ESKİŞEHİR TECHNICAL UNIVERSITY JOURNAL OF SCIENCE AND TECHNOLOGY
A- APPLIED SCIENCES AND ENGINEERING

2021, 22(3), pp. 312-325, DOI:10.18038/estubtda.962633

RESEARCH ARTICLE

ANALYSIS OF ONLINE SHOPPING BEHAVIORS DURING COVID 19 PANDEMIC: ANKARA CASE

Burcu YILMAZEL[1,*], Müzeyyen Anıl ŞENYEL KÜRKÇÜOĞLU [2], Tuğrul HOCAOĞLU [3], Saye Nihan ÇABUK [4], Bülent GÜNSOY [5], Alper ÇABUK [6]

[1] Department of Computer Engineering, Faculty of Engineering, Eskisehir Technical University, Eskisehir, Turkey
[2] Department of City and Urban Planning, Faculty of Architecture, Middle East Technical University, Ankara, Turkey
[3] Department of Marketing and Personal Relations, Yalvaç Vocational School, Isparta Applied Sciences University, Isparta, Turkey
[4] Department of Geodesy and Geographical Information Technologies, Earth and Space Sciences Institute, Eskisehir Technical University, Eskisehir, Turkey
[5] Department of Economics, Faculty of Economics, Anadolu University, Eskisehir, Turkey
[4] Department of Architecture, Faculty of Architecture and Design, Eskisehir Technical University, Eskisehir, Turkey

ABSTRACT

The COVID-19 pandemic has caused noticeable changes when it comes to the consumption and purchasing behaviors of customers and the increase in online shopping besides various fields such as health, education, and transportation. Within this context, the goal of this study is to determine the relations between the online shopping, shopping locations, and the 3 particular time intervals during the COVID-19 pandemic in Turkey, which were set to represent the pre-pandemic, pandemic, and new normal periods, in 2020. Correspondingly, the purpose of the study is to reveal the differences among the essential pandemic periods in the country and the selected geographic context regarding online food and non-food expenditures. To fulfill this aim, the online shopping data of Marketyo were processed and a sample of 979 observations from 7 districts of Ankara province was analyzed via two factor ANOVA method to determine the effects of pandemic periods and chosen districts on online food/non-food expenditures. The results revealed a significant statistical difference in mean food and non-food expenditures among both periods and districts. The highest amount of food and non-food expenditures were recorded mostly in Etimesgut, Çankaya, and Keçiören districts during Period-2, while the lowest was in Altındağ, Mamak, and Sincan districts during Period-1. According to the Turkey HSD test results, Sincan differed from all the other districts, as the lowest online market spending rate was recorded in this district. The results are assumed to be in line with the socio-economic development levels of the districts, as well as other issues such as internet accessibility, availability of technological devices, and geographical factors. The findings of this study are supposed to provide guidance for further studies for the determination of the pandemic on online shopping behaviors and patterns, as well as their geospatial relations.

Keywords: COVID-19, Online shopping, Shopping behavior, ANOVA

1. INTRODUCTION

Besides various fields such as health, education, transportation etc., the emergence and rapid spread of the COVID-19 pandemic have caused changes on the consuming and shopping behaviors of the customers [1–3] and increased e-commerce sales [4]. Overwhelming demand on some particular products such as food, groceries and healthcare and decreased sales of non-essential goods, especially during the early stages of COVID-19 spread, were also reported [5]. The research of [6] has shown that in the first weeks of the pandemic, a significant number of consumers tended to stock a large number of products, mostly of food. The study of [7] showed that US citizens have begun to radically change their typical shopping habits with the COVID-19 pandemic. When the pandemic occurred, US citizens first increased all their expenditures by more than 40%, attempted to stockpile products by borrowing and using credit cards, and then all expenditures sharply decreased by 25-30%, especially in travel, entertainment and restaurants. The only exception to this decline has been food expenditures in particular and grocery-drugstore expenditures in general. [8] highlighted the increase in food purchases

*Corresponding Author: sncabuk@eskisehir.edu.tr
Received: 05.07.2021 Published: 29.09.2021

and a disfavor in luxury good demand. There is also a good number of studies supporting the fact that pandemic has increased the overall shift towards online shopping methods and channels although the results vary from country to country [9–13]. According to the Bazaarvoice[1] data regarding the impact of COVID-19 on e-commerce, online commerce has started to increase on a global scale since February 2019 and this increase rate reached 96% in April, when the social isolations peaked.

[14] conducted a study in 16 USA cities to determine the changes in local commerce by the examination of approximately 450 million credit card transactions on a monthly basis corresponding to 11 million customers. Besides putting forward comprehensive details about the shifts in purchasing rates in different locations and from different in-come groups, the authors also concluded that there was a 1,5% growth in local commerce online spend in March 2020.

