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## Article

# Factors Affecting the Growth of E-Shopping over the COVID-19 Era in Hanoi, Vietnam

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**Abstract:** In response to insufficient understanding of the determinants of change in e-shopping behaviors during the COVID-19 pandemic in developing countries, this paper used the data from 355 respondents, collected in Hanoi during the social distancing period (April 2020), to explore the factors associated with shopping online more frequently (i.e., representing the growth of e-shopping) for five product types (food, medical products, clothing, electronics, and books) in Hanoi, Vietnam. The results showed that nearly 80% of the respondents engaged in e-shopping more frequently than they did before the outbreak of COVID-19. As regards shopping online more frequently in general (i.e., for at least one product type), females were more likely to do so. In-store shopping enjoyment and a decrease in income were a facilitator and a deterrent, respectively. Regarding specific product types, completely working from home had a positive association with more frequent e-purchasing for electronics. Fear of disease encouraged higher frequencies of e-shopping for food and medical products. Notably, the shortage of physical supply was not a determinant of buying any product type online more frequently. As for the implications of our findings, supporting and encouraging low-income shoppers, older persons, and females to engage in e-shopping is necessary to limit the detrimental effects of the pandemic on their lives. The growth of internet purchasing expresses a need to manage the development of urban delivery services, to limit the uncontrolled proliferation of motorcycles. E-shopping requires delivery to complete the online-to-offline process; therefore, protecting the health of delivery drivers to ensure the safety of the whole online shopping process would be necessary.

**Keywords:** online shopping; e-commerce; COVID-19; developing country; Vietnam; social distancing



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## 1. Introduction

The persistent increase in employing information and communication technologies (ICT) over the past two decades has enabled more spatiotemporal flexibility for persons wishing to shop, through the emergence of online shopping [1]. In academia, e-shopping, as a new and promising channel, has attracted the attention of marketing scholars, regarding efforts to find incorporated schemes for deploying multiple channels [2,3]. Since virtual shopping is a viable alternative to physical shopping, planners are interested in its effects on the spatial distribution of stores, thereby causing further impacts on other land uses [4]. The relationship between internet shopping and mobility is a popular topic in the transport science domain. Because shopping is one of the critical purposes of making trips [5–9], online purchasing may be accompanied by a reduction in transport activities, thanks to the significant removal of shopping-related mobility [10–13]. As a result of receiving considerable attention from multiple disciplines, the subject of online shopping has a massive body of literature [5].

One of the primary research areas focusing on online shopping is the modeling of online shopping behaviors. Specifically, prior studies explore factors determining the adoption, the frequency, and the timing of shopping online [10,14–20]. Unlike other e-activities, such as working from home, e-shopping is a more complex phenomenon, due to the diversity of product types with distinct attributes. For example, search goods (e.g., books) often have uniform quality and pricing, with easy access to their full profiles on the internet. In contrast, experience goods like clothing may need many visits before a purchase decision is made [21]. Therefore, to enrich our understandings of factors associated with the practices of online shopping, some recent research has considered different product categories, like groceries, clothing, books, and electronic appliances [11,14,16,21,22].

First detected in Wuhan in December 2019, a highly infectious disease caused by a new coronavirus (SARS-CoV-2) rapidly escalated into a pandemic, officially named COVID-19 [23]. To combat the “public health emergency of international concern” declared by the World Health Organization, a series of interventions and recommendations at different degrees (e.g., wearing masks, working from home, social distancing, and lockdown) to limit physical interactions between citizens have been issued [24–26]. In adapting to the context of mobility restrictions, people have been accelerating the use of ICT to perform daily activities, such as shopping [27,28]. ACI Worldwide reports that the purchase volume of e-commerce for June 2020 increased by 31%, compared to the same month in 2019 [29]. Many super/hypermarkets (e.g., Ocado in the UK and Carrefour in France) had to deal with huge demand by adopting online queues or taking their online shopping websites down [30].

The rapid emergence of e-shopping in the era of COVID-19 has resulted in much research on this behavior and its influential factors worldwide. Most of these studies are based in high-income countries (e.g., Germany [31], the United States [32], Canada [33], Kuwait [34], and Qatar [35]) or places witnessing e-commerce booms before COVID-19 struck (e.g., China [36] and India [37,38]); however, far less knowledge is reported from developing countries, where virtual shopping is relatively new for most of their citizens (e.g., Vietnam [39] and Bangladesh [40]). Due to the varying severity of COVID-19 impacts, and dissimilarities in how the governments and citizens responded to the pandemic across countries, knowledge from case studies would be less generalizable [36,38]. This stresses a need for more empirical evidence to attain a better understanding of online shopping during the COVID-19 pandemic. As well as this finding, the major focus of previous studies is on internet shopping in general [31,34,39–41], or purchasing groceries or food online [32,33,35,36]. To the best of our knowledge, there has been no research considering various product types simultaneously. This could be a gap in the extant literature because the decisions when buying different kinds of products on the internet may be jointly affected by several factors. Consequently, the identified effects of factors on shopping behavior may be inconsistent when modeling the purchase of different kinds of products separately [14].

Based on the abovementioned gaps, this study aims to investigate the factors associated with the growth in engaging in e-shopping for a range of product types, during the social distancing period, in a megacity of a developing country. E-shopping behaviors can be measured in a number of ways, such as adoption, spending, and frequency [42]. The current study uses the increase in frequency to represent the growth of e-shopping. Specific research questions are as follows:

- Question 1: Is there growth in the frequency of e-shopping?
- Question 2: What are the determinants of a higher frequency of e-shopping?
- Question 3: In which ways, the COVID-19 pandemic impacts the frequency of e-shopping?

These three questions are considered both for e-shopping in general and specific e-shopping for five product groups (i.e., food, medical products, clothing, electronics, and books).

This study has extended the literature in the field of online shopping research in three respects. First, it is one of the first studies providing empirical insights into changes in the frequency of online shopping for various product types in a city of a developing country over the social distancing period, due to the outbreak of COVID-19. Second, it identifies the factors associated with higher frequencies of purchasing certain product categories online, using a joint probit model. Third, it reports the effects of COVID-19 (i.e., fear of disease, a decrease in income, and increased working from home) on the frequency of e-shopping. These findings will be informative for policymakers and managers, with respect to addressing the fallout from the pandemic and potential challenges resulting from the growth of e-shopping.

The authors continue this paper with an extensive review of the factors associated with purchasing online under normal circumstances, and of recent publications regarding online shopping behaviors in the context of COVID-19. Section 3 describes the development of e-retailing and e-shopping in Vietnam, both pre-COVID-19 and during the COVID-19 pandemic. Section 4 comprises data collection and the methods used, before the main findings are presented and discussed in Section 5. Finally, conclusions, implications, and research limitations are offered in Section 6.

## 2. Literature Review

### 2.1. Determinants of Shopping Online under Normal Circumstances

E-shopping behavior primarily comprises three dimensions, including adoption (i.e., shopping channel choice), spending, and frequency [42]. Therefore, we review existing research on factors determining (1) the adoption, (2) the frequency of shopping online, and (3) e-shopping time to find the potential candidates explaining the changes in the frequency of purchasing online in the era of COVID-19.

To characterize people engaging in e-shopping, sociodemographics have been examined in prior studies with mixed results.

