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Does the Covid-19 affect food consumption patterns? A Transaction Cost Perspective

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Abstract

The purpose of this research is to study transaction costs and their antecedents, in relation to the willingness to buy groceries online in Italy, and to observe the effect of Covid-19 is having in those. The study used a positivist deductive approach to the theory development. To evaluate the relations, we developed a PLS-SEM using SmartPLS version 3.3.3, and tested the model using WarpPLS 7.0. The pandemic's discomforts impact significantly the willingness to buy food online, and it is also a mediator between transaction costs and willingness to buy online. The findings may help those manufacturers struggling with low-performing e-commerce during the Covid-19 pandemic. When restrictions are enforced, manufacturers should take action to reduce the uncertainty associated with online shopping. From the political point of view, it highlights the need for institutional help in organising online supply chains.

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Introduction

Without any doubt, the Covid-19 pandemic has changed our lives. It affected the entire food system, creating uncertainty and discomforts in terms of both security and safety (Gao *et al.*, 2020; Goddard, 2020; Kinsey *et al.*, 2020; Galanakis, 2020). During 2020, the food sector overall saw a drastic cut in consumption. This figure is determined by the collapse of the Ho.Re.Ca. which goes from 86 billion euros in 2019 to 34 billion in 2020. On the other hand, part of this loss is balanced by the growth in retail sales, which allows to predict an increase in domestic consumption of about 6% compared to 2019 (Ismea, 2020). In 2020, there was an increase in e-commerce purchases (Osservatori.net, 2020), on both Italian and foreign sites. The food and grocery sector had a value of 2,5 billion euros, with a growth of 55% (Osservatori.net, 2020). The most relevant component (87% of the sector) is represented by food, with a growth of 85% compared to 2019. Nowadays, technology is increasingly invading everyday life, and web connection is more crucial than ever (Eurostat, 2020). Even before the Covid-19 Pandemic, the Internet was increasingly been used for interpersonal relationships, leisure, information and shopping. Despite the growing popularity of e-commerce channels (ISTAT, 2019), the agri-food sector lags in business to consumer (BTC) online sales volume. While food and grocery internet purchase are still marginal in Italy, it is increasing, also influenced by the Covid-19 Pandemics. They are followed by food delivery (ready-to-eat food) with 706 million (+19%) and niche products with 589 million euros (+63%). In particular, online confirms an important growth driver for large-scale distribution, with growth of 23.5% over 2020 in value and a turnover of 1.8 billion euros, equal to 2.5% of the total turnover of the sector (Consorzio Netcomm, 2021).

For what may concern online wine purchase, in Italy there are few big online retailers (XtraWine, Bernabei, and Soundtaste) which sell alcoholic beverages online (Socialmeter, 2020), but wine producers are far behind for e-commerce implementation. In 2020, e-commerce in Italy saw an overall increase of 8% compared to 2019, and only the food and grocery sector grew by 70% compared to the previous year (Nomisma Wine Monitor, 2021). Even if the numbers of web sales in the wine sector are lower than those of large-scale distribution (10% lower), the e-commerce of wine has achieved a turnover of between 150 and 200 million euros (Nomisma Wine Monitor, 2021). To be clear, in 2020 there was a real acceleration for e-commerce where over 8 million have chosen to buy wine online, about 27% of total wine consumers, compared to 17% in 2018 (Nomisma Wine Monitor, 2021). At the same time, there has also been an increase in the size of e-commerce: it is estimated that the weight on total sales in the retail channel should go

from 1% in 2019 to 2-3% in 2020 (Nomisma Wine Monitor, 2021). It could be interesting to notice that online shopping habits are different. In fact, consumers usually buy online products of a higher price range than those chosen during the in-person shopping on the shelf. For example, there is a relevant gap between the label price of still and sparkling wines, where the digital consumer spends 59% more, or € 3 per liter in physical spending and € 4.8 per liter in online shopping (Nomisma Wine Monitor, 2021).

In a nutshell, Covid-19 pandemic has brought to light the need for e-commerce sales to reach their full potential and for consumers to trust agri-food products purchased via web and applications.

Thus, the current paper tries to understand how the difficulties in acquiring grocery personally, due to the pandemic, have affected consumers' behaviour towards online shopping for groceries (food and wine). Transaction costs theory was already used to explain consumers' behaviour towards online shopping (Liang and Huang, 1998; Teo *et al.*, 2004; Suki and Suki, 2017), but it lacks of contributions regarding online Grocery shopping, while there is some literature about food delivery (Chin and Goh, 2017). As for the relationship between Covid-19 and Willingness to Buy (WTB), there are interesting contributions (Gao *et al.*, 2020; Hobbs, 2020; Kim *et al.*, 2021), but they do not consider transaction costs (TC) and their antecedents. The study tries to bring together these two streams of research, maybe helping shed a light on how the Pandemic has affected consumers' behaviour towards online food purchase.

One of the distinguishing features of the current study is the use of PLS-SEM to evaluate Transaction Costs in relation to the willingness to buy groceries online. This methodology was already used to study online shopping behaviour regarding clothes and fashion purchases (Rahman and Mannan, 2018; Rodríguez *et al.*, 2020), but also for food (Chin and Goh, 2017). In the current study, we used PLS-SEM, with bootstrapping as cross-validation method, carried out with SmartPLS 3.3.3 (Ringle *et al.*, 2015), and checked using WarpPLS 7.0 (Brewster, 2011; Kock, 2017). While the first is a linear program, the second is non-linear, enabling us to check for the robustness of our results (Kumar and Purani, 2018). This particular way of proceeding makes our study one of the first to investigate consumers' transaction costs for grocery purchase, and the mediating role of Covid-19, using both linear and non-linear PLS algorithms. The findings may help develop managerial strategies, and study the effect of an exogenous variable on consumers' behaviour towards online food shopping. The results could also be crucial in elaborating policies and interventions aimed to encourage online purchasing, which is especially essential in helping to prevent the spread of the disease.

