UNDERSTANDING SHIFTS IN POLISH CONSUMERS' SHOPPING BEHAVIOR BEFORE, DURING, AND AFTER THE COVID-19 PANDEMIC

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ABSTRACT

During the COVID-19 pandemic, one of the most prominent shifts in consumer behavior was the growth in online shopping. This study examined Polish consumers' shopping behavior before, during, and after the pandemic, focusing in particular on (1) the extent to which preexisting trends in online shopping continued, were modified, or were abandoned and (2) the change in the proportion of online and offline shopping before and after the pandemic. The key factors influencing these changes were identified by applying the extended unified theory of acceptance and use of technology (UTAUT2), supplemented with trust/risk and sociodemographic variables as moderating factors. Data were collected through computer-assisted telephone interviews in May and June 2022 ($N = 1010$). The results of the logistic regression analysis confirmed that the modified UTAUT2 model explains the differences in Polish consumers' shopping behaviors. Performance expectancy and social influence positively influenced the propensity for online shopping, and adding interaction effects to the models demonstrated that sociodemographic factors moderated the positive impact of facilitating conditions and hedonic motivation. The trust/risk factor negatively influenced the respondents' propensity for online shopping, and only age, gender, place of residence, and car usage were significant factors influencing this propensity directly or through moderating effects.

Keywords: Online shopping; COVID-19; UTAUT2; Trust; Risk

1. Introduction

Since early 2020, the COVID-19 pandemic has had a profound and far-reaching impact, and it became clear during the initial stages of the COVID-19 outbreak that a sustained and proactive approach to minimize transmission and protect vulnerable populations would be necessary. As of June 2023, the total number of confirmed COVID-19 cases had reached 768 million worldwide, with nearly 7 million lives lost due to the disease (OECD, 2023). In Europe, the burden imposed by COVID-19 has been extensive, with a devastating death toll of 2.2 million and 277 million confirmed cases. In response, many governments implemented unprecedented public health policies and mandated nonpharmaceutical interventions, leading to significant disruptions in various sectors of the economy, including the retail industry. The implemented safety measures included nationwide lockdowns, which often required the closure of 'non-essential' retail stores, limiting the availability of goods and forcing consumers to purchase certain goods online. In addition, sanitary restrictions made traditional shopping in brick-and-mortar stores more difficult and time-consuming, increasing the appeal of online retailers.

The most prominent and dynamic shift in consumer behavior during the COVID-19 pandemic was the substantial growth in online sales, which, compared to the pre-pandemic period, effectively doubled in many Western economies.

Two primary factors drove this transformation: customers' concerns regarding the health risks associated with in-person shopping (Eger et al., 2021; Lu et al., 2022), and the limited availability of nonessential goods, most of which were only accessible through online platforms (Hanif et al., 2022). The transition from offline to online shopping became a global phenomenon, with online platforms such as Amazon becoming the primary means for purchasing nonessential goods during lockdown periods.

The COVID-19 pandemic triggered other prominent changes in consumer behavior. The initial fear-driven practices adopted during the early stages of the pandemic were short-lived, with an example of such behavior being "panic buying" in the grocery retail industry, which resulted in shortages of basic products such as canned foods, rice, pasta, and toilet paper (Cooper and Gordon, 2021). Purchasing frequency (Rose et al., 2023) and the composition of shopping baskets also changed during the lockdowns, with masks, sanitizers, and home office equipment becoming new priorities (Kawasaki et al., 2022; Yuan et al., 2021). Another short-term impact on physical retailing across the Western world, which was linked to the closure of nonessential stores and the new norm of working from home, was a significant drop in footfall on high streets, at shopping centers, and in retail parks. These rates have, however, returned to about 85% of pre-pandemic levels following the relaxation of lockdown restrictions, and this rebound can be attributed to the emergence of two predominant consumer reactions: On the one hand, certain customers sought to compensate for lost time and engaged in increased shopping activities, leading to queues outside popular stores, and on the other hand, some customers exhibited apprehension regarding potential infection risks and refrained from visiting nonessential establishments.

Importantly, a number of additional and longer-lasting changes in consumer behavior have persisted, driven by disruptions in global supply chains and working patterns. The limited availability of goods and services due to supply chain issues has further reinforced the inclination toward online shopping (Cappelli and Cini, 2020). The pandemic changed the way many people organize their time; many people now have reduced physical mobility, and their intra-family responsibilities have changed. In turn, these changes have also influenced the decision-making processes of individuals, as well as the channels through which they engage in shopping activities (Hashem, 2020). Researchers have found that in response to these shifting circumstances, consumers not only have adapted to online shopping but also have improved their skills in navigating and utilizing online platforms. Consequently, their motivations and preferences regarding different shopping channels have undergone significant transformations (Ngoh and Groening, 2022).

In our study, we focused on the case of Poland, which experienced one of the highest excess mortality rates in Europe, with a loss of approximately 120,000 lives and 6.5 million confirmed cases. The Polish government's initial response to the pandemic was similar to that of other Western European countries and included implementing lockdown measures. In the first wave, which lasted from 13 March to 4 May 2020, all nonessential stores, restaurants, and services were required to close, with certain restrictions persisting until the end of May 2020. During the second wave, restrictions were initially implemented regionally but were expanded to nationwide lockdown measures from October 2020 to mid-January 2021. Most physical stores were closed during these periods, including all shopping centers and large stores, with the exception of super- or hypermarkets, pharmacies, and drugstores, compelling consumers to adjust their shopping behavior.

The Polish case of pandemic-related changes in shopping behaviors is particularly interesting for several reasons. First, the country had high numbers of COVID-19 cases and deaths relative to other European nations and experienced underplanned and often chaotic restrictions. Therefore, Polish consumers faced not only limited access to physical stores but also significant uncertainty, which may have encouraged them to shop online. Second, Poland had a solid e-commerce sector before the pandemic, although it was less developed than the forerunners of e-commerce, such as the UK and the Netherlands. The number of online shopping stores and platforms was therefore relatively large, and consumers, even if they did not personally use this form of shopping, were aware of the existence of online shopping options as well as national online payment systems (Świecka et al., 2021). Third, according to 2022 data from LastMileExperts, the online shopping infrastructure of automated parcel lockers in Poland is the third-densest network in Europe (after Denmark and Finland), with almost nine parcel lockers per 10,000 inhabitants (parcelandpostaltechnology.com, 2022). The Polish population has exhibited a strong willingness to shop online, especially during the pandemic, as it allowed for the collection of goods ordered online without direct interaction with other people (Czerwinska et al., 2023).

Despite the profound changes in shopping practices caused by the pandemic, the evidence regarding factors driving consumer behavior changes in Poland is rather sparse, with a particular dearth of studies focusing on the post-pandemic period. Some research has examined the differences in shopping behavior between various demographic groups (Buraczynska et al., 2022), but few researchers, if any, have investigated the factors influencing these changes or the spatial variation of these factors. Although numerous papers have explored changes in shopping behavior during the COVID-19 pandemic, the shift toward online shopping in particular, the extent to which these changes are likely

to continue or revert to pre-pandemic conditions remains understudied (Alcedo et al., 2022; Roggeveen and Sethuraman, 2020; Salon et al., 2021; Salvietti et al., 2022). Further, several studies that have investigated this issue predominantly relied on consumers' declarations about their post-pandemic plans regarding shopping behavior rather than their actual practices (Gomes and Lopes, 2022; Hansson et al., 2022; Javadinasr et al., 2022; Meister et al., 2023; Svatosova, 2022; Zielke et al., 2023). This study aimed to fill these research gaps by examining the long-term effects of the pandemic on shopping behavior rather than the immediate shifts. The pandemic's influence on shopping behavior is well-documented; however, most of the relevant studies were conducted during the pandemic, when lockdowns and/or other restrictions were in place, and they captured immediate changes in consumer behavior as a reaction to the new pandemic situation.[1] In contrast, our research provides evidence of more enduring and long-term changes that have continued to shape consumer choices even after pandemic-related restrictions were lifted (i.e., when the direct cause of the observed changes had disappeared). In conducting this study, we contribute to the line of research on post-pandemic shopping behavior changes (Ghodsi et al., 2022; Higueras-Castillo et al., 2023; Kumar et al., 2023, 2024; Tran et al., 2023), also described as a "long-term" effect (Foltynova and Bruha, 2024; Gupta and Mukherjee, 2022; Javadinasr et al., 2022).

By using information on actual shopping practices, not solely intended ones, we also aim to identify factors affecting the durability of behavioral changes. The influence of the COVID-19 pandemic was measured indirectly by examining changes in consumer engagement in online shopping before, during, and after the pandemic and by assessing changes in the relative proportion of online shopping in the shopping channel mix before and after the pandemic (i.e., the shift in consumers' propensity for online shopping).[2]

The primary focus of this study is to examine changes in the propensity for online shopping across four major product categories (dry packaged food, hygiene articles and household chemicals, household appliances, and clothing) before and after the pandemic. These categories are in accord with the classifications used by the Polish Central Statistical Office (GUS) and are representative of the most popular product categories bought online in Poland before the pandemic (clothes, household, appliances) and those that were identified as especially popular during the pandemic (dry packaged food, hygiene articles and household chemicals, clothes; based on GUS data).

We apply the extended unified theory of acceptance and use of technology (UTAUT2) model, supplemented by an additional construct influencing consumer behavior, namely trust/risk, to identify and verify key factors influencing shopping behavior changes. Furthermore, we incorporate several additional moderating factors into the analysis based on previous research findings, such as place of residence, presence of children under 18 years of age, car usage, and education (Gao et al., 2020; Saphores and Xu, 2020; Shi et al., 2019). Modifying the UTAUT2 model by adding new antecedent and/or moderating variables is a common approach that enables researchers to generate new knowledge and improve the explanatory power of the model (Amalia, 2019; Gupta et al., 2022; Putri, 2018; Schmitz et al., 2022).

