 0.1 %, except for age between 15 and 24 years at 5% and marital status at 10 %. Regarding age, all groups are less likely to use this type of banking compared with the reference group (25–44 years), which indicates that this age segment uses IB services more. In terms of education level, respondents with a secondary level of education use IB less than those with baccalaureate degrees

(reference group in the models). In contrast, respondents who completed higher education use IB more. Therefore, high-education levels seemingly exert an influence on the increased use of this type of banking. Having a job, whether self-employed or salaried, exerts an impact on the increased use of IB compared with being unemployed (benchmark). Finally, high-income levels are also conducive to the use of IB. These results are reflected in models 2 and 3, except for marital status, which is not significant in the sample of women but positive and significant in the sample of men.

Figure 2 summarizes the results regarding the acceptance (A) or rejection (R) of the hypotheses presented in the conceptual model.

Figure 2. Conceptual validate model
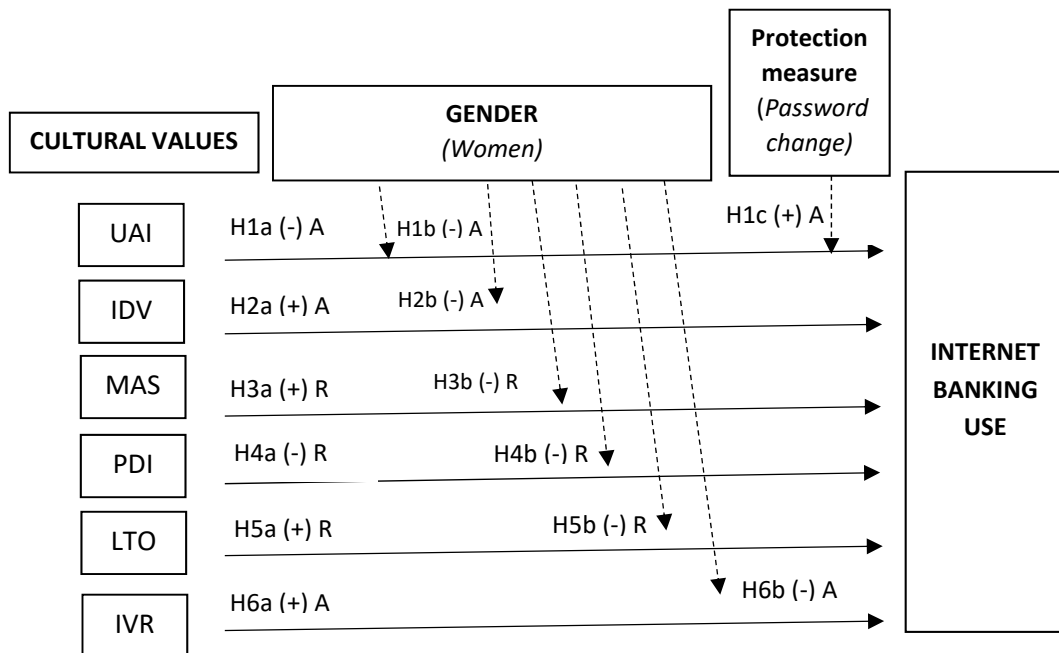
A = Accepted hypothesis; R= Rejected hypothesis. The predicted sign in brackets
Source: Own elaboration

Robustness analysis

With the objective of analyzing the robustness of the results, the study re-estimates the models by substituting the Hofstede cultural values with those of the Schwartz model. (Schwartz, 2006) proposes three bipolar dimensions of culture that represent alternative resolutions to each of three problems that confront all societies - namely, mastery versus harmony, embeddedness versus autonomy, and hierarchy versus egalitarianism. We obtained the data from Schwartz (Schwartz, 2008) (see Table A1 in the Appendix). The sample is smaller because the scores of this model are unavailable for three of the countries (i.e., Lithuania, Luxembourg and Malta). The results of Model 4 (Table 4) indicate that mastery (associated with Hofstede´s masculinity) and embeddedness (associated with Hofstede´s collectivism, which is the inverse of individualism) display a negative and significant sign. In addition, these results are maintained in the sub-samples of women and men (models 5 and 6; Table 4), although with varying levels of intensity, which is similar to the initial results. Hierarchy (associated with Hofstede´s power distance) is not significant for the three models. These results are consistent with those obtained for Hofstede's homologous dimensions.