1. Background

Consumers and Transaction Costs

Transaction cost theory (TCT) aims to explain why actors choose a particular organisational form to transact, rather than another (Coase, 1937; Williamson, 1979, 1991). Three main dimensions characterise the TCT: asset specificity (As), Uncertainty (U) and Frequency (F) (Williamson, 1979, 1991). The first two are positively related to transaction costs. That is, by increasing them, the cost associated with the transaction increases. Asset specificity refers to the degree to which the investment in support of the transaction is re-deployable (Williamson, 1991). If an investment is not specific, it poses few hazards because it has alternative uses. Uncertainty is related to the cost associated with an unexpected outcome due to information asymmetry (Williamson, 1991). It could be related to both people and the environment. Frequency refers to the periodicity with which transactions occur (Williamson, 1991). Recurring transactions are associated with fewer uncertainties and risks due to the trust created between the actors, and therefore the frequency is negatively correlated with the transaction costs. In the current study, only two out of three antecedents of transaction costs were considered (asset specificity and uncertainty). This both because the frequency was already found out as not significant (Yeo *et al.*, 2017), and because it was not included neither by Teo *et al.* (2004), nor by John and Weitz (John and Weitz, 1988). According to the previous studies, information technologies (IT) can change the governance structures associated with TC. In this regard, there are two main directions: one that states that IT has reduced transaction costs by favouring market mechanisms (Alt, 2017). The other, argues that use of IT fosters closer relationships with external partners (Alt, 2017). There are confirmations on both aspects, namely that the use of IT can favour market mechanisms as well as hierarchical relationships (Glassberg, 2007; Alt and Zimmermann, 2015). In particular, within Business-to-Customer and Customer-to-Customer transactions price and costs are signals, elements of the transaction. In the Business-to-Business transactions they are also used to manage the relationships between the actors (Glassberg, 2007). Thus, when the transaction is customer-oriented, Information technologies and buying online may reduce information asymmetry and uncertainty, due to the easy access to a great amount information (such as that about products, retailers or comparison), and thus reduce the associated transaction costs (Glassberg, 2007; Alt and Zimmermann, 2015). On the other hand, when the transaction is business oriented, there are elements involved in the transaction which may slow down e-commerce diffusion such as specific requirements, trust, managerial skills

and reputation (Glassberg, 2007). These elements may lead to establish closer strategic relationships when IT are involved.

The decision to buy online is nothing more than an organisational form of a transaction. According to the TCT, the alignment between organisational form and transaction should minimise the associated transaction costs (Gibbons and Roberts, 2013). The more the transaction is perceived as risky (high TC), the more centralised (hierarchical) the organisational form chosen is because it allows the actors to monitor the transaction closely. If the perceived transaction costs are low, they may choose a decentralised organisational form (market) because the incentives are sufficiently high to cover the associated hazards (Williamson, 1991). Although TCT is usually applied in Business-to-Business (BTB) transactions, several authors tried to use it to explain consumers' behaviour. Liang and Huang studied the acceptance of electronic products by consumers using transaction costs (Liang and Huang, 1998). Marchini *et al.* (2021) tried to classify different forms of food distribution, from the most centralised (home-made) to the most decentralised (large scale distribution), using transaction cost theory. According to their study, if the perceived transaction costs are low, consumers may choose a decentralised organisational form (Williamson, 1991; Marchini *et al.*, 2021).

Traditionally, consumer's behaviour towards online purchases is linked to dimensions such as satisfaction and loyalty (Rahman and Mannan, 2018; Rodríguez *et al.*, 2020). However, some authors have tried to study it using transaction cost theory (Teo *et al.*, 2004; Suki and Suki, 2017). In particular, Teo *et al.* (2004) sought to assess US and Chinese consumers' readiness to shop online using transaction cost antecedents, confirming the relationship between antecedents and perceived transaction costs for online purchase. As for online grocery shopping, Yeo *et al.* (2017) used an integrative theoretical approach based on Contingency Framework and Extended Model of IT Continuance to evaluate the structural relationship between different characteristics of food purchase (such as post-use utility, hedonistic motivations, price saving orientation), shopping characteristics online (convenience motivation, time-saving orientation, previous online shopping experience), consumer attitude and behavioural intention towards online food delivery. On the other hand, Suhartanto *et al.* studied the effect of quality on online service loyalty for delivery food. Finally, Chin and Goh (2017) used a PLS-SEM to assess consumers' intentions towards online food and grocery shopping. Their study found that perceived utility is a significant determinant of the decision to buy food online. Our study aims to link two research lines: TCT to study consumer behaviour, and online shopping for groceries (food and wine). The current study tries to observe the relationship between antecedents (in particular, As and U) and perceived TC associated

with online grocery purchase. Moreover, we try to evaluate whether TC affect consumers' behaviour (WTB), and how the Covid-19 has affected this relation. Considering the effects of Covid-19 on the food system, both in terms of security and safety (Gao *et al.*, 2020; Goddard, 2020; Kinsey *et al.*, 2020; Galanakis, 2020), we sought to observe both its direct effect on the willingness to buy online, and whether it has a mediating role between TC and WTB. Given the statistical data, it is expected that the perceived discomforts caused by Covid-19 would have a positive effect on the WTB food and wine online. According to the theory developed by Marchini *et al.*, (2021) we consider online shopping as a very decentralised organisational form, and consumer interests associated with online shopping, as a form of incentive (high incentives characterise decentralised transactions) (Williamson, 1979, 1991).