The remainder of this paper proceeds as follows. The next section provides information on online shopping in Poland before and during the pandemic. The third section presents a literature review covering the factors that influence online shopping propensity and the UTAUT2, and we also present our research hypotheses. The fourth section describes the research methodology, sample, and data collection, and the fifth section presents the results of the analysis. Finally, the paper ends with a discussion of the results and a conclusion.

2. Online Shopping in Poland

With over 38 million inhabitants, Poland is one of the largest and fastest-growing e-commerce markets in Europe, with a predicted revenue of 15,173 million euros and an annual growth of around 10% in 2023 (ecommercedb.com). In 2022, the share of individuals who had made online purchases within the last 12 months was still below the European Union (EU) average (according to Eurostat), but the distance between Poland and the EU average has consistently been narrowing. According to a 2020 survey (before the pandemic), 47% of Poles had made an online purchase within the last three months, compared to the EU average of 54%; two years later, this number had increased to 51% (versus the EU average of 56%). Figure 1 presents data from the GUS regarding online shopping engagement by Polish consumers in different demographic groups prior to the pandemic (2019) and in the post-pandemic period (2022).

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[1] 56 out of 64 articles analyzing the impact of the COVID-19 pandemic on consumer shopping behavior (presented in Table 1) used data collected during the pandemic (2020 and/or 2021) to identify purchasing behaviors modified by the pandemic.

[2] Although the respondents were not directly asked whether changes in their shopping behaviors were associated with or caused by the pandemic (we assumed that they would not be able to objectively assess the reasons for the changes in their purchasing behavior), we performed statistical analyses, and based on statistically significant results, we drew conclusions on the influence of the pandemic.
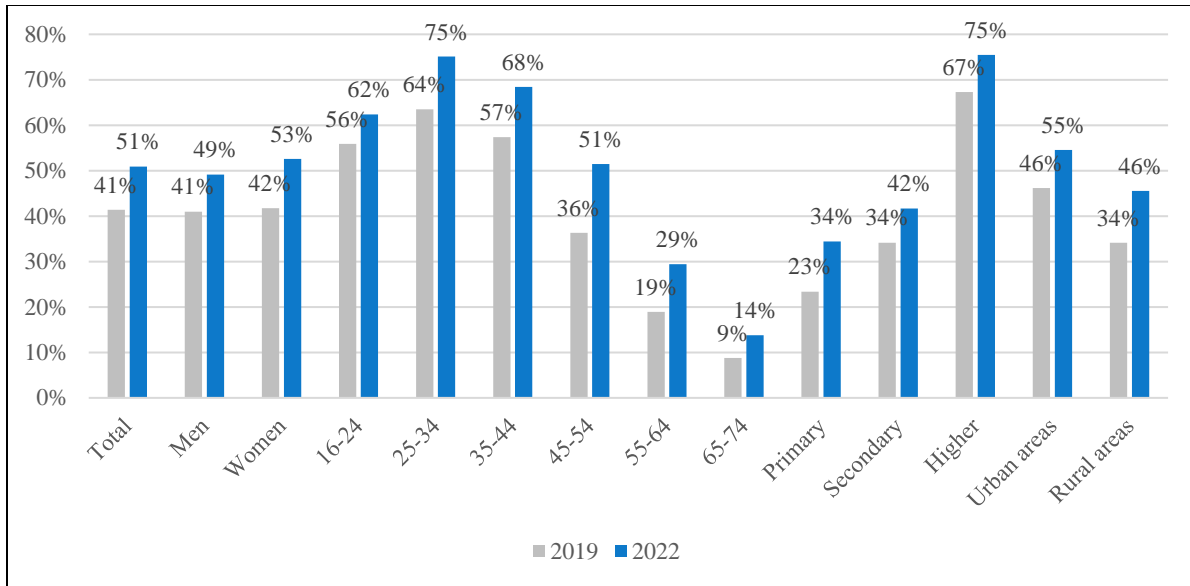
Figure 1: Share of Individuals Who Reported Making at Least One Online Purchase Within Last Three Months (% of Population Aged 16–74; Source: Own Elaboration Based on GUS Data)

Regarding online shopping behaviors, the pandemic's primary effect on Polish consumers was a change in their frequency of online shopping. 60% of Poles surveyed by Waliszewski and Warchlewska (2021; $N = 994$) declared that after the onset of the pandemic, they were buying items online more often. However, only 1% of Polish consumers made their first online purchase during the pandemic (KPMG, 2020; $N = 1,001$).

3. Literature Review and Research Hypotheses

In this section, we review the literature on changes in consumer online shopping behavior before and during the pandemic. This is followed by a presentation of the UTAUT2 and previous research on online shopping that has used the UTAUT2 as a theoretical framework. The section ends by presenting our research hypotheses, which were formulated based on the literature review.

3.1. Factors Influencing Propensity for Online Shopping

The phenomenon of online shopping and the factors influencing its adoption and spread have been analyzed by researchers for the past 25 years. Typically, the influencing factors have been related to consumers' sociodemographic and economic characteristics, such as age, gender, education, income, and family structure (Arce-Urriza and Cebollada, 2010; Crocco et al., 2013; Hjorthol and Gripsurd, 2009; Jaller and Pahwa, 2020; Park et al., 2021; Sanchez-Torres et al., 2017), as well as geographical attributes such as place of residence or spatial mobility linked to car ownership (De Keyser et al., 2015; Shi et al., 2019; Valentini et al., 2011; Wang et al., 2014). Therefore, we used these factors in our research as explanatory variables.

From the geographical perspective, having limited access to physical stores, which might be expected in more rural and remote communities, positively influences one's propensity for online shopping (Melis et al., 2016; Ren and Kwan, 2009; Zhiqun et al., 2009); however, populations living in urban areas might be more open to innovation (Cao et al., 2013; Dannenberg et al., 2020; Farag et al., 2006; Jaller and Pahwa, 2020; Park et al., 2021). These differences were described by Anderson et al. (2003), who proposed two hypotheses. First, according to the efficiency hypothesis, rural areas are more likely to adopt e-commerce because it compensates for low accessibility to physical stores. Based on the innovation-diffusion hypothesis, however, urban populations are more open to new technologies and thus should adopt e-commerce more quickly. Therefore, incorporating the place of residence (defined as rural or urban) in modeling is important for developing this discussion, particularly from the perspective of the longer-term impact of the COVID-19 pandemic.

Another essential aspect of online shopping research is to understand how consumers integrate different shopping channels, such as brick-and-mortar shopping and online (and recently mobile) purchases. In the marketing domain, this topic has developed into omnichannel and multichannel research (De Keyser et al., 2015; Kondo and Okubo, 2022; Konus et al., 2008; Sands et al., 2016; Thaichon et al., 2022). In addition, various geographical analyses have considered this issue, since the use of offline and online shopping channels is associated with different, often complementary, spatial behaviors and may have various spatial consequences (Le et al., 2022; Ozbilen et al., 2021;

Rai, 2021; Shi et al., 2019). Thus, the non-dichotomous nature of preferred forms of shopping needs to be considered, with this consideration not only including exclusively online or offline shoppers but also several mixed categories of consumers who engage in varying proportions of both forms of shopping.

The COVID-19 pandemic has generated a fresh surge of research on online shopping, as it was anticipated that the new, unusual circumstances would significantly propel the growth of online shopping in terms of both its range (the number of consumers purchasing online) and intensity (the frequency of online shopping). Many studies have investigated offline/online shopping behaviors during COVID-19 across the world (Table 1). These studies have yielded compelling evidence supporting the growth of online shopping, including higher numbers of online purchases by both experienced and new online shoppers (Gruntkowski and Martinez, 2022; Javadinasr et al., 2022; Park et al., 2021; Young et al., 2022) and higher spending per transaction (Rose et al., 2023). However, this growth has not been uniform among consumers. Some consumers, despite having modest pre-pandemic experience with online shopping, quickly engaged with it during the pandemic, whereas others continued to shop in physical stores (Bogevska et al., 2022; Islam et al., 2021; Luo et al., 2023).

Table 1: Geographical Distribution of Online Shopping Research During COVID-19 Pandemic

Country	Research on online shopping during the pandemic
Belgium	Beckers et al., 2021
Canada	Dianat et al., 2022; Nielsen et al., 2022; Thomas-Francois et al., 2023
China	Akar, 2021; Chmielarz et al., 2022; Gao et al., 2020; He and Pan, 2022; Li et al., 2020; Lu et al., 2022
Czech Rep.	Bartok et al., 2021; Eger et al., 2021; Foltynova and Bruha, 2024; Svatosova, 2022
Germany	Brüggemann and Olbrich, 2022; Gruntkowski and Martinez, 2022; Koch et al., 2020
Greece	Mouratidis and Papagiannakis, 2021
India	Al-Hattami, 2021; Gupta and Mukherjee, 2022; Habib and Hamadneh, 2021; Kumar et al., 2023, 2024; Rout et al., 2022
Italy	Andruetto et al., 2023; Alaimo et al., 2020; Fanelli, 2021
Iran	Ghodsi et al., 2022
Japan	Kawasaki et al., 2022; Yabe et al., 2021
Korea	Moon et al., 2021
Lebanon	Boustani et al., 2022
Netherlands	Baarsma and Groenewegen, 2021
Pakistan	Shahzad et al., 2022; Sheikh et al., 2023
Poland	Buraczyńska et al., 2022; Chmielarz et al., 2022; Grzywińska-Rąpca, 2022; Jasińska-Biliczak, 2022; Kusz et al., 2023 Waliszewski and Warchlewska, 2021
Portugal	Gomes and Lopes, 2022; Higueras-Castillo et al., 2023
Spain	Higueras-Castillo et al., 2023
Sweden	Andruetto et al., 2023; Fuentes et al., 2022; Hansson et al., 2022