In addition, the United Kingdom ceased to belong to the EU in January 2020; thus, the models were re-estimated, except for observations from this country (sample = 18,454). The results (not reported) are similar in sign and significance to those initially obtained, except for IVR, which remains positive and significant in all models. Finally, the study estimated the models by successively considering gross domestic product per capita, broadband Internet penetration and the financial development index as control

variables. The results are the same in sign and significance, except for indulgence. However, these macroeconomic variables display high correlations with one another and with four out of the six cultural dimensions of Hofstede; thus, we did not consider reporting the results as appropriate.

Table 4. Cultural values and Internet banking in Europe. Robustness: Schwartz´s model								
Dependent variable: Internet banking, dummi=1 if the respondent uses the Internet banking								
Estimation method: multilevel logit regression								
	Model 4			Model 5			Model 6		
Sample	All sample			Women			Men		
	β	OR	Z	β	OR	Z	β	OR	Z
Mastery	-3.4849**	0.0306	-2.47	**-3.9552****	0.0191	-2.54	**-3.0255****	0.0485	-2.37
Embeddedness	-2.4026***	0.0904	-2.91	**-2.4021*****	0.0905	-2.64	**-2.5036*****	0.0817	-3.35
Hierarchy	0.3063	1.3584	0.37	0.3032	1.3542	0.33	0.3762	1.4568	0.50
Women	0.0630	1.0650	1.61	-	-	-	-	-	-
	1.7953***	6.0215	34.23	1.7295***	5.6379	24.04	1.8843***	6.5821	24.45
Age25_44	Reference			Reference			Reference		
Age15_24	-0.2118**	0.8090	-2.22	-0.2539**	0.7757	-1.93	-0.1562	0.8553	-1.12
Age45_64	-0.3480***	0.7060	-7.68	-0.4244***	0.6541	-6.94	-0.2851***	0.7518	-4.15
Age65_more	-0.4971***	0.6082	-7.28	-0.6217***	0.5369	-6.72	-0.4530***	0.6356	-4.25
Baccalaureate	Reference			Reference			Reference		
Secondary studies	-0.5931***	0.5525	-8.19	-0.6223***	0.5366	-6.20	-0.5402***	0.5825	-5.13
Highest studies	0.4806***	1.6171	11.14	0.4358***	1.5463	7.18	0.5197***	1.6816	8.4
Married/Partner	0.0704	1.0730	1.62	-0.0275	0.9728	-0.47	0.1967***	1.2174	2.96
Unemployed	Reference			Reference			Reference		
Self employed	0.9352***	2.5479	11.35	1.1226***	3.0726	8.77	0.7575***	2.1330	6.66
Employed	0.5412***	1.7180	10.56	0.5762***	1.7793	8.85	0.4689***	1.5983	5.51
Lower-income	Reference			Reference			Reference		
Middle income	0.3644***	1.4397	8.70	0.3320***	1.3938	5.79	0.4069***	1.5022	6.58
High income	0.8210***	2.2729	8.85	0.8402***	2.3168	6.31	0.8259***	2.2839	6.36
Intercept	20.9659***	-	3.50	23.0250***	-	3.49	19.2407***	-	3.56
N Observations	17,988			9,833			8,155		
Log-likelihood	-8,391,81			-4,571.25			-3,833.80		
Wald Chi2	2,242.16***			1,180.31***			1,079.53***		

*OR: Odd ratio. *, **, *** significant at 10%, 5% and 1%, respectively.*

5. DISCUSSION AND CONCLUSIONS

To bridge the existing gap in the literature, this study analyses the direct rate at which cultural values impact on the use of IB in EU countries and the moderating effect of gender, and the use of protective measures against the risk involved in conducting online banking transactions. This study has been possible due to the availability of data

from the Special Eurobarometer 499 cybersecurity survey. This survey enabled the current study to contrast the presented hypotheses on a sample of 19,255 individuals belonging to 27 countries under the EU.