The study of Teo *et al.* (2004) found that TC had a negative and significant impact on WTB online. However, online shopping for food and wine has some peculiarities. First of all, consumers who shop for groceries online often look for innovative products and variety (Rohm and Swaminathan, 2004). Second, the mitigation of uncertainty, especially for infrequent purchases, is essential. Sellers can only use signals to mitigate consumers' uncertainty about their product, as they cannot inspect it in person. In this case, the information given on the website (Luo, 2002; Suki and Suki, 2017) and food-specific indications, such as labels and certifications (Riganelli and Marchini, 2016; Oncini *et al.*, 2020; Polenzani *et al.*, 2020), become crucial. Unlike Teo *et al.* (2004), we did not consider "Trust" among the antecedents of TC because it is already embedded in the other two dimensions (uncertainty and asset specificity) (Williamson, 1979, 1991).

2. Materials and methods

Conceptual Model

Uncertainty

In this context, consumers can be uncertain about both the product and the producer. Uncertainty about the product is defined as the difficulty of consumers in evaluating the product and predicting how it will behave in the future (uncertainty about performance) (Dimoka *et al.*, 2012). Producer uncertainty refers to the difficulty in assessing sellers' actual characteristics and predicting whether they will act opportunistically or not (Pavlou *et al.*, 2007). Furthermore, for online shopping, there is also uncertainty regarding web stores (Eastlick and Feinberg, 1999). In this context, conflicts arise

between the seller and the buyer regarding their different interests and purposes. On the one hand, if the buyer wants the best quality at the lowest price, the seller, on the other hand, wants to get the highest selling price in exchange for a lower quality. The seller can act opportunistically, taking advantage of his position and knowledge of the product (Akerlof, 1978).

Regarding the behavioural uncertainty towards online stores, problems could arise regarding consumers' ability to evaluate the contractual performance concretely (Teo *et al.*, 2004). Nowadays, numerous tools have been developed to reduce it (Pavlou *et al.*, 2007). In addition to certifications, which are very important for food products, there are also: reputation, informativeness of the website, product diagnostics, and social presence.

Corporate reputation is the consideration that people have of a company, based on the operations carried out by it. According to the literature, there is a positive relationship between perceived reputation and trust in online retailers (McKnight *et al.*, 2002). A classic way to build a reputation online is the feedback system. Feedback means the possibility of leaving a comment or rating a particular service (or product) by entering a personal evaluation (Broutsou *et al.*, 2012). Many providers (such as eBay, Amazon and Yahoo) have established such online reputation systems to promote the exchange of information on the credibility of individual merchants (Broutsou *et al.*, 2012). Another tool is the information provided on the corporate website, which is defined as the degree to which a site offers information that buyers perceive as useful (Luo, 2002). Product diagnostics is the extent to which a buyer believes that a website helps evaluate a product (Kempf and Smith, 1998). It reflects the website's ability to provide relevant product information to help online shoppers accurately assess product quality. Offering proper online product diagnostics reduces product uncertainty as this is also a weapon against adverse selection. Finally, the concept of social presence refers to the extent to which a means of communication is perceived as truly capable of transmitting the participants' presence in the communication and making interactivity via the web closer to the consumer (Short *et al.*, 1976). In a nutshell, it creates a perceptual illusion in which the user perceives distant entities, such as websites or online sellers, as if they were close (Choi *et al.*, 2001). However, food and drink are particular products, the purchase of which is still closely related to physical components such as sight, smell and touch. Therefore, we hypothesised a positive impact of uncertainty on perceived transaction costs, and therefore a negative impact on the willingness to shop online.

H1. Uncertainty may increase the transaction costs for grocery online purchase.

Asset Specificity

As mentioned above, TCT defines Asset Specificity as the degree of specificity of durable investments made to execute particular transactions (Williamson, 1979). Asset specificity can be human and physical (Teo *et al.*, 2004). The first is the investment, in terms of time and effort, to acquire the necessary skills to purchase online (Teo *et al.*, 2004). The second is the economic investment made to pursue the transaction (Teo *et al.*, 2004). In this context, it can refer to all those specific actions and purchases made to buy online. Given the current wide availability of tools to buy via the web (smartphones, computers, tablets) and that they are essential for almost all daily activities, we have not considered this latter type of investment in the model.

The main problem with buying goods online is the learning process that the customer goes through (Liang and Huang, 1998; Teo *et al.*, 2004). It is common knowledge that inexperienced consumers are significantly influenced by the specificity of the assets, vice versa, the experienced ones, not at all (Teo *et al.*, 2004). As Liang and Huang (1998) reported, the buying process is complex as it consists of several steps. First, the search for information and comparison. Nowadays, this step also includes the negotiation phase, which takes place mainly through the comparison of related products and services on specific platforms. Then, examination, order and payment, delivery and post-service follow-up. Therefore, online acquisition is a complex process. It starts by learning where to buy the needed product, how and where to compare different products and websites, and how to save money by shopping online. These human investments, in time and effort, increase transaction costs. It follows that:

H2. Asset Specificity may increase the transaction costs for grocery online purchase.