Some of the publications in the field focused specifically on the food shopping related issues during the pandemic and the evaluations were made on subjects such as changes in shopping behaviors, patterns and methods [15–17]. Some researchers examined the changes in the demand/sales/consumption of specific types of products during COVID-19 pandemic such as fruit and vegetables [18] and dairy products [19]. [20] aimed to determine the relation between the number of COVID-19 cases and purchasing preferences (consumer behaviour) of the grocery customers in USA and conducted an online choice experiment with 900 respondents to fulfil this aim. The survey was based on discrete choice experiment method allowing the detection of particular attributes, namely purchasing methods, time window, minimum order and fee under given scenarios of the pandemic. The results revealed that the preferences have significantly changed during the pandemic and there was an inverse ratio between the increase in the COVID-19 spread and the in-shop shopping willingness. [21] also conducted an online survey in two major metropolitan areas in USA with the participation of 861 respondents to determine changes in the food purchases and consumption patterns between March and May 2020. The authors also highlighted the considerable increase in the purchases of particular products such as household cleaners and hand sanitizers in March 2020, and increasing demand on online shopping services, including online grocery shopping since the pandemic started. The results of the survey showed that 66% of the participants preferred to go to the store less often due to the risks shopping at the store and the amount of the snack consumption increased by 41,9 %. Regarding the relation with income and food categories, only little statistical significance was determined. [22] also made an online survey with 961 respondents in January-February 2020 in China for eliciting the food and grocery shopping behaviors. The results showed that the customers' demand was higher on vegetables, rice and meat during the early times of the pandemic, and online shopping increased from 11% to 38%. In another study conducted in the Netherlands to examine the eating behaviors and food purchases during the lockdown, the authors found that a majority of the survey participants kept their eating and food shopping behaviors. Still, there was an increase in the purchase frequency of shelf-stable and frozen products, and no significant change for fruit, vegetables, fish, sweets, snacks and beverages purchases [23].

The first COVID-19 case in Turkey was reported on 11st March, 2020, resulting in various strict measurements, including lockdowns. After COVID-19 came out, spread rapidly and strict measures were taken, all sectors operating in the economy were affected from different angles and at different intensities in the country. The COVID-19 pandemic in Turkey has also increased the rate of online shopping dramatically. According to the data of Interbank Card Center (BKM) available at https://bkm.com.tr/, the number of domestic transactions of domestic and foreign cards in online shopping was 55.824.709 in April 2020. In 2020, when the COVID-19 pandemic continued, the use of internet and mobile payment technologies has increased in all segments of the society and the habit of online payment has become quite common. While the card payments made over the internet were found to be around 190 billion TL in

[1] https://www.bazaarvoice.com/blog/the-impact-of-covid-19-on-e-commerce-by-category/

2019, this figure increased by 37% in 2020 and reached 260 billion TL. With the digital transformation, the share of card payments made by businesses and users over the internet exceeded 22%.

Nevertheless, the literature about the change trends in the online shopping behaviors during the COVID-19 outbreak in Turkey is rather scarce. [24] underlined the overall increase by 200% in e-commerce in Turkey between March and May 2020 and referred to the Pay TR February-March 2020 data to notify the increasing demands for different product categories. The author presented that there was a 186% increase in the grocery category, 168% in the health, 108% in the cosmetics, 69% in the book/stationery, and 42% in the nuts. [25] also referred to the same data in her study to present the change in online purchases according to different product groups in Turkey. However, the context of these studies are rather limited and do not include any information regarding demographic variables, correlations between the shopping preferences and consumers' background etc. [26], on the other hand, conducted a survey with 200 participants to determine the change in online shopping behaviors (shopping frequency, less and most demanded products, etc.) in accordance with the demographic characteristics. The results showed that the online shopping preferences of 64,5% of the participants changed during the pandemic. The less favorable products had a varying range from clothing to cosmetics, and the most preferred ones were food (61,5%), medical products (8%) and cleaning materials (7%), respectively. Still, the results were neither linked with the locations of the participants nor the demographic variables were related with the purchased product categories.

The mentioned studies above reflect important investigation results mostly about the status of online shopping in different geographic context, shopping/purchasing behaviors (methods, time windows, product types and preferences etc.) and their demographic relations (correlation between the results and the demographic variables), during the COVID-19 pandemic. The relevant studies in Turkey, on the other hand, are rather limited, narrowly scoped and mostly focus on the overall online expenditure amounts in the country and distribution of the preferred product types, as well as its relation with the demographic characteristics. No particular study, which examine and compare the changes in online shopping behaviors during different specific time intervals and in different spatial regions, has been detected by the authors. Actually, it is of significance to determine whether particular time periods and different geographical context have also influenced the online shopping preferences. Regarding this necessity, the main goal of this study is to analyze the online food and non-food shopping data in 7 selected districts of Ankara province, Turkey, during 3 main periods of COVID-19 pandemic reflecting the pre-pandemic, pandemic and new normal periods in 2020, so as to determine the relations between the online shopping behaviors, particular pandemic periods and shopping locations on district basis. The results of this study is expected to provide significant contributions to the literature to guide the policy makers and the retail sector. Although this study is not directly related with marketing sector and it has not been possible to comprehensively relate the findings with the demographic characteristics of the shoppers due to the data unavailability, the results are believed to be promising for the marketing strategists and experts as they are expected to facilitate to understand how people from different spatial regions and different time periods were involved in online shopping experience. In other words, marketing sector is not in the scope of this study. Still the results obtained can be taken as basis for further studies in the marketing sector. The differences in online shopping behaviors during particular periods, which also reflect different restriction levels and implementations, may also guide the marketing experts to make detailed research to conclude to what extend the characteristics of the defined periods may have influenced shopping preferences.