While some authors do not find significant associations with gender in online shopping behavior [43] and for books in particular [14,16], numerous researchers do. Women are more likely to shop online at a higher frequency [7,10,16,19], and spend more time e-shopping at home [15]. Several studies, however, show conflicting findings, with males having a greater likelihood of online shopping [8,18]. The effects of gender vary across product types. Women are associated with higher frequencies of online shopping for clothing, groceries, and daily goods, but a lower frequency for electronics [14,44].

Age has a negative effect on e-shopping behavior [7,8,15,18–20]. Nevertheless, a positive association between age and e-shopping frequency is reported when respondents are young (i.e., up to 33 years old) [10,16,45].

Much of the extant literature demonstrates that income is positively associated with online shopping behavior [8,14,15,18,20]. Hjorthol and Gripsrud and Zhen et al. achieve the same results, with a significant and positive influence of income on the frequency of shopping online for clothing but presented conflicting findings for books [14,16]. Notably, lower-income respondents are involved in a higher frequency of online shopping [10]. The reason may be that lower-income consumers deploy e-shopping to benefit from a lower price compared with traditional purchasing. There are no associations between income and online shopping behavior, according to [7,44,45].

A wealth of previous studies report consistently that better-educated people have a greater probability of engaging in online shopping [10,14,16,18,20,45]. By contrast, education is not a significant factor in several articles [7,15,44].

As parents with children at home often spend much of their time providing transporting services and in extracurricular activities, they are more likely to implement online shopping in response to the lack of free time to shop [14,16,20,45]. A few publications, however, argue that children in households are not a determinant of online shopping time [15] and online shopping engagement [44]. Likewise, the presence of children does not affect the frequency of buying electronics over the internet [14].

The basis for e-activities is the increasing availability of the internet; therefore, unsurprisingly, variables related to the use of this global network are predictors of online shopping behaviors. These factors are the frequency of utilizing the internet [7,19,45], the number of years using the internet [18], types of home internet access [21], and the amount of time using the internet per day or month [15,21].

While sociodemographic characteristics and internet-specific variables have been examined extensively, shopping channel-related attitudes are essential factors that have been intensively researched over the past decade. Mokhtarian et al. [42] introduce 13 underlying factors, extracted from 42 shopping-related attitudinal statements of 966 respondents in Northern California. From this point on, the thirteen-factor list has been referenced heavily to design the following studies. In [14] for example, novelty-seeking has positive associations with the frequencies of buying clothing, books, daily goods, and electronics online; however, cost consciousness is not significant for all of these product categories. In-store shopping enjoyment is found to negatively impact the choice of online shopping for clothing [21]. It is also negatively associated with online shopping time at home [15]. By contrast, positive attitudes (i.e., novelty-seeking, time-consciousness, and cost-consciousness) toward internet purchasing increase the time people spend e-shopping. Recently, the pleasure of shopping has been addressed in [22]; however, it does not affect the choice of shopping channels substantially.

The review above highlights two main points. First, the factors influencing e-shopping behaviors can be divided into two main groups, including (1) background information (i.e., socio-demographics and the use of the internet) and (2) attitudes toward shopping. Second, the inconsistent findings on the associations of these factors with e-shopping behaviors under normal circumstances emphasize that it is difficult to ascertain exactly how such factors will affect e-shopping behavior in the era of COVID-19.

## 2.2. Studies of Factors Associated with Online Shopping during the COVID-19 Era

As can be seen in Table 1, which presents recent analyses on internet shopping behavior during the COVID-19 pandemic, understanding has been attained primarily using data from developed countries or from those seeing a proliferation of e-shopping since before COVID-19 struck [31–36,38,40]. Meanwhile, the same is not true for developing countries where this shopping opportunity is relatively new for most citizens, with only two studies conducted [39,40].

Most studies have concentrated on general online shopping [31,34,38–40], while many have focused on groceries or food [32,33,35,36]. Articles regarding the online purchasing of food usually consider more than one product type. Mirhoseini et al. [33] analyze search and experience products using responses from 32 participants in Canada, while Gao et al. [36] and Ben Hassen et al. [35] examine the choice of different food types (e.g., fruit, vegetable, meat, seafood, and grain). Nonetheless, product types are used as either the values of a predictor variable [33] or separate outcome variables (i.e., overlooking the potential effects of joint variables) [35,36].

The vast majority of researchers have utilized a factor analysis technique to derive underlying constructs from attitudinal items [31,33,34,38–40], and have neglected the associations between socio-demographic variables when engaging in online shopping. The constructs used are mainly involved in the perception of the characteristics of online orders (e.g., price and time), risks related to online shopping, the (in-)convenience of online purchasing, the benefits of e-shopping, and other belief factors (e.g., trust or attitudes). To test the relationships between constructs, structural equation modeling has been conducted [31,34,38,39]. Regarding research that does not carry out factor analysis, Gao et al. [36] adopt an instrumental variable strategy, utilizing the distance from the city in question to Wuhan as the instrumental variable. The authors use socio-demographics as control variables; however, they do not explore how such characteristics affect online shopping behavior. Similarly, demographic variables are not considered by Grashuis et al. [32], who undertake an online framed choice experiment to elicit preferences for time windows,



fees, minimum order requirements, and purchasing methods, using 32,400 choice decisions made by 900 grocery shoppers in the US. However, Grashuis et al. stress the potential associations between online grocery shopping and demographic characteristics; thus, these should be investigated in future research. In a study based in Qatar [35], groceries ordered online are found to be positively associated with educational level but negatively associated with age.

**Table 1.** Synthesis of research on factors contributing to online shopping behavior in the pandemic period.

Study	Sample Size Area	Survey Method	Factors/Variables Used	Analysis Method
Pham et al. [39]	427 Vietnam	Google Forms	Awareness of utility, ease-of-use awareness, awareness of marketing policy, awareness of price and cost, effect on society, awareness of COVID-19.	Factor analysis and SEM
Gao et al. [36]	770 China	WeChat	Age, gender, education levels, household head, household size, percentage of children, percentage of the elderly, region, city administrative level, risk of COVID-19 infection, share of COVID-19 cases, distance between Wuhan and city of residence.	Instrumental variable strategy and bootstrap
Alhaimer [34]	385 Kuwait	Emails, WhatsApp, Instagram	Financial risk, product risk, non-delivery risk, convenience risk, risk severity, risk susceptibility, risk of formal penalties, attitudes	Factor analysis and SEM
Koch et al. [31]	451 Germany	Online survey through Prolific	Perceived usefulness, internal subjective norms, external subjective norms, hedonic motivation	Factor analysis and SEM
Grashuis et al. [32]	900 US	Amazon's Mechanical Turk	Purchasing method, time window, minimum order requirement, fee	Discrete choice experiment method
Al-Hattami et al. [38]	222 India	Web-based questionnaire	Confirmation, perceived usefulness, satisfaction, perceived task–technology fit, trust	Factor analysis and PLS-SEM
Mirhoseini et al. [33]	32 Canada	Recruitment through institution subject panel	Mathematical complexity, product type, interaction between mathematical complexity and product type, perceived mental effort, cognitive absorption	Factor analysis and maximum likelihood method
Neger et al. [40]	230 Bangladesh	Online survey	Product factor, price factor, time-saving factor, payment factor, security factor, administrative factor, psychological factor	Factor analysis and ANOVA
Ben Hassen et al. [35]	579 Qatar	Emails, Twitter, WhatsApp, the Survey Monkey platform	Venue types for buying food, food types, eating places, feelings during the COVID-19 pandemic, citizenship, gender, level of education, household income, occupation, household composition, age	Mainly descriptive statistics and some tests

The substantial adoption of preventive interventions offers limited avenues for data collection. Almost all studies have depended upon online surveys, social networks, and convenience sampling techniques. Consequently, limited sample sizes and biases toward persons who are familiar with the internet and have email addresses or social network accounts are unavoidable [31,33–35,38–40]. This would be considered as the nature of research in the COVID-19 era.