The results confirm the influence of cultural values on the use of IB in Europe. Specifically, the greatest use of IB occurs mainly in the majority individualistic and indulgent EU countries. By contrast, the use of this type of banking is lower in countries that display high-uncertainty avoidance and are characterized by consumers with high-risk aversion. In any case, although high UAI reduces the use of IB, the use of protective measures, such as password change, can contribute to the increased use of IB services. These results offer support to the abovementioned arguments. However, the result relative to the cultural dimension of masculinity versus femininity is contrary to the predicted hypothesis. According to the arguments presented, increased use of IB should be noted for countries with high-masculinity levels. However, the results reveal the opposite. In this manner, Takieddine & Sun (2015) argue that the diffusion of IB is more likely in societies with low-masculinity levels, because the use of technology in these cultures meets personal and professional needs. In addition, Hofstede et al. (Hofstede et al., 2010) assert that 'technological developments are also likely to support a shift from masculine to feminine values in industrial societies' (p. 185).

The results demonstrate certain differences in gender. Thus, the incidence of UAI is presumably only significant in women, since they are more risk-averse than men. On the contrary, indulgence is only relevant to men. However, individualism and masculinity exert a similar effect on women and men in terms of IB use. Furthermore, the interaction

between UAI and protective measures is only relevant to women, which is related to men who are less risk-averse.

The socio-economic and demographic profiles of Internet bank users were those of employed individuals aged 24–44 years with medium- or high-income levels and with medium or high-education levels. Thus, the high-IB use rates in certain countries within the sample analyzed, such as Denmark, Finland, the Netherlands and Sweden (more than 90 %) are explained by a combination of cultural values. This result is in line with those obtained in the proposed model. Similarly, countries with low rates of IB use, such as Bulgaria or Romania (less than 25 %), present a combination of cultural values that are in line with the results achieved (Table A1). In Southern Europe, Greece, a country with the highest score for UAI (100 points), stands out for the low use of IB at 38%. Along this line, Anysiadou et al. (2021) conclude that Greeks fear that 'there is a risk of non-protection of their privacy and personal information, or that the application will not operate properly and they will lose money which, as a consequence, leads them to develop a negative attitude towards these services' (p. 17).

Alternatively, Nordic countries, which are characterized by a cold climate, present high-IB use rates compared with the low-IB use rates in countries located in Southern Europe with a warm climate. Thus, weather may influence IB use to the extent that low temperatures enhance the use of technologies because people tend to avoid going to banks to resolve financial matters. In this sense, Hofstede et al. (Hofstede et al., 2010) previously noted the relationship between climate and cultural dimensions, and certain studies associate cultural values with climate. For example, Kwon et al. (Kwon et al., 2011) found a positive association amongst temperature, masculinity and power

distance, negative with individualism score and not significantly related to UAI or long-term orientation.

As previously discussed, the only study that is similar to this research in that it covers several countries - especially in Europe - is that of Takieddine & Sun (2015). Based on the difference of means between country clusters, the current study concludes that countries belonging to cultural groups with high uncertainty avoidance levels and masculinity and power distance, and low levels of individualism exhibit low diffusion rates of IB use. However, the present study also offers important differences. First, this study analyses the moderating effect of gender on the relationship between cultural values and IB use. Second, this study considers the characteristics of users and estimates the models using multilevel logistic regression. In contrast, Takieddine and Sun consider the country as a unit of analysis and use classification methods (cluster) to classify countries based on the values of their cultural dimension, which does not enable the extraction of causal relationships. Third, the current study uses all dimensions in Hofstede´s cultural model, whereas Takieddine and Sun employ only four dimensions.