Consumers' Interest

Satisfying consumers' interests may affect acceptance of online tools (Wigand, 1997). Following the actors have a bounded rationality. It means that they have limited memory and limited cognitive power. Thus, they are not capable of process or rather known all the information, and to reach an optimal decision may be difficult (Williamson, 1981). Therefore, opportunistic behaviours may arise, i.e., the actors may not be entirely honest about their decisions or try to take advantage of the situation (Teo and Yu, 2005). In this sense, the transaction governance may also depend on the actors' interests. Teo *et al.* (2004) consider convenience and economic utility as the main proxies for consumers' interest. In fact, it is fair to assume

that consumers, given the uncertainty of the situation and their bounded rationality, make decisions to maximise these two elements. The first can be defined as the perceived advantages of online shopping (Eastlick and Feinberg, 1999). Indeed, by shopping online, consumers can save time, effort, stay safe at home, and find the best product for their needs by checking different websites (Jiang *et al.*, 2011). Consumer interest (CI) has been found to have a significant impact on behavioural intentions related to online shopping for delivery food (Yeo *et al.*, 2017).

Economic utility refers to the alleged possibility of making better bargains (and prices) by shopping online (Eastlick and Feinberg, 1999; Teo *et al.*, 2004). It has an impact on behavioural intentions (Yeo *et al.*, 2017). Moreover, online sellers often apply specific discount strategies, making digital buying even more convenient. Additionally, consumers can compare websites and prices to find the best deal. Therefore, in the present study, we considered consumer interest as an antecedent of transaction costs for purchasing food and wine online, as a proxy of the opportunistic behaviours of the consumers, given their bounded rationality.

H3. Consumer interests may decrease the transaction costs for grocery online purchase.

In the literature about consumers' and transaction costs, the antecedents usually do not present interactions between themselves (Liang and Huang, 1998; Eastlick and Feinberg, 1999; Teo *et al.*, 2004; Teo and Yu, 2005). In fact, they may be considered as distinct features linked to transaction costs, each of them trying to capture a different shade of consumers behaviour in the transactional process.

Transaction costs, Willingness to Buy, and Covid-19

As earlier mentioned, online shopping can be seen as the most decentralised form of food acquisition. According to the literature, and the transaction costs theory, transaction costs (TC) can affect consumers' behaviour regarding online shopping (Liang and Huang, 1998; Eastlick and Feinberg, 1999; Teo *et al.*, 2004; Williamson, 1991). Thus, the following hypothesis:

H4. There is a negative relationship between transaction costs and willingness to grocery online.

According to the statistics, the Covid-19 has increased online food purchase (Gao *et al.*, 2020). The Pandemic has created several difficulties,

linked with the environmental perception. If the environment is perceived as risky, the consumers may change their behaviour accordingly (Kim *et al.*, 2021). The discomforts associated with Covid-19 pandemic (Covid) may have increased the willingness to buy online (Gao *et al.*, 2020; Hobbs, 2020; Kim *et al.*, 2021). Therefore, our fifth hypothesis is the following:

H5. The discomforts associated with Covid-19 pandemic increase the willingness to buy grocery online.

Given that, we would observe if the difficulties associated with Covid-19 may mediate the relationship between TC and WTB. In fact, if the transaction costs associated with online grocery purchase are high, the discomforts created by the pandemic may be perceived as higher, and this may influence consumers' behaviour regarding online purchase (WTB) (Gao *et al.*, 2020).

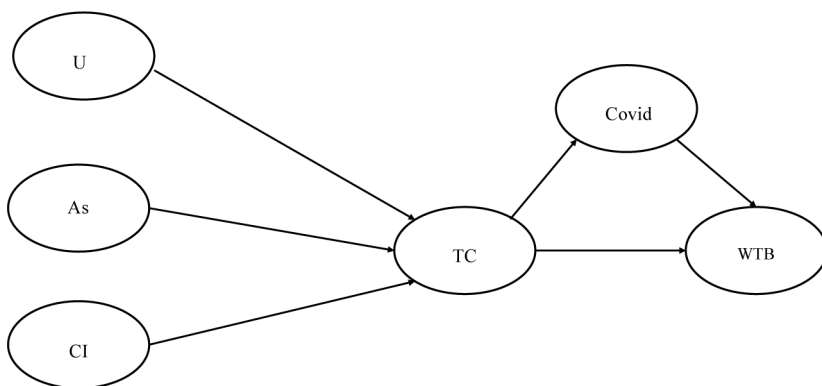
Therefore, the following hypotheses:

H6. High transaction costs may increase the perceived discomforts associated with Covid-19.

H7. The perceived discomforts due to the Covid-19 pandemic mediate the relationship between transaction costs and willingness to buy grocery online.

Figure 1 shows the Conceptual Model used for the analysis, with all the relations presented in the previous paragraphs.

Figure 1 - Conceptual Model



Source: Authors' elaboration.

Data Collection

To conduct the research, we used a positivist deductive approach to the theory development (Yeo *et al.*, 2017). Using a positivist approach should help avoid bias in the research (Saunders *et al.*, 2009). To limit costs, use digital-only means and facilitate collection, we used a non-probabilistic sampling method to collect the data (Armstrong *et al.*, 2014; Yeo *et al.*, 2017), and convenience sampling (Yeo *et al.*, 2017). We used a questionnaire, using Google Form, distributed in Italy between November and December 2020. A pre-test of 10 questionnaires was carried out, which were removed from the final sample. A sample size of 220 respondents was reached. The questionnaire was in Italian, and we informed the interviewees about the anonymity of the data before the start.