2. MATERIALS AND METHOD

2.1. Study Area and Data

This study focuses on the analysis of the online shopping data and their relation with the particular periods of COVID-19 pandemic within the scope of the study. Study area is Ankara province, the capital of Turkey, located in the central Anatolia region with a surface area of 24.521 km². The

province is the second highly populated city in the country with 5.663.322 individuals according to 2020 records. Ankara has 25 administrative districts comprising 1425 neighborhoods, and has been particularly chosen as the study area due to its population characteristics and therefore the potential to comprehensively reflect the shopping tendency in Turkey. Within the context of the study, the most populated 7 districts of Ankara province: Altındağ (A), Çankaya (C), Etimesgut (E), Keçiören (K), Mamak (M), Sincan (S), Yenimahalle (Y) with more observations (online shopping data) are included in the analysis.

Many medium-sized and large supermarkets in Turkey offer online ordering and home delivery services to the customers. One of the general approaches in meeting the technical infrastructure and software requirements required to manage this process is to get support from companies experienced in the software industry. Marketyo[2], is one of the leading companies operating in many different provinces of Turkey, that provides omni-channel marketing and e-commerce solutions for local market chains. It brings customers and these markets together. This feature is very important in terms of representing the broad scope of shopping trends in Turkey. Consequently, within the scope of this study, online market shopping data obtained from Marketyo for Ankara province, during three main periods (Period-1, Period-2, and Period-3) are taken as basis in this study. Considering that the first COVID-19 case in Turkey was officially announced on March 11, 2020, "Period-1" is determined to cover the pre-pandemic period between February 10, 2020 – Mart 11, 2020, a month of intense restrictions (school closures, curfews and restrictions, working from home, isolation rules, etc.) with the first COVID-19 case. "Period-2" is set to include the pandemic period between March 11, 2020 – April 11, 2020, and time in which normalization began along with the reduction of the restrictions. Lastly, "Period-3" comprises the "new normal" period between July 1, 2020 – August 1, 2020.

The structure of the online market shopping data consists of a series of online order information. Each online order is identified by a unique number and contains information about the customer, the order date, the district of the order, and the total order amount. An example order record is shown in Table 1. According to the table, the online order numbered O123 was ordered by customer C1000 on March 20, 2020, the order was delivered to Ankara province, Çankaya district, and the customer paid 125 TL for the delivery.

Table 1. Example of an order record

Order	Order Date	Customer ID	City	Distinct	Order Total
O123	20-03-2020	C1000	Ankara	Çankaya	125
O124	20-03-2020	C3000	Ankara	Mamak	75
O125	20-03-2020	C5000	Ankara	Keçiören	320
O305	06-07-2020	C1000	Ankara	Çankaya	240
O306	06-07-2020	C7000	Ankara	Sincan	450

In addition, for each order, the information of the products that the customer purchased in that relevant order is also available in the data as a transaction. More specifically, for shopping basket identified by a unique transaction number, the information including the code, the category, and the unit price of the product, the quantity bought, and the total price paid for that product by the customer are available. An example transaction is shown in Table 2. According to the table, the transaction numbered T123, which includes the products in the online order number O123, consists of three products: PC4000, PC1000, and PC1010.

[2] https://www.marketyo.com/

Table 2. Example of a transaction set

Transaction ID	Order ID	Product Code	Product Category	Quantity	Unit Price	Total Price
T123	O123	PC4000	Meat & Fish	1	80	80
T123	O123	PC1000	Fruits & Vegetables	5	5	25
T123	O123	PC1010	Cleaning Products	2	10	20
T124	O305	PC3000	Cosmetics	4	50	200
T124	O305	PC1030	General Food	5	8	40

This raw data has been passed through pre-processing steps and data extraction is performed in accordance with the goal of the study. Firstly, considering the order dates, the data is classified into three periods (Period-1, Period-2, and Period-3), and the total expenditures are extracted for each period. Subsequently, the data is also disaggregated on the basis of districts, and the total expenditures are extracted for each district as well. In order to examine the interaction effect between the pandemic periods and the districts on online food/non-food expenditures, purchased products are marked as food and non-food according to their product category, and the amount of food and non-food expenditure was extracted for each order. At this point, orders containing both food and non-food products are included in the analysis. Therefore, orders that do not contain any food products or non-food products are eliminated. As a result, a sample of 979 observations are obtained (Table 3), and the effects of pandemic periods and the districts, as well as the interaction effect between the pandemic periods and the districts on online food/non-food expenditures are examined on these observations details given in Appendix (Table 5).

Table 3. Observations used in the experiments.

	# of Observations			
Districts	**Period-1**	**Period-2**	**Period-3**	**Total**
Altındağ (A)	24	31	27	**82**
Çankaya (C)	94	107	105	**306**
Etimesgut (E)	31	32	31	**94**
Keçiören (K)	43	47	47	**137**
Mamak (M)	44	54	52	**150**
Sincan (S)	14	22	17	**53**
Yenimahalle (Y)	52	54	51	**157**
Total	**302**	**347**	**330**	**979**

2.2. Method

A two-way analysis of variance (ANOVA), namely two factor ANOVA, is used in the analysis of the effects of pandemic periods and chosen districts on online food/non-food expenditures. The group effects, i.e. if there is difference in food/non-food expenditures in terms of pandemic periods and districts as well as the interaction between the pandemic periods and districts, are investigated, thus, a two-way ANOVA is selected for this research. Two-way ANOVA is defined as an analysis method for a quantitative outcome and two categorical explanatory variables [27] and how a response is affected by two factors [4]. The equation (1) is represented as;

$$y_{ijk} = \mu + \alpha_i + \beta_j + \alpha\beta_{ij} + \varepsilon_{ijk} \quad (1)$$

where y_{ijk} is the dependent variable, α_i and β_j are the main effects referring to the categorical explanatory variables for *I* categories in rows and *J* categories in columns, respectively, $\alpha\beta_{ij}$ is the interaction effect, and ε_{ijk} is the error term.