Switzerland	Meister et al., 2023
Turkey	Akar, 2021; Arslan and Turan, 2022; Chmielarz et al., 2022
UK	Boyle et al., 2022; Ogundijo and Onarinde, 2021
USA	Adibfar et al., 2022; Chenarides et al., 2021; Duffy et al., 2022; Ellison et al., 2022; Javadinasr et al., 2022; Jensen et al., 2021; Luo et al., 2023; Ngoh and Groening, 2022; Park et al., 2021; Rose et al., 2023; Shen et al., 2022; Truong and Truong, 2022; Youn et al., 2022; Young et al., 2022
Vietnam	Nguyen et al., 2021; Tran et al., 2023

Importantly, several studies have indicated that the factors affecting the propensity for online shopping during the pandemic remained similar to those before the pandemic. A greater inclination toward online shopping was exhibited by a younger, more highly educated population with higher incomes, as well as by people with children (Adibfar et al., 2022; Beckers et al., 2021; Duffy et al., 2022; Ellison et al., 2022; Gao et al., 2020; Gomes and Lopes, 2022; Javadinasr et al., 2022; Jensen et al., 2021; Kawasaki et al., 2022; Shahzad et al., 2022; Young et al., 2022). The influence of gender has remained unclear, with some studies providing evidence that women are more likely to engage in online shopping (Buraczyńska et al., 2022; Kawasaki et al., 2022; Nguyen et al., 2021; Shakibaei et al., 2021; Shen et al., 2022; Truong and Truong, 2022; Young et al., 2022) and others highlighting men's increased propensity for online shopping (Adibfar et al., 2022; Gomes and Lopes, 2022). Similarly, the results for car ownership have been inconclusive, with some studies finding those with a car to be more inclined toward online shopping (Shen et al., 2022) and others finding a similar inclination among those without a car (Javadinasr et al., 2022).

Nevertheless, research on online shopping behavior during the COVID-19 pandemic revealed an important new factor that influenced consumers' inclination to make online purchases: brick-and-mortar shopping during the pandemic was associated with a higher risk of infection. Thus, pandemic-related health concerns and compliance with social distancing and other protective measures increased the propensity to shop online, which represented a less dangerous option involving no social interactions or close proximity to other people (Akar, 2021; Fihartini et al., 2021; Ghodsi et al., 2022; Javadinasr et al., 2022; Jensen et al., 2021; Moon et al., 2021; Prasad and Srivastava, 2021). This relationship might partially explain why the innovation-diffusion hypothesis, suggesting that those who live in urban areas are more open to new technologies and thus shop online more often (Anderson et al., 2003), was supported in most of the research on this topic conducted during the pandemic. In more densely populated urban areas, the risk of infection during physical shopping was higher than in smaller towns and rural areas. Therefore, apart from greater openness to innovations and new technologies, the fear of infection while shopping in physical stores also enhanced the prevalence of online shopping in cities. Empirical data, which demonstrated that consumers living in urban areas were more inclined toward online shopping during the pandemic, could be perceived as supportive of the innovation-diffusion hypothesis (Andruetto et al., 2023; Baarsma and Groenewegen, 2021; Beckers et al., 2021; Gao et al., 2020; Park et al., 2021; Shahzad et al., 2022).

Despite the extensive literature on changes in shopping behavior during the pandemic as well as the factors that influenced such shifts, research on the durability of the identified changes under post-pandemic conditions, including studies taking into account the factors influencing these processes, has remained scarce (Zaban and Plaut, 2024). Importantly, then, the present research also provides the post-pandemic perspective and uses the context of Poland, which aligns with other Central and Eastern European countries that are characterized by specific shopping behaviors that are associated with the legacy of 40 years of centrally planned economies characterized by shortages, more dispersed retail structures, and a lower (although rapidly growing) prevalence of online shopping (Deufel et al., 2019; Zielke et al., 2023). This study can thus serve as a reference for future studies also analyzing the impact of the pandemic on consumers' shopping behaviors in other geographical contexts, not only in Central and Eastern Europe.

3.2 Extended Unified Theory of Acceptance and Use of Technology (UTAUT2)

Researchers investigating changes in consumers' behaviors during the COVID-19 pandemic have used various theoretical models to analyze the factors encouraging online shopping. These include the theory of planned behavior (TPB; Akar, 2021; Ghodsi et al., 2022; Gruntkowski and Martinez, 2022; Li et al., 2020; Moon et al., 2021; Ogundijo et al., 2021; Theodorou et al., 2023; Tran et al., 2023 Youn et al., 2021), the technology acceptance model (TAM; Arslan and Turan, 2022; Rout et al., 2022; Thomas-Francois et al., 2023; Youn et al., 2022), and the protection motivation theory (PMT; Moon et al., 2021; Rout et al., 2022 Youn et al., 2021). In this research, the UTAUT2 was

selected as the theoretical framework and the basis for designing the empirical research rather than the previously mentioned alternatives (the TPB, TAM, and PMT) for several reasons. The most important was that the UTAUT2, proposed by Venkatesh et al. (2012), is an extension of the UTAUT in the consumer behavior context. The model, which was designed by synthesizing, *inter alia*, the TAM and TPB, is thus more suitable for explaining changes in shopping behaviors during and after the pandemic. Importantly, the TPB primarily explains behavioral intentions, which may not always translate into actual behavior, especially in crisis situations, such as a pandemic, when intentions can be rapidly overridden by external factors. Moreover, the pandemic accelerated the formation of new shopping habits, which the TPB does not explicitly account for. This factor—new habits—is a significant element in our research focused on long-term changes in shopping behavior. We also excluded the PMT, which emphasizes perceived threats and coping—while these might be relevant to understanding initial shifts to online shopping, they do not fully capture the complexities of long-term changes. In addition, the PMT focuses on negative motivations and neglects social factors; therefore, it is more suitable for use as a framework for health-related behaviors. Besides, the UTAUT2 model allowed us to add additional factors that have been proven to impact the propensity for shopping online—here, risk and trust as well as moderating variables such as sociodemographic characteristics (Khechine, 2016) were incorporated into the model. Several previous studies have demonstrated that the risk and/or trust factor has a significant impact on the online shopping behavior of Polish consumers (Bylok, 2021; Tul-Krzyszczuk et al., 2024) and that this factor is influenced by sociodemographic characteristics (Sołoma and Wyszyński, 2013). Moreover, since the pandemic conditions affected people with different sociodemographic characteristics (e.g., gender, place of residence, age) in varying ways, we aimed to examine whether these differences would be reflected in changes in purchasing behavior.

The UTAUT2 was designed to conceptualize factors influencing the acceptance and use of new consumer technologies. In addition to the four constructs included in the UTAUT model, three constructs were added to the UTAUT2. The model also assumes three moderating factors that affect behavioral intention, which subsequently determines a consumer's behavior, specifically their use of a new technology (Table 2).

Table 2. UTAUT2 Model (Venkatesh et al., 2003; Venkatesh et al., 2012, pp. 159–161)

Constructs present in UTAUT model	Constructs added in UTAUT2 model	Moderating factors in UTAUT2 model
Performance expectancy: the degree to which using technology will provide benefits to consumers when performing certain activities	Hedonic motivation: the fun or pleasure derived from using a technology	Experience: the opportunity to use a target technology
Effort expectancy: the ease of use associated with a technology	Price value: the cognitive trade-off between the perceived benefits of the applications and the monetary cost of using them	Gender: the consumer's gender
Social influence: the extent to which consumers perceive that important others (e.g., family and friends) believe they should use a particular technology	Habit: the extent to which people tend to perform behaviors automatically because of learning; automaticity	Age: the consumer's age
Facilitating conditions: consumers' perceptions of the resources and support available to perform a behavior		

Finally, we added one more construct to the UTAUT2 model, namely trust/risk, based on the results obtained by Tamilmani et al. (2020), who mentioned trust/risk as one of the key extensions of the UTAUT2. The factors of risk and trust have also been included in several studies using the UTAUT2 (Chen et al., 2021; Human et al., 2020; Pascual-Miguel et al., 2015; Van Droogenbroeck and Van Hove, 2021) and other theoretical frameworks (Al-Hattami, 2021; Bianchi and Andrews, 2012; Dai et al., 2013; Gruntkowski and Martinez, 2022; Habib and Hamadneh, 2021; Pentz et

al., 2020). Based on the results of research discussed earlier (see Section 3.1) we also decided to expand the model with four moderating factors, namely education, car usage, the presence of children under 18 years of age, and place of residence. Previous research has shown that these factors significantly influence the propensity for online shopping, including during the pandemic. Therefore, we aimed to verify whether this influence would also be observed in the Polish context and to determine the direction thereof (positive or negative influence on propensity for shopping online).

The UTAUT2, as well as its later modifications and extensions, appears to be a high-quality and robust theory and has become one of the most commonly used theoretical frameworks for analyzing the adoption of innovations (Tamilmani et al., 2021) including online shopping, with results suggesting that not all of the constructs always significantly influence the behavioral intention to shop online (Table 3).