The review above highlights four major points. First, little is known about the factors associated with online shopping growth in developing countries. The second is the limited knowledge of the effects of socio-demographics on e-shopping behaviors. The third is the lack of studies considering e-shopping for a variety of product types simultaneously. Last, but not least, is the high prevalence of online-based survey approaches deployed within the COVID-19 period.

### 2.3. Potential Determinants Characterizing the Impacts of COVID-19 on E-Shopping Behaviors

The main focus of this paper is on the impact of COVID-19 regarding the change in frequency of online shopping; therefore, this sub-section presents empirical evidence to propose relevant factors representing the influences of the pandemic.

When facing a pandemic crisis, many consumers experience a lack of control over their choices, stemming from increased anxiety and uncertainty about the potential shortage of goods due to disruptions of transportation networks, labor shortages, and the need for

individual emergency supplies. To take back control, they tend to purchase numerous utilitarian products (e.g., rice, pasta, frozen food) [27], resulting in the occurrence of empty shelves. This situation, unfortunately, motivates a feeling of panic, further spreading purchasing behavior for relieving a potential shortage rather than meeting actual demands (i.e., panic-buying behavior) [27,46–49]. Since supermarkets usually apply the just-in-time stock level approach to attain cost efficiency [46], they possibly fail to respond to a widespread and unprecedented increase in demand for various product types in many areas simultaneously. However, online shops may not struggle with this issue because they are small-sized and medium-sized systems with flexible product flow. Therefore, consumers may turn to online shopping to seek products that are unavailable in stores. In this sense, the shortage of goods in physical stores may encourage consumers to shop more in virtual ones.

Online shopping is also a scheme adopted by individuals for limiting the risk of infection by avoiding the crowds in stores and supermarkets. Using data from ten countries in Asia, Africa, and Europe, Dryhurst et al. find a significant correlation between the adoption of preventive health behaviors and risk perception [25]. Another recent study reports the positive relationship between the fear of disease and purchasing personal protective equipment [50]. This finding is in line with the fact that medical products (e.g., masks and gloves) have been substantially searched for and bought on the internet [47,51].

Working from home is an e-activity that has been highly recommended [24,52–54] to both restrict the human-to-human transmission of SARS-CoV-2 and maintain productivity. An analysis including 27 international enterprises from various sectors (e.g., banking and energy) emphasizes that this working arrangement has been massively adopted, but without adequate preparation [55]. This means that workers may need to equip their home as an office themselves, with a plethora of media and ICT devices to adapt to teleworking.

The COVID-19 pandemic has caused unprecedented shocks to economies, with substantial disruption. According to [56], 2.7 billion workers (81% of the world's workforce) have been affected by lockdown measures, with an average decline in working hours of 6.7%. Less working time leads to lower personal income. Furthermore, companies may cut salaries to weather their difficulties and avoid lay-offs. Consequently, decreases in income have been common in the era of COVID-19. With a more constrained budget, people may possibly have to reduce their consumption and shopping.

Based on the review above, some potential predictors representing the impact of the pandemic on e-shopping behaviors may be working from home, fear of disease, a shortage of goods in physical stores, and a decrease in income. Furthermore, in the context of a health crisis, it would be interesting to consider online shopping for medical products.

Overall, the theoretical framework adopted for this study comprises three main (predictor) factor groups, including background information, attitudes towards shopping, and the impact of COVID-19 (see Figure 1). The two first groups are derived from Section 2.1, while the last is taken from Section 2.3. Three groups are relatively comprehensive, with both socio-demographic and psychological variables. Attitudinal constructs included in this study differ from those used in previous studies; hence, this current research can provide new insights into factors associated with e-shopping behaviors. As regards outcome variables, besides the frequency of online shopping in general, the frequencies of buying five product types (i.e., food, medical products, clothing, electronics, and books) are considered. This allows the study to fill in part of the knowledge gap related to the lack of understanding about factors determining online shopping for different product types.

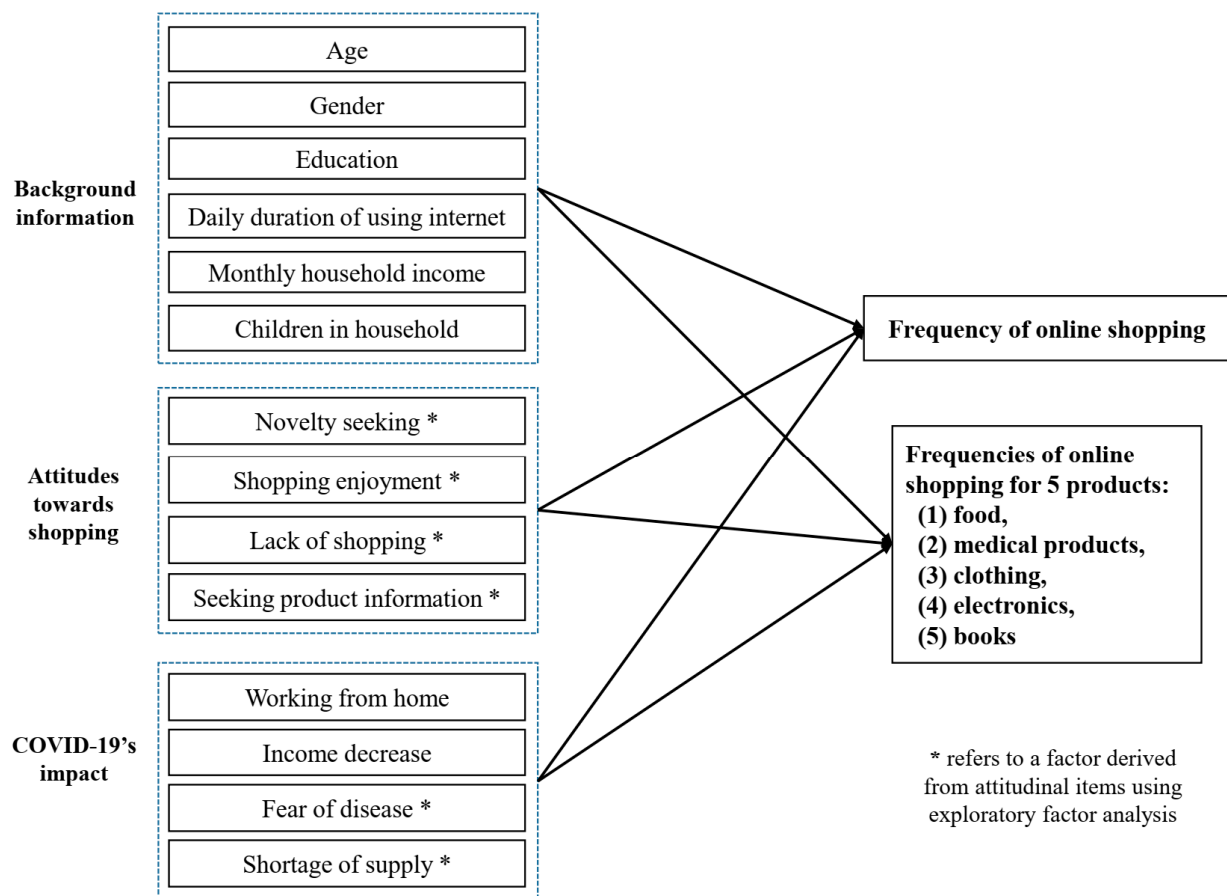


Figure 1. Theoretical framework of this study.