The assumptions for the two-way ANOVA are (1) continuous dependent variable, (2) homogeneity of variance for each combination of factors, (3) no significant outliers, (4) independent observations, (5) normal distribution of the dependent variable.

The study aims to reveal whether there are differences among the pandemic periods as well as selected districts in online food and non-food expenditures. To understand the group differences as well as the interaction effect, a two-way ANOVA is applied to test the following three research questions:

- Is there any difference in online food/non-food expenditures for any pandemic periods at the mean level?
  H_0: $\mu_{P1} = \mu_{P2} = \mu_{P3}$
  H_1: At least one inequality
  α: 0.05

- Is there any difference in online food/non-food expenditures for different districts at the mean level?
  H_0: $\mu_A = \mu_C = \mu_E = \mu_K = \mu_M = \mu_S = \mu_Y$
  H_1: At least one inequality
- α: 0.05
- Is there any interaction between pandemic periods and districts on online food/non-food expenditures?
  H_0: There is no interaction between pandemic periods and districts
  H_1: There is interaction between pandemic periods and districts

In this study, the post-hoc Tukey HSD Test is also applied to reveal the pairwise comparisons for the levels of the main effects (periods and districts) in order to understand whether the pairs significantly differ from each other at the mean level. The HSD Test equation (2) is given below;

$$HSD = \frac{M_i - M_j}{\sqrt{\frac{MS_w}{n}}} \tag{2}$$

Here, $M_i - M_j$ indicates the difference between the pair of means, MS_w is the mean square within groups, and n is the number of subjects in the group. The null hypothesis and the alternative hypothesis for Tukey HSD test are as follows:

Periods

$H_0: \mu_i = \mu_j \; where \; i,j = \{P1, P2, P3\}$
$H_1: \mu_i \neq \mu_j \; where \; i,j = \{P1, P2, P3\}$
$\propto = 0.05$

Districts

$H_0: \mu_i = \mu_j \; where \; i,j = \{A, C, E, K, M, S, Y\}$
$H_1: \mu_i \neq \mu_j \; where \; i,j = \{A, C, E, K, M, S, Y\}$
$\propto = 0.05$

Tukey HSD reveals if a group differs from another, thus, provide more detailed information for policy makers to develop factor-based solutions or ideas.

3. RESULTS

Within the context of the study, a two-way ANOVA is run on a sample of 979 observations to examine the main effects of pandemic periods and the districts, as well as the interaction effect between the pandemic periods and the districts on online food/non-food expenditures. The first factor, pandemic periods, includes 3 levels. Period-1 refers to the pre-pandemic period, Period-2 refers to the

pandemic period with strict measures such as lock-downs, and Period-3 refers to the pandemic period with relaxed measures which is called as the 'new normal'. The second factor, districts, has 7 levels indicating the districts of Ankara: Altındağ (A), Çankaya (C), Etimesgut (E), Keçiören (K), Mamak (M), Sincan (S), Yenimahalle (Y). Although Ankara has more than 7 districts, the most populated ones with more observations are included in the analysis, whereas the districts with less than 30 observations in total has been eliminated to prevent outliers. Log-transformations were applied on the dependent variables (online food expenditures, online non-food expenditures) to get a more normally distributed data. ANOVA, indeed, is a robust test against normality, meaning that it is tolerable to have a non-normal distribution to some extent, while [38] provide empirical evidence for the robustness of F-test under a wide variety of conditions involving non-normal distributions likely to represent real data**.** Nevertheless, log-transformation enables normalization of the data distribution to a certain level, and get more accurate results. There are 979 observations for the online food/non-food expenditures in total, both of which are continuous data reflecting the online market expenditures in Turkish Liras. Descriptive statistics are presented for the dependent variables (food and non-food expenditures) in Table 4.

Table 4. Descriptives for the food expenditures and non-food expenditures.