Table 3: Factors Influencing Behavioral Intention to Online Shop (Not Only During COVID-19 Pandemic)

Performance expectancy	Chen et al., 2021; Erjavec and Manfreda, 2022; Gupta et al., 2022; Jayasingh et al., 2022; Qasem, 2021; Sheikh et al., 2023; Singh et al., 2017; Zhang et al., 2023
Effort expectancy	Gupta et al., 2022; Higueras-Castillo et al., 2023; Jayasingh et al., 2022; Sheikh et al., 2023; Zhang et al., 2023
Social influence	Chen et al., 2021; Gupta et al., 2022; Higueras-Castillo et al., 2023; Jayasingh et al., 2022; Qasem, 2021; Sheikh et al., 2023; Singh et al., 2017; Zhang et al., 2023
Facilitating conditions	Higueras-Castillo et al., 2023; Qasem, 2021; Singh et al., 2017
Hedonic motivation	Gupta et al., 2022; Jayasingh et al., 2022; Qasem, 2021
Price value	Jayasingh et al., 2022; Qasem, 2021; Singh et al., 2017
Perceived trust/risk	Higueras-Castillo et al., 2023; Singh et al., 2017

3.3. Research Hypotheses

Based on the literature review, we formulated the main research hypothesis: (H) The modified UTAUT2 model (supplemented with trust/risk and additional moderating factors) explains how Polish consumers changed their shopping behavior during the pandemic. In addition, we formulated three detailed research hypotheses regarding changes in shopping behaviors between the time before and after the pandemic (thus, the change must have occurred during the pandemic period): (H1) The UTAUT2 constructs of performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit facilitated an increase in the propensity for online shopping during the pandemic. (H2) The trust/risk factor, defined as perceiving online payments as not completely safe, did not facilitate an increase in the propensity for online shopping during the pandemic. (H3) Age, gender, education, place of residence, car usage, and presence of children under 18 years of age had a moderating effect on the influence of the UTAUT2 constructs and trust/risk on the shift in the propensity for online shopping during the pandemic.

4. Data and Methods

4.1. Sample and Data Collection

Data for the analysis were collected in May and June 2022 among Polish consumers by using the computer-assisted telephone interview (CATI) method. A representative sample of 1,010 respondents was selected using random-quota sampling (stratified random sampling) based on randomly selected landline and mobile phone numbers. The database of phone numbers was created based on the number ranges assigned to individual telecommunications operators (landline and mobile) by the Polish Office of Electronic Communications. The quotas reflected the demographic structure of the Polish population aged 16 years and older, taking into account gender, age, education,

and size and region of place of residence (these characteristics were determined at the beginning of the interview). Participation in the survey was voluntary, anonymous and with no compensation.

The CATI method was chosen to ensure the inclusion of consumers who would not have been reachable if the survey had been conducted exclusively online. Online surveys are the most popular method of data collection in research on shopping behavior, as they are low-cost and easy to distribute, making them preferable to telephone interviews for many researchers (Alessi and Martin, 2010). However, when researchers use online surveys, the sample is automatically limited to people who use the Internet rather often, as they have to not only complete the survey but also receive and accept the invitation, which may be distributed through social media or platforms through which respondents are recruited. Furthermore, respondents must be willing to engage in online activity (e.g., they trust that the link they use is safe). As one of the aims of the study was to identify the magnitude of the change in online shopping behavior, it was important to include respondents less familiar with the Internet and even those who do not use it all (and therefore do not shop online). However, the CATI method is not without limitations, one of which might be selection bias. For example, those who engage in telephone interviews may be more willing to accept risk and thus adopt online shopping and payment methods; consequently, the telephone interview approach may potentially exclude individuals with higher risk aversion who refuse to take part in such interviews. The trade-off between obtaining a fully representative sample and the limitations of resources and technical feasibility is an inherent feature of any data collection method in the social sciences.

In a pilot study, the questionnaire was tested on 25 respondents who were asked not only to answer the questions but also to comment on the clarity and intelligibility of the questionnaire. The final version of the questionnaire was prepared based on their responses. The survey consisted of 14 questions: four concerning online and offline shopping behaviors before, during, and after the pandemic; one question regarding the respondent's opinions and attitudes toward online shopping; four questions about additional factors, such as frequency of car and Internet usage, access to online and offline shopping infrastructure, and the presence of children under 18 years of age in the household; and four demographic questions concerning age, gender, education, and place of residence. The respondents were informed that for the purpose of this study "before the pandemic" referred to the period before the first restrictions were introduced by the Polish authorities—specifically, before March 14, 2020; "during the pandemic" referred to the period during the lockdowns, when restrictions on store operations were in force and certain types of stores were closed; and "after the pandemic" referred to the time when the interview was conducted. The demographic characteristics of the respondents are presented in Table 4.

Table 4: Sample Structure

Gender		Location (population in thousands)		Education	
Female	51%	Rural areas	39%	Elementary, junior high, and lower	21%
Male	49%	Urban area up to 20	14%	Basic vocational	24%
Age		Urban area 20–49	11%	Medium	30%
15–24	14%	Urban area 50–99	8%	Higher	25%
25–34	20%	Urban area 100–199	8%		
35–44	20%	Urban area 200–499	9%		
45–59	25%	Urban area above 500	11%		
60+	22%				

4.2. Operationalization of Variables

The UTAUT2 model was supplemented with the trust/risk construct and sociodemographic variables as moderating factors in interaction effects (Table 5). We operationalized the trust/risk factor by combining two constructs used in previous studies: trust (the extent to which a consumer believes that online shopping is safe) and risk (the likelihood of a consumer suffering a loss when purchasing online; Chen et al., 2021). The statement used in

the questionnaire ("I am not sure if online payments are safe") refers to both trust and risk since belief in the security of online payments is directly related to the belief that online shopping is safe (trust) and that the likelihood of (financial) loss during the online shopping process is low (risk). Questions measured with the Likert scale were transformed into binary variables with the answer "definitely agree" coded as 1 and all other responses coded as 0. We selected to code as 1 only the top answer because this solution increased the predictive power of the models. For the same reason, we decided to recode the question about accessibility as 1 for the answer "less than 10 minutes" and 0 for all other answers (10–20 min, 21–30 min, 31–45 min, 45–60 min, and over 60 min).

Table 5: Operationalization of Theoretical Model

Element of the UTAUT2	Survey question	Variable definition	Variable name
Performance expectancy	To what extent do you agree with the statement: Shopping online is more convenient than in brick-and-mortar stores.	"Definitely agree" on the Likert scale (binary)	PE
Effort expectancy	To what extent do you agree with the statement: Online shopping requires more effort than in-store shopping.	"Definitely agree" on the Likert scale (binary)	EE
Social influence	To what extent do you agree with the statement: People in my closest circle (family, friends, acquaintances) recommend that I shop online.	"Definitely agree" on the Likert scale (binary)	SI
Facilitating conditions	Time to get to physical stores (grocery, pharmacy, household appliances, clothes). Time to get to online shopping infrastructure (parcel locker, collection point).	Less than 10 min (binary)	FC_grocery FC_chemist FC_household_appl FC_clothes FC_parcel_locker FC_collection_point
Hedonic motivation	To what extent do you agree with the statement: I enjoy shopping online.	"Definitely agree" on the Likert scale (binary)	HM
Price value	To what extent do you agree with the statement: Online shopping is cheaper than in-store shopping.	"Definitely agree" on the Likert scale (binary)	PV
Habit	How often do you use the Internet?	Every day (binary)	H
Trust/risk	To what extent do you agree with the statement: I am not sure if online payments are safe.	"Definitely agree" on the Likert scale (binary)	TR
Gender	Gender		Gender
Age	Age group		Age
Education	Education level		Education

Car usage	How often do you use a car (as a driver or a passenger)?	At least once a week (binary)	Car_often
		Never (binary)	Car_never
Presence of children under 18 years of age	Do you have children under 18 years of age living with you?	Yes (binary)	Children
Place of residence	Rural/urban area, size of town/city	Large city (popl. over 500,000; binary)	City
		Rural area (binary)	Rural

4.3. Data Analysis

The data were analyzed using PS IMAGO PRO with the IBM SPSS Statistics analytical engine. A logistic regression method was used, with the adoption of a forward stepwise regression model based on the likelihood ratio with interaction effects. Logistic regression models are used with binary dependent variables and allow researchers to determine the factors that affect the probability of the analyzed event taking place. Such models have been used for many analyses of online shopping during the pandemic (Andruetto et al., 2023; Duffy et al., 2022; Lu et al., 2022; Nielsen et al., 2022; Tran et al., 2023; Yabe et al., 2021).

After testing several models, two dependent variables were selected to create models yielding statistically significant results. Each dependent variable was used in two models—one with and one without interaction. In the models without interaction, both UTAUT2 constructs and sociodemographic factors were used as independent variables. This was based on the literature indicating that sociodemographic factors can influence online shopping propensity directly (Alaimo et al., 2020; Bartok et al., 2021; Boustani et al., 2022; Buraczynska et al., 2022; Moon et al., 2021) as well as through the moderating effect (Ezennia and Marimuthu, 2022; Gao et al., 2020; Shaw et al., 2022). When selecting variables for interaction effects, we included all variables, even those for which the main effects were not significant. This approach allows for the identification of so-called crossover/qualitative interactions when the effects within different groups are in opposite directions (VanderWeele, 2015, pp. 279–285).