Furthermore, the current results regarding the effect of UAI and IDV confirm the conclusions drawn by the review of (Zhang et al., 2018). Specifically, the authors conclude that countries with high UAI display low percentages of IB use, whereas individualistic countries are more open to this type of innovation.

In summary, the current study demonstrates the importance of considering cultural values when explaining the use of IB. As Lu et al. (2017) indicate, the debate on whether the penetration of technology and innovation influences convergence versus cultural divergence is long-standing. Moreover, Hofstede (Hofstede, 2001) states that cultural

orientation remains different across countries, which supports the importance of considering cultural values. In the same manner, the current study concludes that gender exerts a moderating effect on the relationship between cultural values and IB use. Previous empirical evidence regarding the moderating effect of gender on this relationship is non-existent.

Implications

The present study provides important practical implications for the development of IB. Undoubtedly, digitalization is currently one of the most important challenges for the banking sector wherein the COVID-19 pandemic has been an accelerating factor in the rapid shift towards the digitalization of banking operations (Khan, 2022). Based on the results, banks can improve the effectiveness of marketing strategies in the field of IB by considering these cultural dimensions to attract and retain more IB users and offer personalized services. We cite this implication for two reasons. First, banks frequently act as multinational companies that operate in different countries with various cultures. Second, within the same country, where a bank can operate, societies are becoming increasingly multicultural. In this manner, considering cultural differences is important in terms of enabling bank managers to better design the strategies required to increase IB use in both cases. Therefore, banking entities should design and introduce the experience of IB according to the preferences and cultural orientation of users. For example, the fact that IVR positively influences the use of the IB, especially for men, should urge bank managers to consider the introduction of other enjoyable elements on their websites and applications to customers from cultures where this value is more relevant (Khan, 2022; Khan et al., 2022).

Moreover, one of the risks currently affecting IB customers is the threat posed by cybercrime, as highlighted by the latest report from Banking Banana Skins (Innovation, 2021) which places this risk first in the ranking and may discourage the use of this type of banking. In this regard, the current results demonstrate that in cultures that display high levels of uncertainty avoidance, using certain protective measures can moderate the negative effect of uncertainty. Therefore, financial institutions should insist that clients use protective measures and improve their web security system simultaneously to increase customers' perception of security in the use of IB. Indeed, several studies highlight the need to regularly change passwords as one measure, among others, to strengthen authentication and ensure the safety of operations with financial services (Ali, 2019; Shimna M.S & Sangeetha P.S., 2013)[12].

Limitations and future research

The main limitation of the study is that we were unable to obtain data during the post-COVID-19 period given that the previous Special Eurobarometer 499 survey was conducted in 2019, which was employed by the study. Thus, it stands to reason that the establishment of confinement and social isolation measures has led to an increase in the use of online financial services. According to data on the use of online banking published by Eurostat, EU countries experienced an average growth of 3 percentage points from 59% in 2019 to 62% in 2020. All countries displayed an increase in this percentage, except for Estonia and the Netherlands, which ranged from −2% in the Netherlands to 7% in Spain. Thus, the differences that existed among countries in 2019 have been

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[12]For a recent review of studies analysing the safety of IB clients in the last few years, see Sundaram et al. (2019).

maintained. Therefore, we posit that the results obtained are valid for the post-COVID-19 period[13]. Alternatively, a relevant variable that could explain the use of IB is financial literacy. However, none of the surveys that provide information on financial literacy (e.g., OECD/INFE International Survey of Adult Financial Literacy Competencies) includes the use of online banking, and, conversely, the surveys that include the use of online banking (e.g., Household Finance and Consumption Survey) do not provide information on financial literacy.

Lastly, as extensions of the current study, the possible moderating effect of age, level of education, employment status or income level is worth considering. In this sense, age is also important given the increased resistance levels observed in older adults due to their lower capacity to adapt to technological changes, which is, in turn, partially due to their mistrust of security.

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[13]Numerous studies have analysed the incidence of COVID-19 in online banking, although practically all of them refer to Asian and developing countries. Among the few works referring to Europe are (Carbó-Valverde et al., 2021), (Branzoli et al., 2021) and (Anysiadou et al., 2021).