		Food Expenditures			**Non-food Expenditures**		
Period	**District**	**Mean**	**Std. Deviation**	**N**	**Mean**	**Std. Deviation**	**N**
Period-1	Altındağ (A)	5.912	1.281	24	5.783	1.049	24
	Çankaya (C)	6.220	1.464	94	6.082	1.357	94
	Etimesgut (E)	6.717	1.332	31	6.559	1.276	31
	Keçiören (K)	6.292	0.989	43	6.126	1.058	43
	Mamak (M)	5.423	1.110	44	5.395	1.102	44
	Sincan (S)	4.861	0.950	14	5.029	0.765	14
	Yenimahalle (Y)	5.773	1.422	52	5.539	1.362	52
	Total	6.001	1.363	302	5.871	1.281	302
Period-2	Altındağ (A)	6.914	1.657	31	6.623	1.279	31
	Çankaya (C)	7.998	1.521	107	7.671	1.506	107
	Etimesgut (E)	8.265	1.745	32	8.012	1.660	32
	Keçiören (K)	7.924	1.116	47	7.630	1.057	47
	Mamak (M)	7.061	1.013	54	6.746	1.104	54
	Sincan (S)	5.911	1.268	22	5.927	1.424	22
	Yenimahalle (Y)	7.723	1.103	54	7.327	1.246	54
	Total	7.595	1.484	347	7.295	1.447	347
Period-3	Altındağ (A)	6.718	1.172	27	6.318	1.111	27
	Çankaya (C)	6.985	1.405	105	6.617	1.505	105
	Etimesgut (E)	7.481	1.413	31	7.309	1.513	31
	Keçiören (K)	7.341	0.946	47	7.113	0.954	47
	Mamak (M)	6.581	1.278	52	6.452	1.195	52
	Sincan (S)	5.938	1.289	17	5.488	1.482	17
	Yenimahalle (Y)	6.998	1.380	51	6.563	1.395	51
	Total	6.945	1.338	330	6.636	1.390	330
Total	Altındağ (A)	6.556	1.451	82	6.277	1.197	82
	Çankaya (C)	7.104	1.630	306	6.821	1.600	306
	Etimesgut (E)	7.496	1.624	94	7.301	1.594	94
	Keçiören (K)	7.212	1.214	137	6.981	1.189	137
	Mamak (M)	6.414	1.316	150	6.248	1.262	150
	Sincan (S)	5.643	1.269	53	5.549	1.332	53
	Yenimahalle (Y)	6.842	1.531	157	6.486	1.518	157
	Total	6.884	1.541	979	6.634	1.494	979

The assumption of homoscedasticity is met for both food expenditures and non-food expenditures according to Levene's test with F (20, 958)=1.435, p=.097, and F (20, 958)=1.526, p=.065, respectively. Since the homogeneity of variance for each combination of factors is met, further analyses have been conducted.

The results suggest that there is statistically significant difference in mean food expenditures among periods, F(2, 958)=81.451, p<.001, and among districts, F(6, 958)=18.795, p<.001. However, the interaction effect is not significant F(12,958)=1.091, p=.364. Similar outcomes are observed in non-food expenditures, while the main effects appear to be statistically significant among periods F(2,958)=64.955, p<.001, and among districts F(6,958)=16.921, p<.001, yet the interaction effect is not statistically significant F(12,958)=1.168, p=.302.

The estimated marginal means demonstrate that online food/non-food expenditures are the highest in Period-2, and the lowest in Period-1 (Figure 1), with higher estimated expenditures in Etimesgut, Çankaya and Keçiören districts, and lower estimations for Altındağ, Mamak and Sincan districts.

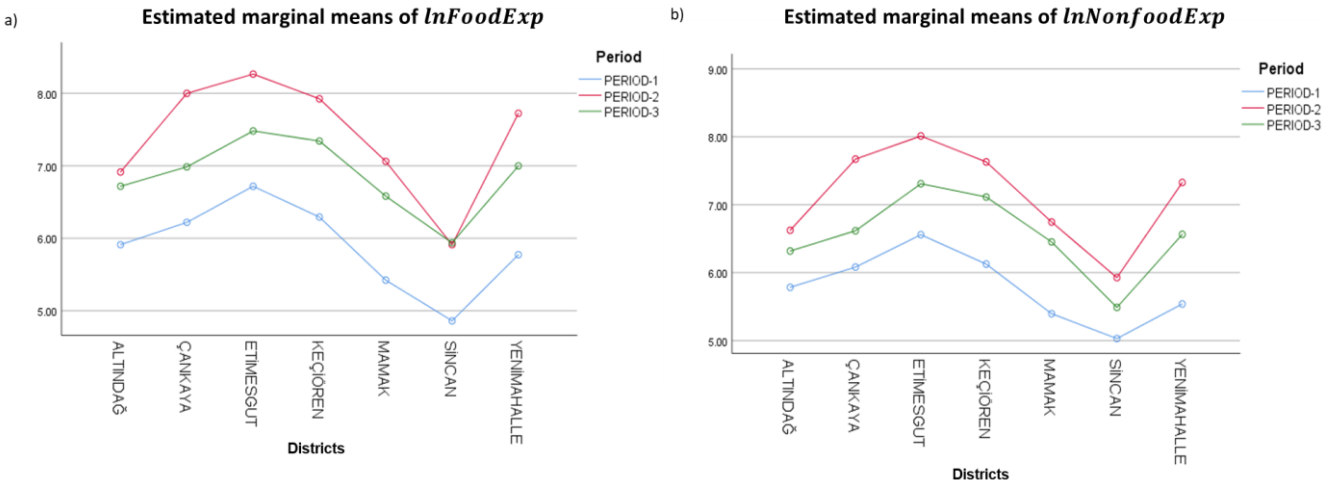

Figure 1. Interaction plots for (a) the food expenditures and (b) the non-food expenditures

Since the assumption of equal variances is met and multiple comparison results show that there are statistically significant differences among both periods and districts regarding food expenditures and non-food expenditures, a post-hoc test is applied to reveal how the groups differ from each other in terms of pandemic periods and districts regarding online expenditures. Tukey's HSDs as reported in the multiple comparisons are investigated to find out evidence for differences among groups.