Including interaction in logistic regression allows for the identification of how a given variable modifies the effect that an independent variable has on the dependent variable. In the first model, the tested event was engaging in online shopping before and during the pandemic—in other words, the impact of the pandemic on the persistence of online shopping behavior. The respondents were asked if they had made online purchases (of any products) before the pandemic, during lockdowns, and after the lockdowns ultimately ended. The answers to these questions were recoded into binary variables that enabled us to categorize the respondents into several different groups (described in detail in Section 5.1). In the second model, the dependent variable was a shift in the propensity for online shopping during the pandemic, as measured by an increase in the value of an online shopping index. The index was derived from participants' responses regarding the proportion of online and offline purchases they made across four product categories before the pandemic and at the time of the survey. Respondents were asked to assess the proportion of shopping they did online and offline as one of five categories (only offline = −2, offline and online but mostly offline = −1, equally offline and online = 0, offline and online but mostly online = 1, and only online = 2) for each of the four different product groups. We decided to adopt a comparative approach (e.g., online more than offline, online equally as offline, etc.) because of the retrospective nature of the question. We assumed that it would be difficult for respondents to assess exactly how often they made online/offline purchases before the pandemic, given that they would be recalling activity from more than two years ago, and that it would be much easier for them to make a comparative assessment. The product groups were defined by adapting the classification used by the GUS (dry packaged food, hygiene articles and household chemicals, audio/video devices/household appliances, and clothes). The index was calculated as an unweighted average of the scores in the four product groups. We decided to use an unweighted mean because using a weighted mean would require obtaining data about the relative importance of all categories, both before and during the pandemic. We assumed that in both periods the importance was not the same and that obtaining such detailed data would not be possible (through surveys or other sources). Further, among the four categories, two groups (food and hygienic/chemical products) include products that are cheap but bought often and thus in large quantities, whereas the two other (clothes, home appliances) categories comprise goods that are more

expensive but bought less frequently. Thus, without detailed data, the assumption of variation in their significance would not be justified.

5. Results

Of the 1,010 respondents, 23.7% reported having no experience with online shopping. Among the remaining 76.3%, a rather positive attitude toward e-commerce prevailed (see Fig. 2). In their attitude toward online purchasing, respondents most appreciated the convenience and price value components: 64.4% agreed (agree + strongly agree) that shopping online is cheaper than shopping in physical stores, and over 61.5% of respondents agreed that online shopping is more convenient. Half of the surveyed consumers admitted that they enjoy shopping online and experience social influence encouraging them to make online purchases.
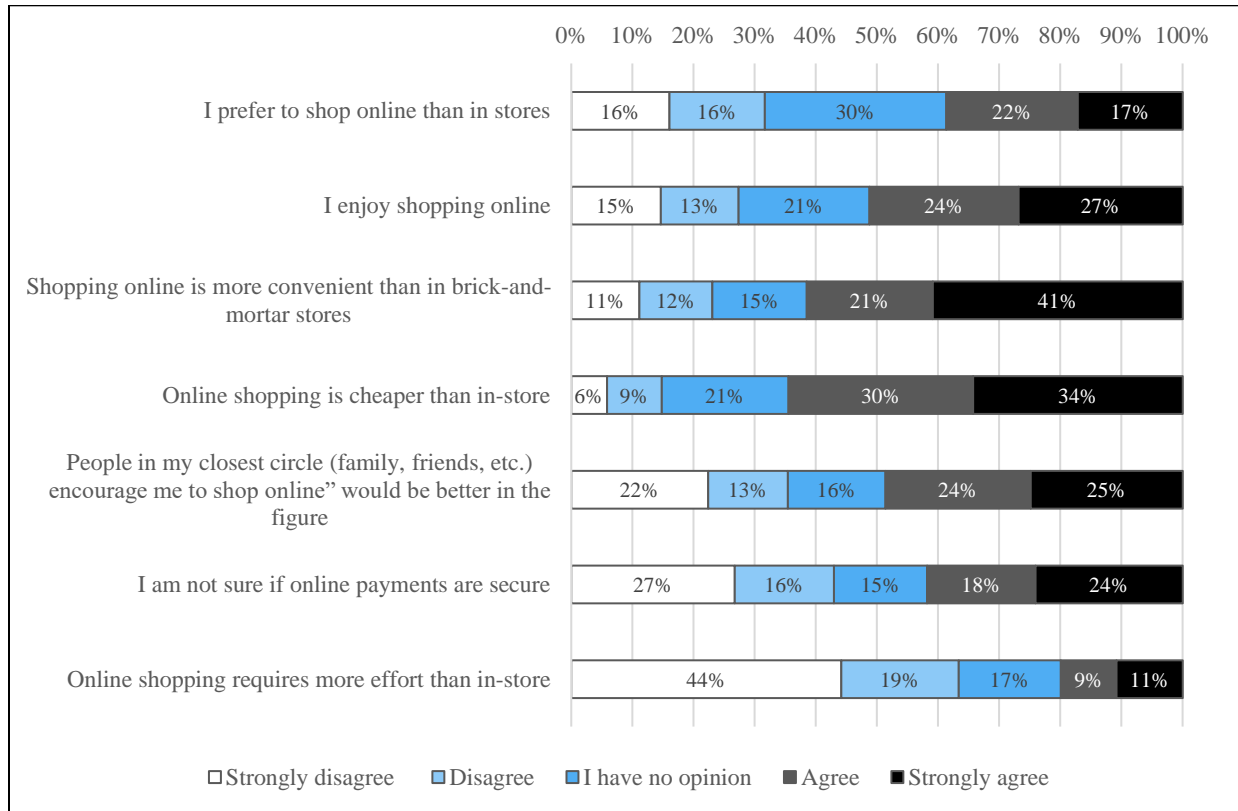

Figure 2: Respondents' Attitudes Toward Online Shopping

Respondents reported having relatively good access to grocery stores and pharmacies but relatively poor access to clothes and electronics stores. Access to online shopping infrastructure, such as parcel lockers and collection points, was also high (see Fig. 3).

5.1. Shopping Channel Changes During Pandemic

Table 6 presents the number of respondents who reported engaging in online shopping before, during, and after the pandemic (regardless of the frequency of doing so). For 12.1% of all respondents, the pandemic changed their shopping behavior in terms of the usage proportion of offline/online channels, with 1.4% of respondents beginning to shop online at the time and 10.7% of respondents stopping their online shopping. For most respondents (84.5%), the pandemic, as well as its end, did not change anything about their engagement in online shopping.
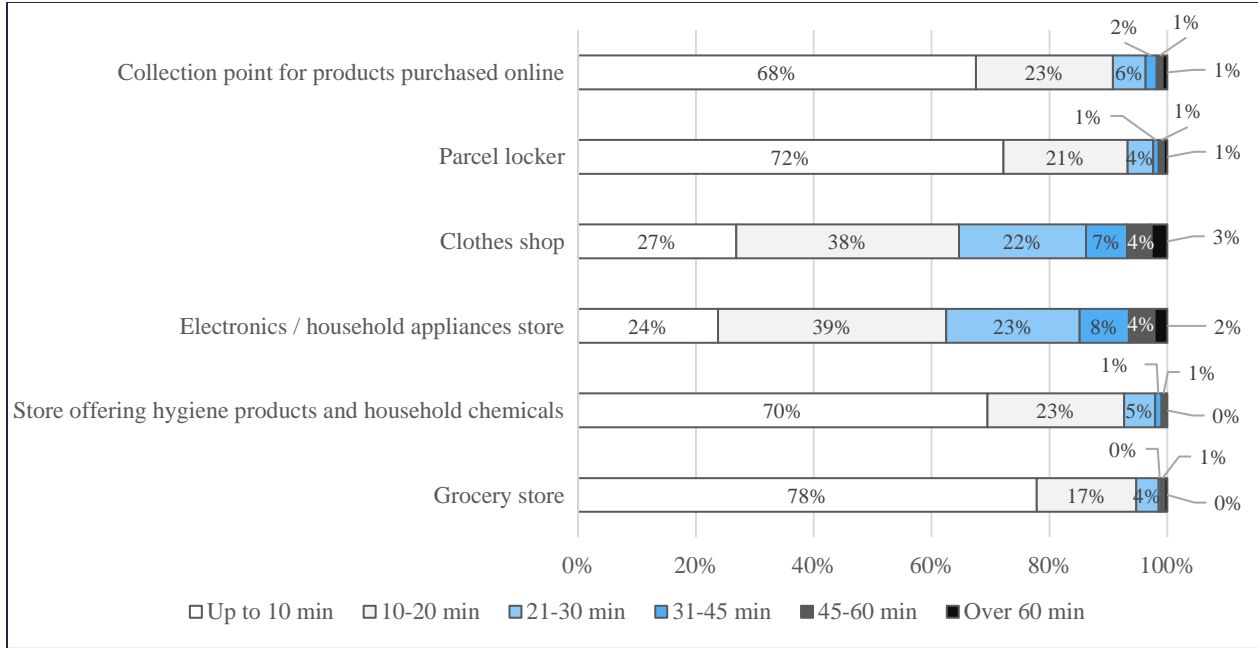
Figure 3: Time Accessibility (How Used Most Often, Even if Different for Each Category) of Shopping Infrastructure

Table 6: Impact of COVID-19 Pandemic on Respondents' Shopping Behavior

Online shopping			*N*	%	Impact of COVID-19 pandemic
Before the pandemic	During the pandemic	After the pandemic			
Yes	Yes	Yes	600	59.4	No influence
No	Yes	Yes	10	1.0	Pandemic triggered a permanent change in shopping behavior toward online
Yes	No	Yes	63	6.2	Pandemic temporarily changed shopping behavior toward offline
Yes	Yes	No	29	2.9	Postpandemic shift toward offline
No	No	Yes	5	0.5	Postpandemic shift toward online
No	Yes	No	4	0.4	Pandemic temporarily changed shopping behavior toward online
Yes	No	No	45	4.5	Pandemic triggered a permanent change in shopping behavior toward offline
No	No	No	254	25.1	No influence

In regard to the different product categories, we observed that shopping in only brick-and-mortar stores was the most popular shopping channel in all categories both before the pandemic and after (Table 7). In addition, for all the analyzed product types, the propensity for online shopping increased during the pandemic.