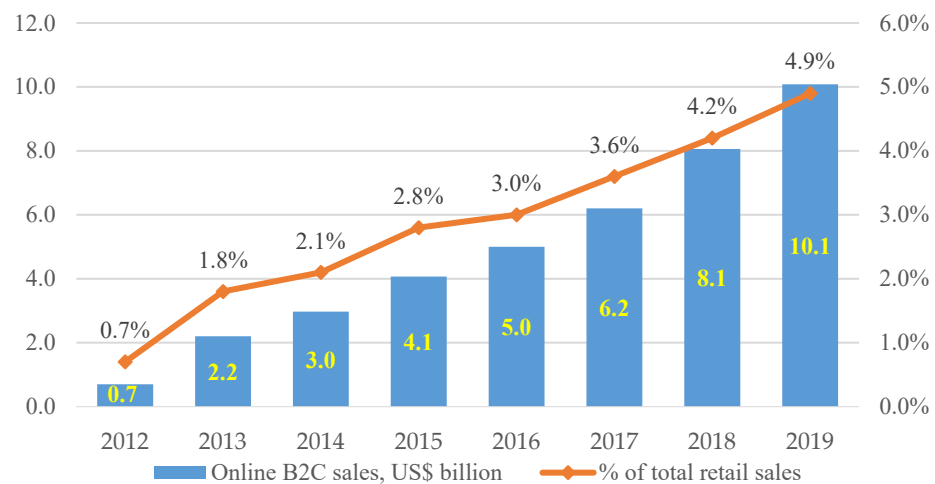
### 3. The Growth of Online Shopping in Vietnam

Vietnam, an emerging country in the Global South [57], has witnessed strong retail growth, with an average annual increase of over 10% from 2013 to 2018 [58]. The 2018 retail revenue was USD 142 billion, and is projected to reach USD 280 billion by 2020 [58].

As regards e-retail, 59 out of over 95 million Vietnamese are internet users, 78% of whom, aged between 16 and 64 years old, have already shopped online [59]. Figure 2 shows that online shopping is increasingly popular, with an upward trend from 2012 to 2019. The value of 2019 was USD 10.1 billion, doubling the 2016 level of USD 5 billion. One reason is the supporting policies initiated by both the national and local governments. Until 2017, only 44 out of 63 provinces had plans for developing e-commerce [58]. Besides this increase, many more persons have utilized the internet during the past five years. The Vietnamese rate of internet users was 66% in 2019, compared to 54% in 2015 [60]. Nevertheless, the value of online sales made up a modest percentage of nationwide retail sales. The highest proportion was seen in 2019 at nearly 5%, while the 2012 share was only 0.7%. The primary reason is the relatively low starting point of the Vietnamese economy.

Hanoi, the capital of Vietnam, contributes the second-largest percentage (11%) to the total retail sales in Vietnam [58]. Online purchasing has been rising in popularity among the inhabitants of this city. According to the results of the 700-household survey, based in Hanoi (since 76% of those surveyed were living in this city) and conducted by Deloitte in late 2018 [58], clothing and personal accessories seemed the most suitable products for online channels, with approximately 40% of the respondents preferring to buy these items on the internet. By contrast, only 18% and 19% of the survey participants show their preferences for shopping online for electronics and food/beverages, respectively.





**Figure 2.** Online sales in the Vietnamese business-to-consumer (B2C) market (source: drawn by the authors based on data documented in [60]).

COVID-19 has reshaped purchasing patterns among the Vietnamese. As in a review by Pham et al. [39], over 50% of customers surveyed showed a decrease in the frequency of visiting physical shops, while 39% purchased more frequently from virtual stores. In the same study, the authors modeled online shopping intention using six factors, including awareness of utility, ease-of-use awareness, awareness of marketing policy, awareness of price and cost, the effect of society, and awareness of COVID-19. Unsurprisingly, a positive relationship between the awareness of COVID-19 and intention was found. The results of this study are valuable; however, this study has only considered one aspect of COVID-19 impacts (i.e., through increased awareness) and overlooked the effects of socio-demographics, coupled with buying different product types online.

## 4. Data and Methods

### 4.1. Data

Data collection was administered in Hanoi, the capital and the second-largest city of Vietnam in terms of population. This city is facing demanding challenges due to the lack of pertinent responses to the negative effects of rapid urbanization [61], such as the uncontrolled proliferation of private motorcycles, unrelenting traffic congestion, risks when traveling, and adverse air and noise pollution [62–69].

To prevent the transmission of the coronavirus, the government of Vietnam decided to apply social distancing from 31 March to 30 April 2020 [26]. To investigate the impacts of COVID-19 on inhabitants' daily lives in Hanoi, we carried out a four-week survey between 6 and 30 April 2020 to collect data on the realities of e-activities. Correspondingly, a questionnaire was created with six parts, as follows.

- First, a cover page revealed the survey objectives and clarified who should participate in this investigation. As we would like to consider the practice of teleworking, only persons who worked from home at least once in the previous seven days from the surveyed day were encouraged to continue the survey.
- The second part inquired about the socio-demographics of respondents and their households, including age, gender, education, the level of income decrease, the household's monthly income, and the number of children. A child was considered to be a person aged between 1 and 11 years old.
- The third part requested respondents to provide the profiles of their companies. Additionally, it elicited information on how much time the respondents spent using the internet per day before the outbreak of COVID-19, and whether they worked entirely from home or not.

- The fourth part included a series of attitudinal statements related to teleworking (for more details, please see [70]).
- The fifth part, using a 5-point Likert scale, required participants to provide their opinions about shopping-related statements. Based on previous studies [14,15], we used the adapted questions representing factors including novelty-seeking, shopping enjoyment, time-consciousness, and cost-consciousness. Besides these factors, within the period of a health crisis, a person would buy a product on the internet because this item is scarce in physical shops but is still available in online shops. Therefore, two questions concerning the reality of the shortage of products were added. Two statements on the fear of the COVID-19 pandemic were included because people may choose online shopping to avoid the risk of infection, due to physical interactions with others in shops.
- The sixth part encompassed seven Yes/No questions. The first one was whether the respondent purchased online more frequently during the social distancing period. The term “more frequently” was defined as a larger number of orders that were made during the last seven days since the surveyed day. It also covered the scenario wherein it was the first time the person purchased online. Questions 2 to 7 had the same contents as the first one but asked about six different product types, namely, food, medical products, clothing, electronics, books, and others.

Within the social distancing period, physical access to candidates was unfeasible; thus, we decided to use emails and online questionnaires to gather data. Over the first two weeks, invitations attached with questionnaires were sent via emails to 400 former students of the Faculty of Transport Economics, part of the University of Transport and Communications. When receiving responses, we sent a reply, showing our appreciation and politely requesting the participants to share the questionnaire with other relevant candidates. Because of the low response rate of the email-based technique over the first two weeks of the survey (less than 25%), we created an online version of the questionnaire using Google Forms and then shared it with large and closed Facebook groups, where we were members. Finally, 422 responses were recorded. However, 52 of them belonged to persons not living in Hanoi, and 15 did not answer all the questions. After removing data from these persons, the samples encompassed 355 respondents, 134 of whom delivered their responses by email.