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Table A1. Sample, IB users and cultural dimensions by country

	Country	Freq.	%	% IB users	% IB women users	% IB men users	UAI	IDV	MAS	PDI	LTO	IVR	MAT	EMB	HIE
1.	Austria	752	3.91	72.60	71.76	73.70	73	55	79	11	60	63	3.92	3.11	1.75
2.	Belgium	796	4.13	78.01	80.10	75.99	94	75	54	65	82	57	3.84	3.25	1.69
3.	Bulgaria	621	3.23	22.38	22.54	22.18	85	30	40	70	69	16	4.02	3.87	2.68
4.	Croatia	810	4.21	42.34	42.13	42.62	80	33	40	70	58	33	4.05	4.00	2.55
5.	Czech Rep.	785	4.08	64.71	62.33	67.98	74	58	57	57	70	29	3.75	3.59	2.22
6.	Denmark	796	4.13	94.59	96.08	93.04	23	74	16	19	35	70	3.91	3.19	1.86
7.	Estonia	687	3.57	83.98	85.55	81.40	60	60	30	40	82	16	3.79	3.81	2.04
8.	Finland	773	4.01	92.75	94.92	90.50	59	63	26	33	38	57	3.66	3.37	1.80
9	France	776	4.03	67.34	69.93	64.58	86	71	43	68	63	48	3.72	3.20	2.21
10.	Germany	1090	5.66	60.17	60.15	61.29	65	67	66	35	83	40	3.93	3.10	1.82
11.	Greece	667	3.46	38.83	32.62	44.84	100	35	57	60	45	50	4.25	3.41	1.83
12.	Hungary	739	3.84	35.99	33.11	40.41	82	80	88	46	58	31	3.73	3.60	1.94
13.	Ireland	743	3.86	68.77	68.87	68.66	35	70	68	28	24	65	4.04	3.41	2.09
14.	Italy	707	3.67	48.79	45.50	52.35	75	76	70	50	61	30	3.81	3.46	1.60
15.	Latvia	677	3.52	80.65	83.41	75.32	63	70	9	44	69	13	3.75	3.83	1.80
16.	Lithuania	573	2.98	71.55	72.50	69.95	65	60	19	42	82	16	-	-	-
17	Luxembourg	407	2.11	78.13	75.37	80.88	70	60	50	40	64	56	-	-	-
18.	Malta	287	1.49	43.55	37.28	52.54	96	59	47	56	47	66	-	-	-
19.	Netherlands	923	4.79	91.87	90.89	93.12	53	80	14	38	67	68	3.97	3.19	1.91
20.	Poland	637	3.31	63.26	61.58	65.76	93	60	64	68	38	29	3.84	3.86	2.51
21.	Portugal	571	2.97	42.55	39.88	46.38	99	27	31	63	28	33	4.11	3.43	1.89
22.	Romania	685	3.56	13.57	11.54	16.27	90	30	42	90	52	20	4.06	3.78	2.00
23.	Slovakia	604	3.14	61.09	63.96	56.60	51	52	100	100	77	28	3.83	3.82	2.00
24.	Slovenia	684	3.55	45.17	45.48	44.83	88	27	19	71	49	48	3.71	3.71	1.62
25.	Spain	721	3.74	51.45	47.54	55.49	86	51	42	57	48	44	3.8	3.31	1.84
26.	Sweden	943	4.9	92.89	91.87	93.85	29	71	5	31	53	78	3.81	3.12	1.83
27.	U. Kingdom	801	4.16	66.41	65.95	66.93	35	89	66	35	51	69	4.01	3.34	2.33
	Mean	19,255	100	61.57	62.12	63.59	71	59	46	51	58	43	3.89	3.49	1.99
	Chi2 (K-W)			3,801[***]	2,300[***]	1,548[***]	19,136[***]	19,125[***]	19,189[***]	19,154[***]	19,185[***]	19,183[***]	17,929[***]	17,932[***]	17,935[***]