Table 7: Propensity for Online Shopping During Pandemic in Different Product Categories

Product category	Only offline	Offline and online but mostly offline	Equally in both	Offline and online but mostly online	Only online
Before pandemic					
Dry packaged food	92.4%	4.5%	2.2%	0.5%	0.5%
Hygiene articles and household chemicals	82.6%	5.4%	7.5%	2.4%	2.1%
Household appliances	59.3%	6.8%	14.0%	6.7%	13.2%
Clothes	60.2%	9.0%	17.6%	6.1%	7.0%
AVERAGE	73.6%	6.4%	10.3%	3.9%	5.7%
Now					
Dry packaged food	87.5%	7.0%	3.9%	1.3%	0.3%
Hygiene articles and household chemicals	76.3%	9.0%	9.0%	2.9%	2.8%
Household appliances	52.5%	8.4%	14.7%	9.2%	15.2%
Clothes	51.2%	9.4%	19.8%	8.8%	10.8%
AVERAGE	66.9%	8.5%	11.8%	5.5%	7.3%
Difference					
Dry packaged food	−4.9	2.6	1.7	0.8	−0.2
Hygiene articles and household chemicals	−6.2	3.6	1.5	0.5	0.7
Household appliances	−6.8	1.6	0.7	2.5	2.1
Clothes	−9.0	0.4	2.2	2.7	3.8
AVERAGE	−6.7	2.0	1.5	1.6	1.6

Based on the reported change in the proportion of online and offline shopping across the four product categories, a general index of online shopping was calculated. Subsequently, the respondents were divided into two groups: those for whom the index increased during the pandemic and those for whom it did not. The two groups did not exhibit statistically significant (measured by the chi-square test) differences in terms of gender, place of residence, or access to physical stores (of all analyzed categories). The two groups differed, however, in terms of age and education; younger and more highly educated respondents were overrepresented in the group characterized by an increase in the online shopping index.

5.2. Models 1 and 2: Continuing Online Shopping During Pandemic

Based on the theoretical framework of the UTAUT2, supplemented with trust/risk and including several different sociodemographic variables, we constructed four logistic regression models. In each case, in the first step, all variables were tested for multicollinearity using the variance inflation factor (VIF) to avoid situations in which predictor variables were highly correlated. No multicollinearity was detected. The dependent variable in each model was defined as engaging in online shopping before and during the pandemic (regardless of shopping behavior after the pandemic).

Out of 737 respondents who shopped online before the pandemic, 629 respondents met this condition (so they continued to shop online during the pandemic), and 108 respondents did not (they abandoned online shopping during the pandemic).

The first model (without interaction) explained 10.6% of the variance (Nagelkerke R-squared = 0.106) and had a good fit (Hosmer–Lemeshow goodness-of-fit test: $p = 0.755$). Out of the 20 independent variables included in the model, only four were statistically significant: performance expectancy, trust/risk, age, and not using a car (Table 8).

Table 8 Parameters of Logistic Regression Model 1 (Dichotomous Dependent Variable [DV]: Engaging in Online Shopping Before and During Pandemic or Only Before, No Interaction; $N = 737$)

	B	SE	Wald	df	Sig.	Exp(B)	95% CI for Exp(B)	
Age	−0.185	0.089	4.332	1	0.037	0.831	0.699	0.989
PE	0.95	0.245	15.097	1	<.001	2.586	1.601	4.177
TR	−0.874	0.24	13.248	1	<.001	0.417	0.261	0.668
Car_never	−0.937	0.319	8.636	1	0.003	0.392	0.210	0.732
Constant	2.315	0.305	57.666	1	<.001	10.126		

Regression equation:

Online_shopping_during_pandemic$_{predicted}$ = 2.315 − 0.185*Age + 0.95*PE − 0.874*TR − 0.937*Car_never

The obtained results indicated that only one variable increased the probability of continuing to shop online during the pandemic, whereas three had the opposite effect. For a person who had performance expectancy toward online shopping, the odds of continuing to shop online during the pandemic were 2.6 times greater than those for a person who did not express such an expectation. Rising in age by one age group resulted in a 17% decrease in the odds of continuing to shop online. For those respondents who indicated that they were not sure whether online payments were safe, the odds of continuing to shop online were 58% lower than for those who did not perceive online payments as risky. Finally, for those who never used a car (as a driver or a passenger), the odds of continuing to shop online were 61% lower than for those who used a car often.

The second model was built in the same way as the first, but with additional interaction effects created by combining the UTAUT2 variables and the trust/risk construct with the moderating factors of age, gender, education, car usage, the presence of children under 18 years of age, and place of residence. The model explained 11.8% of the variance (Nagelkerke R-squared = 0.118) and had a good fit (Hosmer–Lemeshow goodness-of-fit test: $p = 0.643$). In the model, no main effect was identified, which means that none of the independent variables in isolation had a significant impact on the dependent variable. When we introduced the interaction effect, the combined effect of both variables became significant, indicating that the variables together have a significant joint effect on the outcome, but each variable in isolation does not. Those who had better access to grocery stores had the highest predicted probability of continuing to shop online, and the difference between this group and others was greater among men (5.7 percentage points) than women (2.7 percentage points). In addition, in regard to trust/risk, the difference between those who did not trust online payments and the remaining respondents was greater among men (21.0 percentage points) than women (8.4 percentage points), while the predicted probability of continuing to shop online was lower among those who were not sure whether online payments are safe. For frequent car users, the predicted probability was significantly higher among those respondents who expressed performance expectancy for online shopping (93.8%) than for those who did not have such an expectation (81.2%); for those respondents who did not use a car frequently, the difference in the mean predicted probability was negligible (80.6% versus 80.2%). Finally, for respondents living in a large city, the predicted probability was lower for those respondents who lived close to the nearest parcel locker than for those respondents who lived farther away from one, whereas for those respondents who did not live in a large city, the probability was higher (Tables 9 and 10).

Table 9: Parameters of Logistic Regression Model 2 (Dichotomous DV: Engaging in Online Shopping Before and During Pandemic or Only Before, With Interaction; $N = 737$)

	B	SE	Wald	df	Sig.	Exp(B)	95% CI for Exp(B)	
Gender*FC_grocery	0.340	0.145	5.496	1	0.019	1.405	1.057	1.866
Gender*TR	−0.679	0.150	20.349	1	<.001	0.507	0.378	0.681
Car_often*PE	1.278	0.295	18.722	1	<.001	3.589	2.012	6.404
City*FC_parcel_locker	−0.751	0.299	6.303	1	0.012	0.472	0.263	0.848
Constant	1.408	0.208	45.733	1	<.001	4.089		

Regression equation:

Online_shopping_during_pandemic$_{predicted}$ = 1.408 + (0.615 + 0.340*FC_grocery)*Gender + (0.615 − 0.679*TR)*Gender + (0.043 + 1.278*PE)*Car_often + (2.440 − 0.751*FC_parcel_locker)*City

Table 10: Mean Predicted Probability for Interaction Effect (DV: Engaging in Online Shopping During Pandemic)

1 = yes, 0 = no	Men	Women
FC_grocery (1)	86.8%	85.0%
FC_grocery (0)	81.1%	82.3%
TR (1)	68.5%	77.9%
TR (0)	89.5%	86.3%
	Car_often (1)	Car_often (0)
PE (1)	93.8%	80.6%
PE (0)	81.2%	80.2%
	Large_city (1)	Large_city (0)
FC_parcel_locker (1)	75.2%	87.0%
FC_parcel_locker (0)	80.6%	84.2%

5.3. Models 3 and 4: Online Shopping Increase

The dependent variable in the third and fourth models was defined as an increase in the value of the online shopping index (regardless of the scale of this growth). Based on this criteria, 277 respondents met the condition of an increase in the online shopping index, whereas 494 respondents did not. The third model (without interaction) explained 9.6% of the variance (Nagelkerke R-squared = 0.096) and had a good fit (Hosmer–Lemeshow goodness-of-fit test: $p = 0.499$). Out of the 20 independent variables included in the model, only five appeared to be significant: performance expectancy, social influence, trust/risk, age, and gender.

Respondents who expressed performance expectancy for online shopping were almost twice as likely to report an increase in the propensity for online shopping during the pandemic than were respondents who did not express such an expectancy. Those respondents who experienced social influence were almost 1.5 times more likely to report an

increase than those respondents who did not. The odds of an increase in the online shopping index for consumers who did not trust online payments were 39% lower than for those respondents who did not perceive such payments as risky. The odds of a man reporting an increase in their propensity for online shopping during the pandemic were 34% lower than for a woman, while for each rising increment in the age category, the odds of an increase in the online shopping index decreased by 21% (Table 11).

Table 11 Parameters of Logistic Regression Model 3 (Dichotomous DV: Increase in Online Shopping Index or No Increase, No Interaction; $N = 771$)

	B	SE	Wald	df	Sig.	Exp(B)	95% CI for Exp(B)	
PE	0.671	0.158	18.052	1	<.001	1.957	1.436	2.667
SI	0.387	0.172	5.049	1	0.025	1.473	1.051	2.065
TR	−0.488	0.213	5.238	1	0.022	0.614	0.404	0.932
Gender	−0.414	0.158	6.899	1	0.009	0.661	0.486	0.900
Age	−0.232	0.064	13.154	1	<.001	0.793	0.699	0.899
Constant	0.379	0.329	1.327	1	0.249	1.460		

Regression equation:

$$\text{Increase\_of\_online\_shopping\_index}_{\text{predicted}} = 0.379 - 0.671*PE + 0.387*SI - 0.488*TR - 0.414*Gender - 0.232*Age$$

The fourth model, with interaction effects, explained 11.8% of the variance (Nagelkerke R-squared = 0.118) and had a good fit (Hosmer–Lemeshow goodness-of-fit test: $p = 0.763$). One variable and five interaction effects appeared to be significant factors influencing the probability of online shopping index growth. Consumers who expressed performance expectancy for online shopping were almost twice as likely as the rest of the respondents to experience growth in the online shopping index. The predicted probability of an increase in the index was higher among women than men in all age groups and declined with age. This decline was much faster among men than women. In the youngest age group (15–24 years old), for both genders, the probability was at a similar level (45.0% and 46.3%, respectively), whereas for the oldest age group, the difference between genders reached 14.2 percentage points. Living close to a grocery store increased the predicted probability of growth in the online shopping index, but among respondents living in rural areas, this growth was much stronger (7.3 percentage points versus 2.8 percentage points). In rural areas, the negative effect of lack of trust for online payments on the predicted probability of growth was much stronger than in urban areas (20.4 percentage points versus 4.5 percentage points). Social influence's positive effect was notably stronger among those respondents who often used cars (11.3 percentage points versus 1.9 percentage points), whereas the positive effect of hedonic motivation was stronger in larger cities than in small cities and rural areas (31.8 percentage points versus 6.7 percentage points; Tables 12 and 13).