As can be seen in Table 2, the numbers of males and females were nearly the same. Because this survey needed the use of technological devices (e.g., laptops or smartphones), unsurprisingly, 62% of the respondents were younger than 31, while the oldest respondents, with an age of at least 46, made up 11.8%. The respondents were well educated, with 24.8% and 62% of those surveyed having postgraduate and bachelor degrees, respectively. Over half (53.2%) of the respondents possessed the same or slight declines (1–15%) in personal incomes. A decrease of between 16% and 49% was seen for 127 participants (35.8%), while 39 ended up with over 49% of their income cut. When it came to the daily time spent using the internet, the figures for the middle (2 h–5 h) and high (>5 h) periods were comparable (151 vs. 141, respectively) and exceeded the figure for persons (63) spending less than 2 h browsing websites. Of the 355 respondents, 209 worked exclusively at home, compared with 146 who worked both at homes and offices. As regards children in households, one-quarter of the participants came from households with one child and at least two children, respectively. The largest percentage (51.8%) was of those from childless families. As for monthly household income, the low (<10 million VND) and the high (>40 million VND) income groups accounted for similar proportions at around 15%, whereas the middle–low-income pool had the largest number of participants (42.5%).

**Table 2.** Descriptive statistics of the samples (N = 355).

Variables	Values	Frequency	Percent
Gender	Male	177	49.9
	Female	178	50.1
Age	Youngest (20–30 years old)	220	62.0
	Middle (31–45 years old)	93	26.2
	Eldest ( $\geq 46$ years old)	42	11.8
Educational level	Without a bachelor's degree	47	13.2
	Graduate	220	62.0
	Post-graduate	88	24.8
Decrease in monthly personal income	0–15%	189	53.2
	16–49%	127	35.8
	$\geq 50\%$	39	11.0
Daily time spent using the internet	Low (<2 h)	63	17.8
	Middle (2 h–5 h)	151	42.5
	High (>5 h)	141	39.7
Monthly household income before the COVID-19 pandemic	Low: less than 10 million VND	55	15.5
	Middle–low: 10–25 million VND	151	42.5
	Middle–high: >25–40 million VND	101	28.5
	High: >40 million VND	48	13.5
Number of children under 12 years old	0	184	51.8
	1	87	24.5
	$\geq 2$	84	23.7
Place of work during the COVID-19 pandemic	Completely working from home	209	58.9
	Working at both home and workplace	146	41.1

#### 4.2. Methods

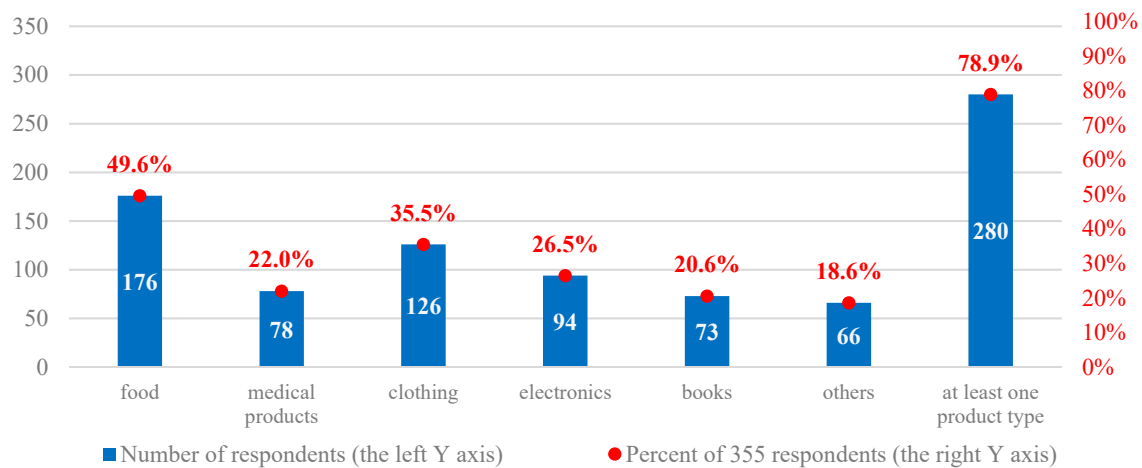
For deploying attitudinal statements, measured by a five-level Likert scale, exploratory factor analysis (EFA) was implemented. The primary purpose of factor analysis is to condense interrelated statements into a set of more distinct constructs (i.e., factors) [42]. A factor is characterized by a group of statements wherein the correlations within this group are significant; meanwhile, the correlations between groups are insignificant [41]. To achieve underlying factors, we implemented principal components analysis with a criterion for eigenvalues of chosen factors being over 1. For maximizing differences between factors, we applied the rotation method of Oblimin, with Kaiser normalization, as deployed in [14,15,21,71]. For evaluating the appropriateness of the use of EFA, the Bartlett sphericity test and the Kaiser–Mayer–Olkin criterion were administered. As well as these, the percentage of variance in the data, explained by the factors, was considered.

After extracting factors successfully, we built a probit model with the dependent variable being whether respondents shopped online more frequently in the social-distancing period (i.e., the first question in the sixth part of the questionnaire, as mentioned in Section 4.1). Then, to model the higher frequencies of online purchasing for five product types (i.e., food, medical products, clothing, electronics, and books), instead of creating five separate probit models for them, we developed a joint probit model including all of these product types. The major benefit of a joint probit model is that it allows correlations between the error terms of individual probit models. As demonstrated in [14,15], online shopping behaviors for product types may be jointly affected by unobserved variables. If we neglect these correlations by considering individual models, the estimates of coefficients may be statistically consistent but not efficient [72]. We used STATA 15.0 to implement all the statistical analyses in this study. The module “cmp” [72] was employed to build the joint probit model.

## 5. Results and Discussions

### 5.1. The Prevalence of Shopping Online More Frequently

Figure 3 shows that buying products in online shops at a higher frequency was common during the period of social distancing, with nearly 80% of respondents reporting that they did so.



**Figure 3.** The number of respondents shopping online more frequently, according to product type.

Approximately half (176) of the respondents declared that they now bought food in virtual stores more frequently. As mentioned in [58], only 19% of those questioned preferred to shop for food online before the era of COVID-19. In this sense, the low rate of persons purchasing food online before the health crisis would cause a high proportion of people buying food more frequently on the internet during social distancing. Another reason would be that many respondents may adapt to the closure of restaurants, café, and street vendors by buying more food from online shops instead of eating out. Surprisingly, clothing showed the second-largest number of persons (126, 35.5%) purchasing online at a higher frequency. This can be explained by a series of promotion strategies by shops. The vast majority of shops have changed from offline to online shopping, with high discount rates for buyers. Many shops also have a group of models who are ready to try on products in different sizes, according to the requests of customers. The percentages of participants who purchased electronics, medical products, and books were comparable at 26.5%, 22%, and 20.6%. Of 355 respondents, 66 (18.6%) bought other product types online more frequently than before.

### 5.2. Results of Exploratory Factor Analysis

The result of the Bartlett test demonstrated the existence of inter-correlation between (attitudinal) variables (see Table 3). The KMO value (0.6361) was higher than the recommended threshold of 0.5 [73]. Accordingly, the use of EFA was appropriate. The amount of variation in data, as explained by factors (74%), was acceptable and comparable with counterparts in many previous studies [14,15].