Multiple comparisons of the periods indicate that all periods are significantly differ from each other for both online food expenditures and non-food expenditures at p<.001 level.

Multiple comparisons of the online food expenditures show that 15 district pairs out of 21 district pairs significantly differ from each other according to Turkey HSD test. While most of the districts significantly differ from each other, Altındağ and Mamak (p=0.382), Altındağ and Yenimahalle (p=.081), Çankaya and Keçiören (p=.388), Çankaya and Yenimahalle (p=.069), Mamak and Yenimahalle (p=.071) and Etimesgut and Keçiören (p=.089) appear as exceptions. Multiple comparisons of the online non-food expenditures follow a similar pattern, but this time 16 district pairs significantly differ from each other, except for Altındağ and Mamak (p=.809), Altındağ and Yenimahalle (p=.191), Çankaya and Keçiören (p=.217), Mamak and Yenimahalle (p=.064), and Etimesgut and Keçiören (p=.056). Thus, it can be concluded that Sincan differs from all other districts, while Mamak, Altındağ and Yenimahalle forms the second homogeneous subset differing from the

rest of the districts, and Çankaya, Keçiören and Etimesgut forms the third homogeneous subset differing from the rest of the districts.

3. DISCUSSIONS

The analysis results of this study are consistent with the developments in other countries around the world and the literature. In the second period of the pandemic, both food and non-food online expenditures increased significantly in all districts of Ankara that are included in the study. This increase is due to the fact that people want to protect themselves from the virus by not taking the risk of getting contaminated in a store, preferring online shopping. Besides this, the curfew restrictions made by the government is another factor which makes online shopping the better choice.

When looking at the online shopping expenditures, there are similarities as well as differences between districts. In this respect, Mamak, Altındağ and Yenimahalle are a homogeneous group with similarities; Çankaya, Keçiören and Etimesgut form another homogeneous group. It has been observed that Sincan is significantly different from the other districts as it has the least online market spending. It is possible to explain this difference in online shopping expenditures with the socioeconomic development level of the districts. It is known that online shopping is preferred by higher income groups. Referring to the context, Sincan, which is at the second lowest level in terms of socioeconomic development [28] between the districts is expected to be behind the others in online shopping. There are many studies in the literature showing that as the education and income level, which are the most important determinants of the socioeconomic development rate, increases, the number of individuals preferring online shopping also increases [29–33]. Çankaya, Keçiören and Etimesgut districts are among the top five districts of Ankara in terms of socioeconomic development. Another homogeneous group, Mamak, Altındağ and Yenimahalle districts, is also observed to be among the top five districts of Ankara in terms of socioeconomic development. Although Mamak is far behind Altındağ and Yenimahalle in socioeconomic development, the fact that it is in the same group with these districts in online shopping expenditures, creates the need to analyze this district from different perspectives, including demographic and sociological factors.

As also highlighted by [34] and [35], accessibility, transportation possibilities and geographical factors can have an impact on online shopping. On the other hand, it should be considered that individuals living in socioeconomically developed districts have higher opportunities to shop online than the ones living in other districts. Computers, mobile phones, tablets, which enable internet access and use are more common in these districts. In addition, the possibility of accessing such devices is higher in districts with high socioeconomic development. This situation, which expresses the inequality of individuals in access and use of information and communication technologies is called "digital divide" in the literature. It should be considered as one of the factors affecting the difference in online shopping expenditures between districts.

3. CONCLUSIONS

COVID-19 pandemic has affected lives and a diversity of sectors globally. While some sectors suffered from the pandemic, others benefited from this process, and direct and indirect effects emerged on demand, profitability and liquidity. The main sectors that have revived due to the pandemic are food, e-commerce, medicine, telecommunications, distance education platforms, computer games, antivirus clothing and materials, and the sectors in which companies that provide video services to those who stay at home due to restrictions. It has been reflected in numerous researches that the sectors that require contact, especially aviation and travel, tourism and hotel management, food and beverages, shopping malls and stores, entertainment, construction and real estate, and oil sectors have been negatively affected by the pandemic at the highest level [36,37]. Regarding this, marketing and shopping environments have gone through a rapid adaptation to provide e-commerce services. There

are various reasons for this global increase in e-commerce parallel to the pandemic. One of these is the desire of consumers to shop in a contactless environment in order to prevent virus contamination. The fact that shopping centers and units can organize and implement regulations that will deliver the needs of consumers to their doorsteps in a short time has made it easier to choose the online shopping option. On the other hand, various restrictions determined by public authorities, especially isolation measures such as curfews, has been a factor that forced consumers to shop online to obtain their needs. Consumers have the opportunity to access a wide variety of products on e-commerce sites and benefit from discounts. Different practical applications offered as an advantage of online shopping have helped to increase the weight of this type of shopping.