Table 12: Parameters of Logistic Regression Model 4 (Dichotomous DV: Increase in Online Shopping Index or No Increase, With Interaction; $N = 771$)

	B	SE	Wald	df	Sig.	Exp(B)	95% CI for Exp(B)	
PE	0.666	0.159	17.519	1	<.001	1.947	1.425	2.660
Gender*Age	−0.152	0.035	18.705	1	<.001	0.859	0.802	0.920
FC_grocery*Rural	0.477	0.182	6.854	1	0.009	1.611	1.127	2.301
TR*Rural	−1.046	0.351	8.886	1	0.003	0.351	0.177	0.699

SI*Car_often	0.461	0.186	6.13	1	0.013	1.586	1.101	2.286
HM*City	1.171	0.427	7.514	1	0.006	3.226	1.396	7.452
Constant	−0.453	0.189	5.766	1	0.016	0.636		

Regression equation:

Increase_of_online_shopping_index $_{predicted}$ = −0.453 + 0.666*PE + (4.944 − 0.152*Age)*Gender + (0.312 + 0.477*FC_grocery)*Rural + (0.312 − 1.046*RT)*Rural + (0.057 + 0.461*SI)*Car_often + (0.070 + 1.171*HM)*City

Table 13: Mean Predicted Probability for Interaction Effect (DV: Increase in Online Shopping Index)

1 = yes, 0 = no	Men	Women
Age (15–24)	45.0%	46.3%
Age (25–34)	38.4%	43.4%
Age (35–44)	29.2%	40.3%
Age (45–59)	24.0%	35.6%
Age (60+)	17.5%	31.7%
	Rural (1)	Rural (0)
FC_grocery (1)	40.2%	35.0%
FC_grocery (0)	32.9%	32.2%
TR (1)	21.7%	31.0%
TR (0)	42.1%	35.5%
	Car_often (1)	Car_often (0)
SI (1)	44.3%	36.1%
SI (0)	33.0%	34.2%
	City (1)	City (0)
HM (1)	61.2%	40.5%
HM (0)	29.4%	33.8%

6. Discussion and Conclusions

This study investigated the shift in consumer shopping behavior during and after the COVID-19 pandemic and identified the main factors influencing this change. Based on a representative sample of 1,010 responses, we were able to determine the extent to which Polish consumers engaged in online shopping activities, explore their attitudes and preferences pertaining to this form of shopping, and analyze how these factors changed during and after the pandemic.

In this section we discuss and explain the results of our analysis and compare them with the findings of previous research, starting with a discussion of how consumers' online shopping attitudes and behaviors changed before and after the pandemic. Then, we examine the factors influencing online shopping and assess the research hypotheses and the modified UTAUT2. The chapter ends by describing the implications of the research (theoretical and practical) and the study's limitations as well as possible directions for future research.

6.1. Online Shopping Attitudes and Behaviors Before and After Pandemic

The general attitude toward online shopping among Polish consumers was rather positive, mostly due to convenience and the lower prices offered by this type of shopping; however, enjoyment and social influence were also often reported as influencing factors. A significant majority of respondents perceived online shopping as requiring equal or less effort than traditional shopping—this perception might also be supported by the relatively high accessibility of online-shopping-related infrastructure such as parcel lockers and collection points. Even in rural areas and smaller towns, most respondents lived within 10 minutes of the nearest facility of this type, and their access to pharmacists was similar and only slightly lower than to grocery stores.

Although pandemic conditions incentivized making purchases online instead of in brick-and-mortar stores, for Polish consumers, this impact was mostly felt through an increase in the propensity for online shopping rather than a complete change in shopping behavior—that is, they did not significantly abandon traditional shopping and shift almost all their shopping activity to the Internet. For most respondents (85%), the pandemic, as well as its end, did not change their engagement in online shopping. This supports previous research showing that in Europe (specifically in Germany), the impact of the pandemic on online shopping frequency was much smaller than in the United States (Shaw et al., 2022).

The highest increase in the propensity for online shopping was observed in categories that were already the most digitalized before the pandemic (household appliances and clothes) and the lowest for dried packaged food. This aligns with data from the GUS, which found that in 2022, only 5% of Polish consumers had bought food online within the last three months, whereas 37% had bought clothes and footwear, as well as with research findings from other European countries suggesting that food is one of the categories least frequently bought online (Van Droogenbroeck and Van Hove, 2017).

6.2. Sociodemographic Factors Influencing Online Shopping

In line with the results of previous research and data from the GUS, having experience with online shopping was associated with younger age (Ariansyah et al., 2021; Bartok et al., 2021; Young et al., 2022), higher education, and car usage (Shi et al., 2019). The presence of children under 18 years of age in a household was also a matter of significant difference between online and offline shoppers, as suggested by the literature (Jaller and Pahwa, 2020; Melis et al., 2016; Park et al., 2021). The lack of gender differences accorded with data from the GUS and numerous previous studies (Ariansyah et al., 2021; Hoogendoorn-Lanser et al., 2019; Lin et al., 2019; Maat and Konings, 2018; Young et al., 2022).

Spatial access to physical stores and, relatedly, one's place of residence (city, town, rural area) were generally not associated with the variables describing previous experience with online shopping. The only exception was found among respondents with the lowest access to specialized stores. Among those with low access, the share of purely offline shoppers was significantly higher. This result contrasts with several previous studies (Melis et al., 2016; Ren and Kwan, 2009; Zhiqun et al., 2009), and can be explained by considering access to specialized stores as an indicator of peripherality. Although in rural areas, the share of respondents without any experience with shopping online was not significantly higher than in cities and towns, we can assume that the rural area category was not uniform; it presumably included people living closer and farther away from urban areas, and the difference between the two was captured by the question about the distance, in time, to specialized stores. Thus, those with the lowest access were respondents living in the most peripheral and most rural communities and, as research has indicated, were less open to the adoption of new technologies and online shopping. This suggests that the traditional category of rural areas used in geographical research is not fine-grained enough in the context of online shopping and that other measures (such as physical store accessibility) might be more informative in this case. Moreover, it also calls into question the relevance of the debate between the efficiency hypothesis and the innovation-diffusion hypothesis (Anderson et al., 2003). The results of this study suggest that in the current stage of e-commerce development, as it is no longer a new technology or innovative way of shopping, place of residence does not differentiate the two analyzed groups. Therefore, in contrast to previous research (Cao et al., 2013; Farag et al., 2006; Jaller and Pahwa, 2020; Park et al., 2021; Singleton et al., 2016), living in urban areas was not related with having any experience with online shopping to a larger extent than was living in rural areas.

6.3. Assessment of Research Hypotheses and Modified UTAUT2

The results of our analysis support the primary hypothesis of our research: *The modified UTAUT2 (supplemented with trust/risk and additional moderating factors) explains how Polish consumers changed their shopping behavior*

during the pandemic. Although not all UTAUT2 constructs were statistically significant, based on this theoretical framework, we were able to develop four regression models (Tables 8, 9, 11, and 12) with satisfactory values of goodness of fit and appropriate calibration (Hosmer–Lemeshow test). From all four models, it was evident that performance expectancy was the most important factor facilitating Polish consumers' online shopping, followed by facilitating conditions, trust/risk, and social influence, as well as hedonic motivation. Performance expectancy could be associated with the greater convenience of online shopping in a non-pandemic period, but during the pandemic, online shopping might have started to be perceived as a more critical issue—namely, consumers sought to acquire essential goods without getting infected with COVID-19. Effort expectancy, price value, and habit did not influence the analyzed variables, in contrast to some previous studies (Gupta et al., 2022; Higueras-Castillo et al., 2023; Jayasingh et al., 2022; Qasem, 2021; Sheikh et al., 2023; Singh et al., 2017; Zhang et al., 2023). One of the reasons for this discrepancy may be the influence of the pandemic conditions under which, due to the impossibility of shopping in brick-and-mortar stores and the health risks associated with such stores, factors such as effort, price, and habit ceased to play crucial roles. Another explanation could be the specificity of Polish or Central and Eastern European consumers; however, since none of the above-mentioned research was conducted in that part of Europe, this requires more in-depth research.

The first research sub-hypothesis (H1: *The UTAUT2 constructs of performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit facilitated an increase in the propensity for online shopping during the pandemic*) was confirmed, but only partially. According to Model 1 (without interaction, Table 8) only performance expectancy increased the probability of continuing to shop online during the pandemic. After adding interactions, these factors turned out to be performance expectancy and facilitating conditions (Table 9). In Model 3 (Table 11), only two of the UTAUT2 constructs, performance expectancy and social influence, positively influenced the propensity for online shopping during the pandemic. When the interaction effect was added (Table 12), only performance expectancy remained as an unmoderated factor, while the positive impacts of facilitating conditions, social influence, and hedonic motivation were moderated by sociodemographic factors.