Research Design

The first was a filter question, which asked respondents if they had ever purchased anything online; if not, the questionnaire had been concluded (only 21 in our study). A final sample composed of 199 observations was analysed. The questionnaire consisted of two sections. A socio-demographic section (Table 1), in which the interviewees were asked about purchasing habits of food and wine products, age, gender, occupation, highest level of education, origin (Northern Italy, Central Italy, Southern Italy, Island) and residence (town centre, suburb, countryside). The second section included the research variables adapted from the study of Teo *et al.* (2004) and others, adjusted considering the products of our study (food and wine, i.e., groceries). All the scales were seven-point Likert scales. Appendix A shows each indicator definition, mean values and standard deviation.

In the uncertainty composite (U), we included both product uncertainty and behavioural (manufacturer's) uncertainty. For the first, six questions were asked, three for food and three for wine. These items measured how difficult it was to find good value for money, high-quality (Liang and Huang, 1998), and certified products (Scuderi *et al.*, 2019). We adapt four constructs from Eastlick *et al.* (1999) for behavioural uncertainty. Respondents were asked to what extent they have difficulty trusting sellers, finding responsive sellers, reliable information, and certified producers (i.e., who have received awards, and accolades). As mentioned above, asset specificity (As) was measured only in terms of human asset specificity, using a five-item scale.

Respondents were asked how much time they spent learning how to shop online (Joshi and Stump, 1999), comparing products online, and finding

trustworthy websites (Liang and Huang, 1998). Respondents were also asked, considering the nature of these products (food and wine), how much their habits would change if they started buying food and wine online. Frequency (F) was measured simply as how often respondents usually buy them online (Everaert *et al.*, 2010). Consumer interest (CI) was measured on a seven-item scale, three of which assessed the extent to which online shopping for food and beverages enabled consumers to search for hard-to-find products (Eastlick and Feinberg, 1999), and save time (Eastlick and Feinberg, 1999). One element was specific to wine: the extent to which online shopping allows respondents to purchase niche wines (biodynamic, sulphite-free, with wild yeasts). These three elements were related to the convenience dimension. The other four measured economic usefulness, so the extent to which buying food and wine online has made it easier for the consumer to take advantage of special discounts and coupons (Achadinha *et al.*, 2014), and save money (Eastlick and Feinberg, 1999). These two items were for both the products, while the other two were for wine only: the extent to which online shopping made it easier to find the best (possibly rare) and better-priced wines (Eastlick and Feinberg, 1999). Transaction costs (TC) were measured on a scale of six elements, three related to time spent searching for the right online stores and products, comparing and inspecting products, adapted by Liang and Huang (1998). One element was related to the time taken to trace the products shipped, adapted from Dahlstrom and Nygaard (1999). Another element was to the time spent understanding the information provided by the websites adapted from Stump and Heide (1996). The last one was shipping costs, adapted from Liang and Huang (1998). Six elements were used to measure willingness to buy (WTB), adapted from Dodds *et al.* (1991). Regarding the perceived discomforts due to Covid-19, we created an ad-hoc five-item scale using the study of Perdana *et al.* (2020) about the uncertainty created by the pandemic in the food supply network, and the study of Pressman *et al.* (2020) about the perceived security risks associated with the pandemic. Therefore, we asked how difficult it was for respondents to get food and drinks out, go to the store, find what they want at the store, find staff who respect the rules to prevent the spread of the disease, and wait to enter the supermarket.

Table 1 - Socio-demographic characteristics

Variable		Total
Responsible for Food Shopping	Yes	87
	Sometimes	96
	No	16
Have you ever bought Food or Wine On-line?		199
	Yes	143
Gender	No	56
	Male	83
	Female	115
	Not specified	1
Age		199
	18-30	138
	31-45	32
	46-65	26
	> 65	3
Origin		199
	North	28
	Centre	135
	South	15
Residence	Islands	21
	City centre	111
	Suburb	65
	Countryside	23
Education		199
	Below High School	1
	High School	36
Family members	University and over	162
	Single	36
	2 members	65
	3 members	38
	4 members	40
	> 4 members	20
Occupation		199
	Not occupied	14
	White-collar	94
	Blue-collar	5
	Self-employed	26
	Soldier	1
	Pensioner	1
	Student	54
	Not specified	4

Source: Authors' elaboration.

3. Results

Measurement Model

Measurement and structural models were analysed using SmartPLS (Ringle *et al.*, 2015). Confirmatory composite analysis (CCA) (Schuberth *et al.*, 2018) was used to test the measurement model, which evaluates the relationships between constructs and indicator variables. First, indicators with factor loading below 0.5 were removed (Hair Jr *et al.*, 2014). Then, we evaluated the composite reliability and Cronbach's alpha. Both the indices have as ideal cut-off 0.7 (Ramayah *et al.*, 2018; Ringle *et al.*, 2020). All the latent constructs of the model possess composite reliability (Table 2). The second component of the measurement model is the convergent validity, measured by the Average Variance Extracted (AVE). It reflects the average commonality for each latent factor in a reflective model, and the cut-off criterion value is 0.5 (Ramayah *et al.*, 2018; Ringle *et al.*, 2020). Thus, constructs possess convergence validity (Table 2). We also considered the constructs' discriminant validity, accessed through the Heterotrait Monotrait (HTMT) ratio procedure, Fornell-Larcker criterion, and cross-loadings. The most conservative threshold for the HTMT ratio is less or equal to 0.9 (Henseler *et al.*, 2015). In our study, the HTMT ratio values are less than 0.9, so discriminant validity is attained (Table 3). The Fornell-Larcker criterion was also respected, and so were cross-loadings.