The six underlying factors extracted were identified as follows: (1) novelty-seeking, (2) lack of (in-store) shopping, (3) shortage of (physical) supply, (4) seeking product information, (5) (in-store) shopping enjoyment, and (6) fear of disease.

**Table 3.** Results of exploratory factor analysis of attitudinal statements.

Attitudinal Statements	Extracted Factors					
	Novelty-Seeking	Lack of (In-Store) Shopping	Shortage of (Physical) Supply	Seeking Product Information	(In-Store) Shopping Enjoyment	Fear of Disease
I am interested in personalized products	0.6824					
I am interested in novel products	0.8242					
I am interested in rare/limited products	0.8337					
Before the COVID-19 outbreak, I was too busy to shop as frequently as I want		0.8813				
Before the COVID-19 outbreak, I was so busy that I usually had to shop faster than I want		0.8878				
Within the social distancing period, it is difficult for me to buy products because shops close			0.8608			
Within the social distancing period, it is difficult for me to buy products because these products are already sold out			0.8754			
I am interested in searching for comments of others about products				0.7843		
I am interested in searching for and comparing prices of products before purchasing one				0.8488		
Before the COVID-19 outbreak, in-store shopping made me relax					0.8770	
Before the COVID-19 outbreak, in-store shopping was my favored choice in my leisure time					0.7913	
Within the social distancing period, the danger of infection from the public is high						0.8181
Within the social distancing period, going to shops increases the risk of infection significantly						0.8313

The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy = 0.6361; Bartlett test of sphericity: chi-square = 922.517; degree of freedom = 78;  $p$ -value = 0.000 (H0: variables are not intercorrelated); extraction method: principal component analysis with eigenvalue > 1; rotation method: Oblimin with Kaiser normalization; score estimation method: regression; variation (of items) explained by four factors that were extracted = 0.7364.

### 5.3. Factors Associated with Online Shopping at a Higher Frequency

Table 4 indicates that females (coef. = 0.494) were more likely to shop online more frequently. One reason might be that females in Vietnam often take primary responsibility for doing household chores and providing care for other family members [74]. Therefore, when facing difficulty in going to stores, they would be pioneers of implementing online shopping as an alternative.

Compared to the youngest group, the oldest group (coef. = −0.432) had less likelihood of purchasing online more frequently, but this result was significant at a 10% level. Similarly, seeking product information was a weak facilitator of shopping online more frequently (coef. = 0.157,  $p$  = 0.055). Unsurprisingly, a higher level of decline in personal income was involved in there being less likelihood of more frequent internet purchasing. Interestingly, based on the effects of a decrease in income and seeking product information, perhaps in the context of losing earnings, the respondents tended to undertake online shopping more frequently, to obtain good products at reasonable prices by comparing a range of candidates. In normal times, shopping enjoyment has a negative association with online shopping behavior [15]. However, in the social-distancing period, many people shifted to online purchasing, causing shopping enjoyment to be positively associated with a higher frequency of e-shopping (coef. = 0.201).

The insignificant effect of fear of disease on the frequency of online shopping seemed inconsistent with the findings of another study based in Vietnam [39]. There could be several explanations for this difference. First, the authors of [39] considered the awareness of COVID-19 rather than the fear of contracting it. Second, the outcome variable of [39] was the intention to shop online, while this current study took the (actual) frequency of online shopping into account. In fact, not all intentions will translate into actual behaviors.



**Table 4.** Results of the probit model for purchasing more frequently online.

Variables	Coef.	p
<b>Gender</b> (ref: male)	0.494 **	0.004
<b>Age</b> (ref: 20–30 years old)		
31–45 years old	0.230	0.340
≥46 years old	−0.432 *	0.082
<b>Education</b> (ref: without bachelor degree)		
graduate	−0.034	0.890
post-graduate	0.151	0.618
<b>Income decrease</b> (ref: 0–15%)		
16–49%	−0.382 **	0.039
≥50%	−1.085 **	0.000
<b>Daily time spent using the internet</b> (ref: low (<2 h))		
middle (2 h–5 h)	−0.345	0.166
high (>5 h)	−0.077	0.763
<b>Monthly household income</b> (ref: low (<10 million VND))		
middle–low (10–25 million VND)	0.265	0.280
middle–high (>25–40 million VND)	0.495	0.074
high (>40 million VND)	0.142	0.654
<b>Children aged under 12</b> (ref: zero)		
1	0.178	0.395
≥2	0.229	0.330
<b>Completely working from home</b> (ref: No)	−0.120	0.480
<b>Novelty seeking</b>	0.098	0.234
<b>Lack of shopping</b>	0.084	0.326
<b>Shortage of supply</b>	0.139	0.115
<b>Seeking products' information</b>	0.157 *	0.055
<b>Shopping enjoyment</b>	0.201 **	0.016
<b>Fear of disease</b>	−0.063	0.462
_cons	0.784	0.047
Log-likelihood	−155.88466	
Pseudo R2	0.1544	

Note: \* refers to “statistically significant at 10% level”; \*\* refers to “statistically significant at 5% level”.

#### 5.4. Factors Associated with Shopping Online More Frequently for Five Products

Table 5 describes the results of the joint probit model, including analyzing five product groups simultaneously. Because the vast majority of the pair-wise correlation coefficients between error terms (e.g., *atanhrho\_12*) were significant, there were unobserved factors jointly affecting the frequency of online shopping by product types. Hence, using the joint model was more efficient than estimating the effects of variables on products according to individual probit ones.

In line with [44], females were found to exhibit a larger probability of online purchasing for food, clothing, medical products, and books. Nevertheless, there was no statistical difference in coefficients for males and females with respect to electronics ( $p = 0.170$ ). This was relatively incompatible with the fact that males tend to spend more time on online shopping [15] and engage in shopping online more frequently [14] under normal circumstances. The female respondents' higher likelihood of purchasing medical products online more frequently may be evidence supporting that women tend to put more emphasis on risks (e.g., traffic, environmental hazards) compared to men [75]. Food can be used for the whole family, while books can be used for children when learning at home, due to the closure of schools. Therefore, the higher frequencies for purchasing such products online can be explained by the main responsibilities for women of household-related tasks [70]. A possible explanation for the higher frequency of buying clothing on the internet for women may be their greater attention to fashion and trends [76]; however, more research is needed.

Age was significant only for purchasing electronics. The respondents aged over 45 (coef. =  $-1.034$ ) were less likely to buy electronic appliances online compared to adults younger than 31. This result can be interpreted by a better grasp of and greater interest

in technologies in the youngest group. In contrast, the oldest group, who would be wary of searching for electronics and buying them online, may ask their younger relatives to purchase electronics for them.