IB: Internet banking; UAI Uncertainty Avoidance Index, IDV: Individualism vs collectivism, MAS: Masculinity vs Femininity, PDI: Power Distance Index; LTO: Long Term Orientation vs Short Term normative orientation, IVR: Indulgence vs Restraint. MAT: Mastery; EMB: Embeddedness, HIE: Hierarchy. K-W: Kruskal-Wallis. [***] significant at 0.01%

Source; own elaboration from Special Eurobarometer 499 (2019), Hofstede Insights and Schwartz (2008)

Table A2. Correlation matrix and Variance Inflation Factor (VIF)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
VIF		2.03	2.16	1.23	2.07	1.46	1.96	1.07	1.04	1.12	1.35	2.07	1.14	1.26	1.06	1.34	1.80	1.23
1. IB	1																	
2. UAI	-0.29***	1																
3. IDV	0.28***	-0.56***	1															
4. MAS	-0.17***	0.21***	0.09***	1														
5. PDI	-0.28***	0.62***	-0.56***	0.17***	1													
6. LTO	0.03***	0.11***	0.15***	0.13***	0.10***	1												
7. IVR	0.23***	-0.49***	0.42***	-0.53***	-0.13***	-0.39***	1											
8. Password	0.33***	-0.09***	0.12***	-0.13***	-0.00	0.05***	0.05***	1										
9. Women	-0.01***	0.01	-0.01	0.02***	0.00	0.01**	-0.06***	-0.03***	1									
10. Age15_24	-0.02***	0.03***	-0.02***	0.04***	0.04***	-0.00	-0.03***	-0.00	-0.00	1								
11. Age45_64	-0.04***	0.04***	-0.03***	0.03***	0.02***	0.02***	-0.04***	-0.02***	0.01**	-0.17***	1							
12. Age>=65	-0.00	-0.19***	0.17***	-0.17***	-0.15***	-0.00	0.19***	-0.05***	-0.04***	-0.10***	-0.42***	1						
13. Sec. studies	-0.16***	0.05***	-0.01**	-0.02***	0.05***	-0.06***	0.03***	-0.08***	-0.00	-0.01***	0.00	0.13***	1					
14. Hig. studies	0.26***	-0.16***	0.10***	-0.13***	-0.19***	-0.04***	0.14***	0.11***	-0.02***	-0.08***	-0.06***	0.01***	-0.26***	1				
15. Married/P.	0.01	0.03***	-0.03***	0.02***	0.05***	-0.03***	-0.02***	0.02***	-0.04***	-0.13***	0.06***	-0.09***	-0.01**	0.02***	1			
16. Selfempl.	0.06***	0.04***	-0.05***	0.03***	0.02***	-0.01**	-0.03***	0.04***	-0.10***	-0.03***	0.06***	-0.09***	-0.04***	0.05***	0.03***	1		
17. Employed	0.06***	0.07***	-0.09***	0.08***	0.07***	0.01**	-0.12***	0.05***	-0.00	0.05***	0.12***	-0.51***	-0.12***	0.04***	0.07***	-0.33***	1	
18. Med. Inc.	0.08***	0.00	0.00	0.01**	-0.00	0.06***	0.00	0.03***	0.02***	-0.01	-0.02***	0.02***	-0.09***	0.12***	0.06***	0.01**	0.02***	1
19. Higher Inc.	0.14***	-0.11***	0.09***	-0.09***	-0.11***	0.02	0.12***	0.06***	-0.04***	-0.00	-0.00	0.03***	-0.07***	0.21***	0.06***	0.07***	-0.01*	-0.33***

IB: Internet banking; UAI Uncertainty Avoidance Index, IDV: Individualism vs collectivism, MAS: Masculinity vs Feminity, PDI: Power Distance Index; LTO: Long Term Orientation vs Short Term normative orientation, IVR: Indulgence vs Restraint. Med.Inc.: medium Inccome. VIF highest income: 1.29.