Structural Model

Table 4 shows the results of the structural model. H1 and H2 were both confirmed, showing that increasing U and As, the TC for the consumer increase ($\beta = 0.261$, $t = 3.703$, $p = 0.000$ and $\beta = 0.480$, $t = 7.885$, $p = 0.000$). This means that, when the consumers are uncertain about the bargain they are making or the specificity of the asset "know how to buy online" is perceived as high, the TC for buying groceries online increase. On the other hand, the effect of CI is neither significant nor negative, but it is of small magnitude ($\beta = 0.039$, $t = 0.392$, $p > 0.1$), rejecting H3. This means that this variable does not significantly affect the TC for the consumers and that they may not find convenient buy online.

The results also show that the direct relationship between TC and WTB, although negative, it is not significant ($\beta = -0.089$, $t = 0.989$, $p > 0.1$), rejecting H4. This means that TC do not have a significant impact on the decision of buying online. However, Covid-19 has had an interesting effect in this relationship. In fact, as the discomforts due to Covid-19 pandemic

Table 2 - Factor loadings, reliability and validity

	Λ	Alpha	CR	AVE
Uncertainty		0.909	0.924	0.578
U1	0.834			
U2	0.774			
U3	0.830			
U4	0.799			
U5	0.639			
U6	0.713			
U7	0.766			
U8	0.678			
U9	0.784			
Asset Specificity		0.749	0.857	0.670
As1	0.882			
As2	0.888			
As3	0.665			
Consumers' Interest		0.856	0.877	0.547
CI1	0.820			
CI2	0.616			
CI3	0.778			
CI4	0.840			
CI5	0.736			
CI6	0.617			
Transaction Costs		0.806	0.861	0.564
TC1	0.796			
TC2	0.884			
TC3	0.535			
TC4	0.570			
TC5	0.890			
WTB Groceries On-line		0.887	0.916	0.686
WTB1	0.816			
WTB2	0.768			
WTB3	0.810			
WTB4	0.882			
WTB5	0.859			
Covid discomforts		0.719	0.824	0.540
Covid1	0.772			
Covid2	0.679			
Covid3	0.692			
Covid4	0.790			

Source: Authors' elaboration.

Table 3 - Discriminant Validity using HTMT

	As	Covid	CI	TC	U
As					
Covid	0.347				
CI	0.143	0.232			
TC	0.658	0.363	0.135		
U	0.326	0.315	0.183	0.419	
WTB	0.089	0.221	0.545	0.093	0.132

Source: Authors' elaboration.

Table 4 - Hypotheses testing

	Path Coefficient	Standard Deviation	T Statistics	P Values
U -> TC	0.261	0.071	3.703	0.000***
As -> TC	0.480	0.061	7.885	0.000***
CI -> TC	0.039	0.100	0.392	0.695
TC -> WTB	-0.089	0.090	0.989	0.323
Covid -> WTB	0.204	0.089	2.285	0.022**
TC -> Covid	0.285	0.077	3.702	0.000***

*** p<0.01, ** p<0.05, * p<0.10

Source: Authors' elaboration.

increase, so does the perceived Transaction Costs ($\beta = 0.285$, $t = 3.702$, $p = 0.000$), confirming H6. On the other hand, as expected, the pandemic has had a significant effect on the WTB online ($\beta = 0.204$, $t = 2.285$, $p = 0.022$), confirming H5.

Mediation Analysis

For what may concern the mediation analysis, the results are presented on Table 5. H7 is confirmed, as the effect of TC on the WTB, with the mediation of the discomforts created by the Covid-19, is positive and significant ($\beta = 0.058$, $t = 1.828$, $p = 0.068$). Therefore, although TC do not

affect directly consumers' behaviour (WTB), the pandemic fully mediates this relationship, making it both positive and significant. Furthermore, it can be interesting to notice that the indirect effect of both U and As on the perceived discomforts due to Covid-19 is positive and significant, while their indirect effect on the WTB (with the mediation of the variable Covid) is positive, but significant only for As.

Table 5 - Mediation Analysis

	Total Effects		Direct Effects	
	<i>Coefficient</i>	<i>T Statistics</i>	<i>Coefficient</i>	<i>T Statistics</i>
TC -> WTB	-0.031	0.336	-0.089	0.989
	Indirect Effects			
	<i>Coefficient</i>	<i>Standard Deviation</i>	<i>T Statistics</i>	<i>P Values</i>
TC -> Covid -> WTB	0.058	0.032	1.828	0.068*
AS -> TC -> Covid	0.137	0.045	3.049	0.002***
U -> TC -> Covid	0.074	0.028	2.696	0.007**
As -> TC -> Covid -> WTB	0.028	0.017	1.673	0.094*
U -> TC -> Covid -> WTB	0.015	0.009	1.626	0.104

Source: Authors' elaboration.

Analysis with WarpPLS

The results were checked using non-linear PLS-SEM, provided by WarpPLS 7.0 (Kock, 2017), which implements a non-parametric algorithm called Warp3. This algorithm is like other PLS algorithms, calculating weights, loadings, and variable scores (Kock, 2017). The warping is performed at the path coefficient level, using a Robust Path Analysis technique (Kock, 2017). Table 6 presents all the Model Fit and Quality indices provided by WarpPLS (Kock, 2010, 2014) which confirm the global model fit (i.e., the model fit with the data).