**Table 5.** Results of the joint probit model for purchasing five product groups online more frequently (N = 355).

Variables	1. Food		2. Medical Products		3. Clothing		4. Electronics		5. Books	
	Coef.	p	Coef.	p	Coef.	p	Coef.	p	Coef.	p
<b>Gender</b> (ref: male)	0.549 **	0.000	0.409 **	0.013	0.324 **	0.033	−0.223	0.170	0.362 **	0.038
<b>Age</b> (ref: 20–30 years old)										
31–45 years old	0.233	0.250	−0.218	0.323	0.019	0.925	0.264	0.211	0.129	0.570
≥ 46 years old	−0.077	0.746	0.009	0.971	−0.159	0.524	−1.034 **	0.006	−0.349	0.252
<b>Education</b> (ref: without bachelor degree)										
graduate	−0.068	0.758	−0.097	0.696	0.577 **	0.021	0.147	0.562	0.859 **	0.019
post-graduate	0.403	0.128	0.102	0.722	0.404	0.165	0.445	0.121	1.110 **	0.004
<b>Income decrease</b> (ref: 0–15%)										
16–49%	0.015	0.926	−0.143	0.416	−0.221	0.183	−0.425 **	0.018	0.154	0.399
≥ 50%	−0.924 **	0.001	−0.579 *	0.057	−0.540 **	0.042	−0.673 **	0.023	−1.040 **	0.012
<b>Daily time spent using the internet</b> (ref: low (<2 h))										
middle (2 h–5 h)	−0.051	0.810	−0.036	0.871	0.160	0.455	−0.099	0.653	−0.344	0.140
high (> 5 h)	0.441 **	0.043	−0.035	0.878	0.284	0.194	−0.291	0.199	−0.147	0.532
<b>Monthly household income</b> (ref: low (<10 million VND))										
middle-low (10–25 million VND)	0.538 **	0.018	0.449 *	0.082	−0.037	0.867	0.075	0.760	−0.054	0.832
middle-high (> 25–40 million VND)	0.614 **	0.013	0.408	0.147	0.075	0.756	0.095	0.717	−0.010	0.972
high (> 40 million VND)	0.551 *	0.061	0.687 **	0.028	0.026	0.928	0.123	0.686	0.547 *	0.073
<b>Children aged under 12</b> (ref: zero)										
1	0.216	0.238	0.274	0.153	0.114	0.546	−0.019	0.925	−0.246	0.272
≥ 2	−0.025	0.902	0.114	0.599	0.313	0.120	0.491 **	0.017	0.473 **	0.027
<b>Completely working from home</b> (ref: No)	0.143	0.353	−0.050	0.762	−0.175	0.265	0.433 **	0.012	0.042	0.813
<b>Novelty seeking</b>	−0.017	0.825	0.120	0.148	0.236 **	0.003	0.151 *	0.059	0.079	0.342
<b>Lack of shopping</b>	0.255 **	0.001	0.136	0.107	0.176 **	0.028	0.021	0.795	−0.030	0.718
<b>Shortage of supply</b>	0.052	0.503	0.024	0.776	0.002	0.981	0.126	0.135	−0.117	0.175
<b>Seeking product information</b>	0.260 **	0.001	−0.018	0.831	0.416 **	0.000	0.187 **	0.023	0.023	0.775
<b>Shopping enjoyment</b>	0.212 **	0.005	0.037	0.644	0.234 **	0.003	−0.039	0.622	−0.068	0.418
<b>Fear of disease</b>	0.156 **	0.041	0.248 **	0.003	0.051	0.508	0.145 *	0.082	−0.081	0.321
_cons	−1.058 **	0.003	−1.291 **	0.001	−1.120 **	0.003	−0.868 **	0.025	−1.838 **	0.000
/atanrho_12	0.224 **	0.039								
/atanrho_13	0.277 **	0.007								
/atanrho_14	0.241 **	0.026								
/atanrho_15	0.206 *	0.082								
/atanrho_23	0.332 **	0.003								
/atanrho_24	−0.211 *	0.080								
/atanrho_25	0.217 *	0.065								
/atanrho_34	−0.062	0.564								
/atanrho_35	0.201 *	0.067								
/atanrho_45	−0.294 **	0.023								
Log likelihood										

−868.10214

Note: \* refers to “statistically significant at 10% level”; \*\* refers to “statistically significant at 5% level”.

Compared with those respondents without a bachelor’s degree, those with higher education levels were more likely to buy books more frequently. The same result is reported in normal circumstances [14,16]. One reason would be that most people without qualifications are blue-collar workers. In contrast, graduates, and especially postgraduates, are usually white-collar workers [77] who are habitual readers.

In the time of social distancing, due to the reduction in manufacturing and business, the incomes of citizens were cut. With a decreased level of income of 50% or more, a respondent was less likely to purchase any products online, compared to a participant who was subject to an income cut of 0–15%.

The average daily time spent using the internet before the outbreak of COVID-19 had an association with the more frequent internet purchasing of food in the social-distancing period, but not for other product types. Specifically, respondents spending over five hours online (coef. = 0.441) had a larger possibility of buying food than those spending under two hours.

As regards household income before the COVID-19 outbreak, it generally had a positive association with online shopping at higher frequencies for medical products and food, but not for other product types. It can thus be concluded that household income may be more involved in the consumption level needed for many family members (e.g., food and masks) rather than with individual demand.

Having a child in a household presents interesting findings related to the impact of COVID-19 on studying and daily lives. A respondent from a household with at least two

children was more likely to purchase electronics and books online, compared to one from a childless household. This can be explained by the fact that, during the temporary closure of schools, many online classes were organized for children, thereby resulting in a need for more computers, laptops, or tablets. As a result, their parents made orders for electronics. Besides, parents may wish their children to spend time at home reading (more) books.

During the social-distancing period, a large number of companies closed entirely or partially, thereby causing staff to work from home exclusively or to work at home and the workplace in combination. Those respondents completely working from home may have to assemble all necessary equipment themselves (e.g., computers, laptops, and portable external hard drives) to be able to work, while others can go to the workplace to borrow the necessary technological equipment. Consequently, the former group was more likely to buy electronics more frequently in virtual shops.

Novelty-seeking positively affected the frequency of internet purchasing for clothing (coef. = 0.236) and electronics, albeit with a weak relationship for the latter ( $p = 0.059$ ). These results, along with the findings of Zhen et al. [14], demonstrated that novelty-seeking was a facilitator of the frequency of e-shopping for clothing and electronics in both normal and health-crisis times. The reason could be that fashion and technology have changed continuously over time.

Lack of time to go shopping was positively associated with purchasing food (coef. = 0.255) and clothing (coef. = 0.176) online more frequently. Food is bought the most frequently while buying clothing always needs much more time to make comparisons. Therefore, people tend to end up with a lack of shopping time for these products in normal circumstances. In the social-distancing period, they could meet this shortage by virtual shopping.

It is common that when there is a health crisis, citizens usually buy many more products than they did in normal times to lay down stores and avoid the lack of goods. In particular, masks become rare in many countries, because wearing masks is a key solution to relieving the risk of infection, and the demand for them overwhelms the production capacity [47,51]. However, our results showed that shortage of supply was insignificantly associated with the likelihood of purchasing any product categories online more frequently. This finding was congruent with the report on the absence of panic-buying for food during the social-distancing period in Qatar [35]. One reason could be that the Vietnamese government started preparing for an outbreak of coronavirus before the first confirmed cases were detected [78]. The scenarios of increased demand for goods were anticipated to boost the capacity of the retail sector. Moreover, unlike in the case of Western countries, the capacity for producing masks in Vietnam is relatively large, because citizens often use masks when on the move to protect their health from the detrimental effects of emissions.

People who like to collect in-depth information about products and compare prices were more likely to shop online more frequently for food (coef. = 0.260), clothing (coef. = 0.416), and electronics (coef. = 0.187). Seeking information was not a significant variable for purchasing medical products online, possibly because buyers may wish to receive direct instructions from pharmacists.

Shopping enjoyment was a positive factor in a higher frequency of buying food (coef. = 0.212) and clothing (coef. = 0.234) online, probably because people regularly bought these products in physical stores for pleasure before the COVID-19 outbreak.