As a result of these rapid developments and changes, many studies have been carried out in the world on changes in shopping and customer behaviors. Considering the scarcity of the relevant works conducted in Turkey, the authors aimed to analyze the online shopping data for food and non-food products in 7 districts of Ankara province in parallel with their relation with 3 particular pandemic periods and the districts. According to the results a noticeable consumer behavior difference between different time periods of Covid19 pandemic amongst different districts of Ankara has been observed. Factors affecting these expenditure differences include the time periods which were divided to three; the pre-pandemic, the curfew and restrictions and the period during normalization. Next to the observations around 3 different time periods, people's mindsets and thoughts on the virus, their income differences, the practicalities of online shopping and the district they live combined with its socioeconomic development level all seem to play a significant role in the overall expenditures variances and people's preferences on products. This in the end brought the explained consumer behavior differences amongst the subject districts and different time periods.

As future work, the collected data regarding people's shopping habits could be re-considered thought of the new curfews and restrictions due to the ongoing virus. These observations should be evaluated and compared with the time period after the pandemic is over. This would conclude the real effects of the COVID-19 pandemic on e-commerce and the overall shopping habits. It is suggested that marketing, social psychiatry and public health experts may team up to have a broader study group and conduct a wider analysis to further examine the implications of these consumer behaviors with the ultimate goal of getting the societies better prepared during another pandemic experience. The results of the suggested future work may provide useful insides on how governors can mitigate future risks during a similar pandemic.

ACKNOWLEDGEMENTS

Authors would like to thank Marketyo administrators for their support and the valuable online sales data, to Başarsoft for providing spatial datasets and to TUBİTAK (The Scientific and Technological Research Council of Turkey) for facilitating the collaboration with sector representative Başarsoft within 2244 Project.

CONFLICT OF INTEREST

The authors stated that there are no conflicts of interest regarding the publication of this article.

REFERENCES

[1] Gopinath V. Comsumer behavior trends during COVID-19 pandemic. Int J Sci Dev Res, 2020;5:310–3.

[2] Iriani SS, Andjarwati AL. Analysis of perceived usefulness, perceived ease of use, and perceived

risk toward online shopping in the era of COVID-19 pandemic. Syst Rev Pharm, 2020;11:313–20. https://doi.org/10.31838/srp.2020.12.50.

[3] Kaur K, Kunasegaran M, Singh J, Salome S, Sandhu Sukjeet K. Impact of the First Phase of Movement Control Order during the COVID-19 pandemic in Malaysia on purchasing behavior of Malaysian consumers. Res J Humanit Soc Sci, 2020;2:131–44. https://doi.org/10.37534/bp.jhssr.2020.v2.nS.id1038.p131.

[4] Bharathi A, Natarajan AM. Cancer classification of bioinformatics data using ANOVA. Int J Comput Theory Eng, 2010;2:369–73. https://doi.org/10.7763/ijcte.2010.v2.169.

[5] Roggeveen AL, Sethuraman R. How the COVID-19 pandemic may change the world of retailing. J Retail, 2020;96:169–71. https://doi.org/10.1016/j.jretai.2020.04.002.

[6] Rogers K, Cosgrove A. How is COVID-19 affecting the way you spend money on the following? Spending more Spending less, 2020. Retrieved on 10.04.2021 from https://www.ey.com/en_gl/consumer-products-retail/how-covid-19-could-change-consumer-behavior

[7] Baker SR, Farrokhnia RA, Meyer S, Pagel M, Yannelis C. How does household spending respond to an epidemic? Consumption during the 2020 COVID-19 pandemic. Rev Asset Pricing Stud, 2020;10:834–62. https://doi.org/10.1093/rapstu/raaa009.

[8] Stanciu S, Radu RI, Sapira V, Bratoveanu BD, Florea AM. Consumer behavior in crisis situations. Research on the effects of COVID-19 in Romania. Ann Dunarea Jos Univ Galati Fascicle I Econ Appl Informatics, 2020;26:5–13. https://doi.org/10.35219/eai1584040975.

[9] Hashem TN. Examining the ınfluence of COVID 19 pandemic in changing customers; orientation towards e-shopping. Mod Appl Sci, 2020;14:59–71. https://doi.org/10.5539/mas.v14n8p59.

[10] Koch J, Frommeyer B, Schewe G. Online shopping motives during the COVID-19 pandemic-lessons from the crisis. Sustain, 2020;12:1–20. https://doi.org/10.3390/su122410247.

[11] Leone LA, Fleischhacker S, Anderson-Steeves B, Harper K, Winkler M, Racine E, et al. Healthy food retail during the COVID-19 pandemic: Challenges and future directions. Int J Environ Res Public Health, 2020;17:1–14. https://doi.org/10.3390/ijerph17207397.

[12] Pham VK, Nguyen T Le, Do TTH, Tang MH, Thu Hoai H Le. A study on switching behavior toward online shopping of vietnamese consumer during the COVID-19 time. SSRN Electron J, 2020. https://doi.org/10.2139/ssrn.3651300.

[13] Safara F. A computational model to predict consumer behaviour during COVID-19 pandemic. Comput Econ, 2020. https://doi.org/10.1007/s10614-020-10069-3.

[14] Farrell D, Wheat C, Ward M, Relihan L. The early ımpact of COVID-19 on local commerce: Changes in spend across neighborhoods and online. SSRN Electron J, 2020:1–27. https://doi.org/10.2139/ssrn.3647298.

[15] Eger L, Komárková L, Egerová D, Mičík M. The effect of COVID-19 on consumer shopping behaviour: Generational cohort perspective. J Retail Consum Serv, 2021;61:2–11. https://doi.org/10.1016/j.jretconser.2021.102542.