The second sub-hypothesis (*The trust/risk factor, defined as perceiving online payments as not completely safe, did not facilitate an increase in the propensity for online shopping during the pandemic*) was fully confirmed because the trust/risk factor negatively impacted the probability of continuing to shop online during the pandemic and the propensity for online shopping during the pandemic in all models (Tables 8, 9, 11, and 12).

The final sub-hypothesis, H3 (*Age, gender, education, place of residence, car usage, and presence of children under 18 years of age had a moderating effect on the influence of UTAUT2 constructs and trust/risk on the shift in the propensity for online shopping during the pandemic*) was also confirmed partially, as only age, gender, place of residence, and car usage were significant factors influencing the probability of continuing to shop online during the pandemic and online shopping propensity directly (Models 1 and 3) or through moderating effects (Models 2 and 4). Education and the presence of children under 18 years of age were found to not be significant. Thus, despite being at higher risk from COVID-19, older consumers were still less likely to shop online during the pandemic. This can be explained by a lack of appropriate skills and/or available support from family members to acquire these skills during the lockdowns. Before the pandemic, consumers with lower trust toward online payments had the option to pay for their online purchases with cash on delivery, but this option was often not available during the pandemic or was associated with the risk of infection. Finally, as private cars were one of the safest modes of transport during the pandemic, it could have been expected that individuals not using a car would be more inclined to shop online to avoid using public transport. However, as most Poles buy convenience goods in local discount stores, which are often accessible on foot, the negative impact of not using a car is easier to understand.

Among the moderating factors, the most influential (through an interaction effect) were gender, age, car usage, and place of residence; education and presence of children under 18 years of age had no effect. Women appeared to be more stable in their propensity for online shopping during the pandemic. For men, the impact of high physical store accessibility and trust toward online payments changed the probability of abandoning online shopping during the pandemic to a greater extent. This may be explained by the fact that during the pandemic, women, who are more often responsible for childcare and household shopping (especially for food), were more affected by lockdown restrictions; thus, online shopping was one means for them to cope with increased time and social distancing constraints. This result is inconsistent with some previous research suggesting that men were more inclined toward online shopping during the pandemic than were women (Adibfar et al., 2022; Gomes and Lopes, 2022). Further, men were characterized by a lower probability of online shopping index growth than women, whereas women were more stable in the increase in their propensity for online shopping across age groups. The decrease in the probability among women was more gradual than among men, which suggests that during the pandemic, older Polish women were more familiar with the new technologies and online shopping than were older men.

In addition, consumers who reported not using cars very often or at all, also seemed more stable in their propensity for online shopping. This may be related to the fact that these individuals are more often people living in rural areas, with relatively lower access to stores. For them, convenience may have a stronger influence, as supported by KPMG (2020), which identified convenience as the most important factor in the decision to shop online. Furthermore, individuals without access to a car may have been dependent on public transport for store visits, which, during the pandemic, posed a higher risk of infection. Therefore, online shopping might have appeared more convenient in terms of avoiding crowds (Javadinasr et al., 2022). The frequent use of a car reinforced the positive impact of social influence on the increase in online shopping during the pandemic; thus, it could be argued that for those living in the most remote areas, social influence had a greater effect on the propensity for online shopping during the pandemic. The tendency toward more frequent online shopping among respondents living in rural areas was also more strongly influenced by a lack of trust toward online payments, whereas respondents who lived in towns and cities were still relatively more inclined toward online shopping during the pandemic, even if they were unsure of the safety of online payments. Surprisingly, the probability of the growth of the online shopping index among rural residents was much higher among those who lived near grocery stores, while the influence of the proximity of grocery stores was much smaller for the rest of the respondents. Residents of large cities were more sensitive to hedonic motivation than were those living outside large cities, whereas for people living in the suburbs of major cities, proximity to parcel lockers was associated with an increased probability of continuing to shop online during the pandemic. Due to the less dense network of facilities in smaller towns and rural areas, access to parcel lockers was particularly crucial for residents outside large cities. Alternatively, those without a car, often of lower socioeconomic status, might have been be more inclined to shop online to seek savings.

When comparing the results obtained from Polish consumers with the meta-analysis conducted by Tamilmani et al. (2020), we observe that similar to the pre-pandemic studies, performance expectancy was a significant factor in increasing consumers' propensity for online shopping. The meta-analysis also supports the results regarding a lack of influence from effort expectancy and price value, as these factors were identified by Tamilmani et al. (2020) as among the least significant elements of the UTAUT2. However, Tamilmani et al. (2020) also included in this group social influence, which was identified as a significant factor in our study. This may suggest that during the uncertain and dynamic pandemic period, the role of social environment and "important others" is greater than under non-pandemic conditions.

6.4. Research Implications

The results of this research have several important implications. From the theoretical point of view, the most important is that our analysis confirmed that the UTAUT2 (supplemented with the trust/risk factor) can be used as a theoretical framework to explain differences in how consumers adjusted their shopping behavior during the pandemic, with consideration of long-term shifts. The second implication is that the traditional rural–urban dichotomy used in geographical research might be overly simplistic for application in studies on consumer behavior. More granular measures, such as physical store accessibility, might be more informative in such a case. Finally, in the context of the theoretical discussion between the efficiency hypothesis and the innovation-diffusion hypothesis (Anderson et al., 2003), our research suggests that at the current stage of development, especially in more digitalized countries, online shopping should perhaps no longer be considered a new technology.

From the practical point of view, the results suggest that, in Poland, encouraging consumers who already shop online to substitute physical shopping with online purchases holds greater potential for increasing online sales than encouraging people who have never made online purchases to start shopping online. Despite the high accessibility of parcel lockers and collection points, it is evident that a significant share of Polish consumers not only prefer shopping in physical stores but also are completely reluctant to engage in online shopping. This predominantly applies to the aging and less mobile population, so from the spatial planning and social sustainability perspective, improving their access to physical stores may be important. For Polish consumers, the most important factor motivating them to shop online was convenience, and this factor remained valid during the pandemic. Therefore, marketing campaigns should thus focus on the utilitarian value of online shopping. It is also clear that there is still large potential for increasing the scale of online shopping through campaigns aimed at reducing the lack of trust toward online payments. Especially for consumers living in more rural areas, this is a significant negative factor. Conversely, for those who live in larger cities, enjoyment related to online shopping seems to be an important positive element.

6.5. Limitations and Future Research

Like most studies, this research has some limitations that can also serve as a basis for identifying future research paths. The most important limitation is related to the geographical scope of the analysis—namely, that the study only covered one country. Therefore, this study may be seen as a blueprint for examining changes in consumer behavior during the pandemic in other countries, particularly those culturally distant from Poland. Another limitation pertains to the fact that, despite the relatively large sample size, the number of observations in some categories was so small

that it was impossible to carry out full analyses. A further limitation that is typical of survey-based research is that this study analyzed only stated, not revealed, preferences; thus, it treated declarations as a reliable source of information about behaviors and preferences. This limitation is especially important for retrospective questions—that is, those that inquire into behaviors from the past (like during the pre-pandemic period). The results obtained from this research can thus be compared with those of studies based on more objective data sources, such as transaction data or retailers' and online platforms' performance records.

Further, despite implementing several mitigating measures, the CATI methodology is still prone to potential selection bias—in particular, individuals more comfortable with technology and online interactions might be more likely to participate in a telephone survey, while those with higher risk aversion toward online shopping and transactions might be less so. Excluding individuals with higher risk aversion could potentially lead to an overestimation of online shopping adoption rates. However, the share of respondents in our survey who declared that they do not shop online (24%) was significantly higher than the indicator published by the GUS for the 16–74 age group (16%). When we compare indicators from both surveys for the same age group (16–59), the numbers are much more similar. Although this may suggest that the measures we used to mitigate the impact of the risk-aversion bias adopted in our study (the CATI methodology using landline and mobile numbers) were effective, for future studies, potential mitigation strategies could include incorporating a measure of risk aversion into the questionnaire to assess the extent of this bias, with potential appropriate adjustment of the results.

Finally, even though the UTAUT2 has been positively verified by many researchers, we must note that the theory was developed before the pandemic and in relation to the adoption of a new technology. The novelty of online shopping is diminishing over time, and it is thus possible that, especially during the pandemic, other factors not included in the UTAUT2 or this study played an important role in the online shopping adoption process. In addition, the statistically significant results may not fully reflect actual, real-world causal relationships. For example, those who engaged more in online shopping during the pandemic might have reported higher scores for variables describing performance expectancy, effort expectancy, and/or social influence partially as a result of confirmation bias—that is, they were looking for justification and/or explanation of their previous behaviors and decisions. Therefore, it would be beneficial to conduct qualitative or mixed-methods research, not necessarily based on respondents' declarations, that could identify less obvious factors affecting consumers' choices and the direction of observed statistical relations. Some such factors have already been suggested in the literature, including how consumers organize their day, how much time they spend on commuting (Harantova et al., 2022; Lu et al., 2022), and other situational factors (Hand et al., 2009).

One of the most obvious future research directions is to investigate, in detail, how the COVID-19 pandemic impacted online shopping in different product categories and how permanent those changes have been. Because individuals often struggle to evaluate their proportional use of various shopping channels accurately, it may also be interesting to investigate how the propensity for online shopping changes temporally and spatially. For example, it is well known that online shopping gains popularity before Christmas, but we would expect that other time-related factors play a role in this matter. Finally, from the geographical perspective, it would be interesting to investigate how one's place of residence and daily/weekly mobility patterns affect one's propensity for online shopping, including the collection of products bought online.

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