Furthermore, the results for all the hypothesis were confirmed, including the mediation effect. The effect sizes provided are similar to Cohen's (1988) f-squared coefficients, but calculated through a different procedure to avoid a distortion inherent in the use of classic PLS-based SEM algorithms (Kock, 2014). With the effect sizes it is possible to assess whether the effects indicated by path coefficients are small, medium, or large. The cut-offs usually are 0.02, 0.15, and 0.35, respectively (Cohen, 1988). Values below

Table 6 - Model Fit and Quality Indices with WarpPLS

<i>Coefficients</i>	<i>Coefficient</i>	<i>P Values</i>
Average path coefficient (APC)	0.211	< 0.001
Average R-squared (ARS)	0.160	< 0.001
Average adjusted R-squared (AARS)	0.152	< 0.001
<i>Indices</i>	<i>Value</i>	<i>Cut-off</i>
Average block VIF (AVIF)	1.094	acceptable if ≤ 5 , ideally ≤ 3.3
Average full collinearity VIF (AFVIF)	1.359	acceptable if ≤ 5 , ideally ≤ 3.3
Tenenhous GoF (GoF)	0.312	small ≥ 0.1 , medium ≥ 0.25 , large ≥ 0.36
Sympson's paradox ratio (SPR)	1.000	acceptable if ≥ 0.7 , ideally = 1
R-squared contribution ratio (RSCR)	1.000	acceptable if ≥ 0.9 , ideally = 1
Statistical suppression ratio (SSR)	1.000	acceptable if ≥ 0.7
Nonlinear bivariate causality direction ratio (NLBCDR)	1.000	acceptable if ≥ 0.7

Source: Authors' elaboration.

0.02 indicate very weak effects, too weak to be considered relevant (Kock, 2014). In our model, the ES for CI is below the threshold for the significance (0.001), meaning that this variable does not affect the perceived TC at all (Table 7).

Table 7 - Effect Size

	U	As	CI	TC	Covid	WTB
TC	0.102	0.252	0.001			
Covid				0.090		
WTB				0.004	0.031	

Source: Authors' elaboration.

Discussion

The first part of the study assesses the relationship between consumers' perceived transaction costs for online grocery shopping, their antecedents (As and U) and consumer interest (CI).

The results confirm H1 and H2, as well as the theory of transaction costs (Williamson, 1979, 1991), the findings of Marchini *et al.* (2021), and Teo *et al.* (2004). Which means that Uncertainty and Asset specificity are antecedents of transaction costs (Williamson, 1979, 1991; Teo *et al.*, 2004),

and, considering online shopping as an extremely decentralised purchasing form, it is confirmed that it is chosen when AS is low, as well as U (Marchini *et al.*, 2021). H3 is strongly rejected, meaning that both the convenience and the economic utility are not important determinants neither of TC nor of WTB, contrary to previous literature (Wigand, 1997; Eastlick and Feinberg, 1999; Teo *et al.*, 2004; Jiang *et al.*, 2011; Yeo *et al.*, 2017). It is probably because, unlike technologies, food is a particular category of product. As explained by Marchini *et al.* (2021), regarding groceries, consumers may find it difficult to trust and rely on decentralised forms of purchase. This is because food is a fundamental asset of the “health capital” (Marchini *et al.*, 2021). Thus, economic utility or convenience may not be as important as other aspects (such as, safety or quality) for food and wine purchase. This theory may also explain why the results obtained by Yeo *et al.* (2017) for take-away are, in this respect, so different from ours. In fact, this type of food is intrinsically characterised by components as speed and convenience, and it is a highly decentralized form of purchasing (Marchini *et al.*, 2021). Furthermore, if we consider CI as a proxy of some sort of “opportunistic” consumer behaviour (for example, they might think that buying the same product online instead of in the store can save money/time, at the expenses of sellers) it must be said that this may not apply to groceries. In fact, in Italy, shopping online for food is usually more expensive than going to the store. Major supermarket chains usually offer this service, but at a higher cost. Therefore, consumers may not find it convenient (or opportunistic) to shop online rather than in-store, as is the case with other products (such as books or technologies). For wine taken individually, however, the situation could be different, but in the present study it was analysed together with food, so we cannot know for sure. However, we must take into account the fact that discounts on wine in supermarkets can be attractive to the consumer.

Surprisingly, perceived transaction costs do not significantly impact willingness to buy food and wine online (rejecting H4), even if the sign is consistent with the theory (Williamson, 1979, 1991; Teo *et al.*, 2004; Marchini *et al.*, 2021). On the other hand, the perceived discomforts due to Covid-19 have a significant and positive impact on the WTB (H5), confirming that the pandemic has affected (at least as long as restrictions are imposed) consumption patterns (Gao *et al.*, 2020; Kim *et al.*, 2021). Furthermore, the results for H6 and H7 confirm that there is a relationship between perceived TC, discomforts created by Covid-19, and WTB food and wine online (Dannenberg *et al.*, 2020). In particular, the difficulties caused by asset specificity and uncertainty increase the perceived discomforts due to Covid-19. The pandemic (and its effects in everyday life) seems to act as a mediator in the relationship between TC and WTB food and wine online, possibly leading to a change in consumption patterns (Hobbs, 2020). In fact,

while from the results there is no significant relation between TC and WTB, Covid-19 has a direct effect on the propensity to purchase online (H5), and transaction costs have an indirect effect mediated by Covid-19 (H7). Thus, Covid-19 may lead to a shift towards online grocery purchase, despite the difficulties encountered during the process (uncertainty and asset specificity). Furthermore, the partial mediation between the antecedents of TC and the perception of the discomforts due to Covid-19 indicates that the difficulties encountered in buying food and wine online increase those perceived from the pandemic (Dannenberg *et al.*, 2020). Although this result is limited, it opens up several avenues of research. Three main questions should be answered soon: Will this effect last? Are there any other variables that can have an influence? What will be the effects on the food supply chain?