Fear of disease had positive associations with more frequent online shopping for food (coef. = 0.156) and medical products (coef. = 0.248). The food-related result can be interpreted according to the fact that in-store shopping for food requires people to communicate physically with the crowd more often, thereby causing a high risk of infection, and thus bringing a higher fear of disease, whereas the mask-related result was compatible with the conclusion that fear favors the purchasing of personal protective equipment [50].

##### 5.5. Answers to the Research Questions

Based on the findings presented in Sections 5.1, 5.3 and 5.4, the responses to the three questions mentioned in Section 1 are as follows.

Answer to Question 1: The obvious growth in the frequency of online shopping is seen with approximately 80% of respondents engaging in this e-activity more frequently. Among product types, more frequent online shopping for food and clothing was much more common than for books, medical products, and electronics.

Answer to Question 2: Gender, decrease in income, and shopping enjoyment are statistically significant predictors of shopping online more frequently. The effects of attitudinal factors and demographics vary across product groups. Shopping for food online is the behavior most affected by attitudinal factors, as reflected by its significant associations with seeking product information, shopping enjoyment, lack of shopping, and fear of disease. In contrast, none of the attitudinal variables are associated with the frequency of buying books on the internet.

Answer to Question 3: The occurrence of the COVID-19 pandemic motivates shopping online more frequently through the fear of disease and completely working from home, but limits e-shopping through a decrease in personal income. Notably, the shortage of supply is not a significant factor for a higher frequency of e-shopping. Besides this, the impacts of COVID-19 on the frequency of shopping for books and electronics occur because of new demands from children for materials and devices to implement online learning and homeschooling.

## 6. Conclusions

COVID-19 has considerably limited in-store shopping, due to the massive implementation of non-pharmaceutical preventive interventions, and has boosted online shopping as an effective alternative in many developing countries where e-shopping had been relatively novel for citizens, prior to the COVID-19 outbreak. Using the data from the 355 respondents, gathered during the social-distancing period in Hanoi, this paper developed probit models to investigate the factors associated with changes in the frequency of online shopping in general, and particularly for five products, including food, medical products, clothing, books, and electronics. The proliferation of e-shopping more frequently for certain product types shows that online shopping has grown substantially in the COVID-19 pandemic. This may reflect the argument that online shopping has a substitution relationship with store purchasing, which is a relatively risky and inconvenient activity at a time of social distancing. However, an inquiry into how online shopping will evolve in the post-pandemic period is taking place. Higher frequencies of shopping online in this study are found to be affected positively by the fear of disease and telecommuting entirely but are affected negatively by a decrease in income. When the pandemic ends, there will be a mitigated fear of disease, less telecommuting, and partially recovered incomes. Such conditions will facilitate physical shopping and will probably reduce the frequency of online shopping, but perhaps not affect the growth of internet purchasing. As we discussed regarding the effects of shopping enjoyment in Section 5.3, we believe that many people, who had never or who had rarely shopped online prior to COVID-19, have shopped online for the first time and/or more frequently. In this way, e-shopping has gone on to be normalized and has become more common in people's lives. Thus, it is expected to become an ever more important channel in the retail sector. This expectation is well supported by early reports from China and developed countries, suggesting that the growth of e-commerce in the post-lockdown period remains strong [29,79].

The rapid growth of e-shopping may lead to fewer shopping trips [80,81], as well as shorter shopping trips in terms of distance [80] and time [20]. In this sense, the substantial development of e-shopping would be a promising solution to the severe traffic congestion in Hanoi. It may, however, cause the proliferation of urban delivery services that include the heavy use of private vehicles, especially motorcycles. It is important to note that, currently, Hanoi is a motorcycle-dependent city and is struggling with traffic congestion, accidents, and air pollution [65,68]. Therefore, framing policies to manage the negative transport-related effects of online shopping growth on urban mobility would be vital. Besides this issue, the considerable emergence of online shopping would make the distinction between

freight transportation and passenger transportation less clear, in that they can be directly transferable according to the choice of shopping channels. Hence, to model and forecast travel demand adequately, as argued by the authors of [82], it would be necessary to consider both passenger and freight movements in a single integrated framework.

Online shopping is an effective solution to prevent the spread of COVID-19 and adapt to the new normal [27,83]. Our study, however, raises concerns about the inequality of opportunities to implement e-shopping, due to the income-related barrier. With a higher decrease in income, a person was less likely to shop online for all five product groups. This means that he or she may reduce their consumption and/or purchase products more frequently in stores, thereby increasing their risk of contracting COVID-19. Similarly, persons from households with the lowest income level before the outbreak of COVID-19 were less likely to shop online more frequently for food, a type of basic goods, in the social-distancing period. This lack of equality emphasizes that low-income people are a vulnerable group, needing the government's greater attention and support to overcome the current health and economic crisis. Another consideration would be gender inequality. Compared to males, females were more likely to buy certain product categories online more frequently. This highlights not only the burden on women, in terms of providing care for family members during the social-distancing period, but also the important role of women in addressing the fallout of the pandemic. Therefore, it is essential to take gender-based differences into account when issuing policy responses to COVID-19's tragic consequences.

Online shopping needs delivery to complete the online-to-offline process. Hence, to sustain the growth of online shopping, it is necessary for local authorities and the managers of delivery platforms to issue policies and regulations that ensure both the health and safety of delivery drivers and the quality of products sold in virtual shops.

This study has found various associations among the same factors, with the possibilities of more frequent internet purchasing for different product categories. Considering particular product types will produce a more comprehensive understanding of purchasing behavior, compared to examining online shopping as a single activity. Furthermore, knowledge of the determinants of the five product groups would be widely informative for supply chain managers, with respect to initiating product-based schemes to maximize the benefits and handle the challenges of the enormous growth of e-commerce.

This study is subject to a number of limitations. First, since the recruitment of respondents was implemented through invitations sent to former students of a particular university, via emails and calls launched on Facebook groups, our samples were biased toward those who had mastered electronic devices and the use of the internet. Additionally, only teleworkers were surveyed. For these reasons, our collected data may not be representative of the whole population of Hanoi, thereby limiting the generalization of our findings. This limitation should be considered when interpreting and comparing our results. However, as a study of the short-term impacts of COVID-19, using an online survey is reasonable [31,33–35,38–40]. Second, due to the design of the questionnaire, we could not examine separately those factors associated with shopping online for the first time. Instead, the first adoption of online shopping was included within purchasing on the internet at a higher frequency. Third, this study did not consider some factors that have previously been demonstrated to affect online shopping behavior, such as residential areas, cost, and time of delivery.

Future research may extend this work in several ways. First, the abovementioned shortcomings should be considered and addressed. Specifically, knowledge of the factors established in the initial stages of COVID-19 underlines a need to conduct longitudinal analyses. This will help to gain a better understanding of the effects of these factors, especially regarding the long-term impacts of COVID-19 on behavior related to online shopping. In this sense, the current paper should be considered as a proof-of-concept, suggesting factors that should be considered in subsequent research. Second, the progression of and extent of COVID-19 varied across countries; therefore, it would be interesting to investigate whether and in what ways the results of this study differ in other areas. Third, exploring



factors influencing changes in the time spent shopping online, and/or the number of goods ordered, would lead to valuable contributions. Another research avenue would be to look at the effects of the rapid emergence of e-shopping on shopping trips, helping to clarify whether this growth will be either a solution or a challenge, or both, for urban transport in developing countries.

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