Conclusions

The current study seeks to assess the role of the Covid-19 pandemic on the relationship between TC and WTB food and wine online. From the results, transaction costs seem not to impact the WTB significantly, but the sign is correct. Furthermore, the study tries to establish whether TCT can also be applied to the online purchase of food and wine products. From the results, the theory holds for these products, although the role of frequency is uncertain. On the one hand, the sign of the relationship is right, confirming the TCT. On the other hand, the relationship is not significant.

From a managerial standpoint, these findings can help those manufacturers struggling with low-performing e-commerce during the Covid-19 pandemic. When restrictions are enforced, manufacturers should take actions to reduce the uncertainty associated with online shopping. As for the specificity of the assets, we should intervene with websites designed ad-hoc, making the experience more accessible for the consumer and more understandable. Furthermore, to avoid the difficulties generated by checking multiple websites and buffer the costs for their creation, producers (especially if local) could join forces and create shared and user-friendly platforms.

The main limitation of this study was the composition and sample size, although we used bootstrapping to compensate for this bias partially. First of all, the sample comprises many young graduates who certainly know the online tool more than other population segments. It would therefore be interesting to analyse the results on different socio-demographic contexts. Another limitation concerns the geographical distribution of the sample, which is mainly concentrated in central Italy. Furthermore, consumption patterns are generally country-specific, so it is not easy to generalise these results. However, the possibilities for new researchers are endless. In fact,

given the pandemic's effect on consumer behaviour, it may be interesting to study whether it will last or change (at least for some categories of consumers) and, if so, for which ones. Furthermore, the same study could be conducted in a comparative way, similar to that of Teo *et al.* (2004). It might also be interesting to study the same phenomenon for purchasing local food and short supply chains.

The main implication for all the actors in the supply chain (plus politicians) is that probably there was a change in consumption and purchase pattern. While in other countries shopping online has long been a widespread behaviour, as seen in the introduction, Italy seems to be reluctant to this type of change. The reasons, as previously illustrated, are different and involve logistical problems, the cultural and social background. However, the consumers after the advent of Covid-19 may change this perspective, so much so that they do not "allow" the transaction costs to impact their purchasing behaviour as much as the inconvenience due to Covid-19. In any case, if at the end of the pandemic a good part of consumers will return, or rather, continue to buy in stores, a slice could decide to continue shopping online or to adopt a hybrid purchasing regime (to recall Williamson's theory). In both cases, there would be a change in buying patterns. There is no doubt that Covid-19 has changed our behaviour.

From a political point of view, according to our study results, sellers should be helped (practically and economically) to adapt to the possibility of selling, primarily online. It could be crucial to reach a broader consumer base and intervene in times of crisis like this. The creation of institutional platforms where small and local producers can easily organise the distribution using technological means could reduce the costs associated with creating and maintaining an e-commerce channel. In conclusion, we do not know what our future "normality" will be like, but it will probably include more digitalisation and online shopping, even for food and wine; so, it may be the right time to start thinking about solutions that are as practical as they are (perhaps) essential.

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Appendix

Appendix A. Indicators' definition

Uncertainty	Mean	Min	Max	SD
It was difficult to find certified producers/sellers	3.18	1.00	5.00	1.48
It was difficult to find responsive sellers	3.44	1.00	5.00	1.59
It was difficult to find reliable information	3.45	1.00	5.00	1.45
It was difficult to trust the producers/sellers	3.05	1.00	5.00	1.44
It was difficult to find certified products(food)	2.88	1.00	5.00	1.56
It was difficult to find high-quality food	3.11	1.00	5.00	1.54
It was difficult to find certified wine	2.71	1.00	5.00	1.62
It was difficult to find qualified wine producers	2.92	1.00	5.00	1.50
It was difficult to find high-quality products (wine)	2.79	1.00	5.00	1.55
Asset Specificity				
I spent a lot of time comparing products	3.34	1.00	5.00	1.67
I spent a lot of time searching for trustworthy websites	3.47	1.00	5.00	1.56
I spent a lot of time learning how to shop online	2.06	1.00	5.00	1.30
Consumers' Interest				
Online shopping allows me to buy hard-to-find products	4.86	1.00	5.00	1.90
Online shopping allows me to save time	5.01	1.00	5.00	1.91
Online shopping allows me to use coupons and discounts	4.43	1.00	5.00	1.81
Online shopping allows me to buy niche wines	4.54	1.00	5.00	1.82
Online shopping allows me to buy the best wines	4.03	1.00	5.00	1.80
Online shopping allows me to buy better-priced wines	3.92	1.00	5.00	1.69
Transaction Costs				
I spent a lot of time comparing products	3.00	1.00	5.00	1.54
I spent a lot of time inspecting products	4.07	1.00	5.00	1.67
I found ship charges very high	3.62	1.00	5.00	1.61
I spent a lot of time tracking my shipped products	3.20	1.00	5.00	1.57
I spent a lot of time understanding website info	3.67	1.00	5.00	1.59
WTB Groceries On-line				
I want to buy food online	3.36	1.00	5.00	2.17
I will buy food online	3.26	1.00	5.00	2.05
I would like to buy wine online	3.37	1.00	5.00	1.99
I want to buy wine online	3.26	1.00	5.00	2.06
I will buy wine online	3.20	1.00	5.00	1.97
Covid discomforts				
During Covid-19 was difficult to find what I want at the store	2.57	1.00	5.00	1.46
During Covid-19 going to the store was difficult	3.11	1.00	5.00	1.66
During Covid-19 was difficult to find store's personnell who respected prevention rules	2.89	1.00	5.00	1.51
During Covid-19 was difficult to wait outside the store	3.22	1.00	5.00	1.61

Source: Authors' elaboration.

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