[16] Faour-Klingbeil D, Osaili TM, Al-Nabulsi AA, Jemni M, Todd ECD. An on-line survey of the behavioral changes in Lebanon, Jordan and Tunisia during the COVID-19 pandemic related to food shopping, food handling, and hygienic practices. Food Control, 2021;125. https://doi.org/10.1016/j.foodcont.2021.107934.

[17] Martin-Neuninger R, Ruby MB. What does food retail research tell us about the ımplications of coronavirus (COVID-19) for grocery purchasing habits? Front Psychol, 2020;11. https://doi.org/10.3389/fpsyg.2020.01448.

[18] Richards TJ, Rickard B. COVID-19 impact on fruit and vegetable markets. Can J Agric Econ, 2020;68:189–94. https://doi.org/10.1111/cjag.12231.

[19] Brumă IS, Vasiliu CD, Rodino S, Butu M, Tanasă L, Doboș S, et al. The behavior of dairy consumers in short food supply chains during COVID-19 pandemic in Suceava Area, Romania. Sustain, 2021;13. https://doi.org/10.3390/su13063072.

[20] Grashuis J, Skevas T, Segovia MS. Grocery shopping preferences during the COVID-19 pandemic. Sustain, 2020;12. https://doi.org/10.3390/su12135369.

[21] Chenarides L, Grebitus C, Lusk JL, Printezis I. Food consumption behavior during the COVID-19 pandemic. Agribusiness, 2021;37:44–81. https://doi.org/10.1002/agr.21679.

[22] Li J, Hallsworth AG, Coca-Stefaniak JA. Changing grocery shopping behaviours among chinese consumers at the outset of the COVID-19 Outbreak. Tijdschr Voor Econ En Soc Geogr, 2020;111:574–83. https://doi.org/10.1111/tesg.12420.

[23] Poelman MP, Gillebaart M, Schlinkert C, Dijkstra SC, Derksen E, Mensink F, et al. Eating behavior and food purchases during the COVID-19 lockdown: A cross-sectional study among adults in the Netherlands. Appetite, 2021;157. https://doi.org/10.1016/j.appet.2020.105002.

[24] Güven H. COVID-19 Pandemik kriz sürecinde e-ticarette meydana gelen değişimler. Avrasya Sos ve Ekon Araştırmaları Derg, 2020;7:251–68.

[25] Yılmaz Ö, Bayram O. COVID-19 pandemi döneminde Türkiye'de e-ticaret ve e-ihracat. Kayseri Üniversitesi Sos Bilim Derg, 2020;2:37–54. https://doi.org/10.51177/kayusosder.777097.

[26] Danışmaz AT. COVID-19 Salgınının Tüketicilerin Online Alışveriş Tercihine Etkisi. Sos Bilim Araştırma Derg, 2020;9:83–90.

[27] Seltman HJ. Experimental Design and Analysis. 2018. Retrieved on 21.03.2021 from http://www.stat.cmu.edu/~hseltman/309/Book/Book.pdf

[28] Şeker M. İnsani gelişme endeksi-ilçeler. İnsani Gelişme Vakfı, İstanbul, 2018. Retrieved on 15.12.2020 from https://ingev.org/raporlar/IGE_RAPOR_2017.pdf

[29] Li H, Kuo C, Russell MG. The impact of perceived channel utilities, shopping orientations, and demographics on the consumer's online buying behavior. J Comput Commun, 1999;5. https://doi.org/10.1111/j.1083-6101.1999.tb00336.x.

[30] Sim LL, Koi SM. Singapore's internet shoppers and their impact on traditional shopping patterns. J Retail Consum Serv, 2002;9:115–24. https://doi.org/10.1016/S0969-6989(01)00029-7.

[31] Sin L, Tse A. Profiling internet shoppers in hong kong: Demographic, psychographic, attitudinal and experiential factors. J Int Consum Mark, 2002;15:7–29. https://doi.org/10.1300/J046v15n01_02.

[32] Naseri MB, Elliott G. Role of demographics, social connectedness and prior internet experience in adoption of online shopping: Applications for direct marketing. J Targeting, Meas Anal Mark, 2011;19:69–84. https://doi.org/10.1057/jt.2011.9.

[33] Mehrotra AA, Elias H, Al-Alawi AI, Al-Bassam SA. The effect of demographic factors of consumers online shopping behavior in a GCC university. Ethical Consum. Comp. Stud. Across Differ. Cult. Emerg. Res. Oppor, 2019, p. 126–51. https://doi.org/10.4018/978-1-7998-0272-3.ch008.

[34] Anderson WP, Chatterjee L, Lakshmanan TR. E-commerce, transportation, and economic geography. Growth Change, 2003;34:415–32. https://doi.org/10.1046/j.0017-4815.2003.00228.x.

[35] Farag S, Weltevreden J, van Rietbergen T, Dijst M, van Oort F. E-shopping in the Netherlands: Does geography matter? Environ Plan B Plan Des, 2006;33:59–74. https://doi.org/10.1068/b31083.

[36] Allianz Araştırmalar. COVID-19'un sektör bazında olumsuz etkileri. İstanbul: 2020. Retrieved on 03.04.2021 from https://www.eulerhermes.com/content/dam/onemarketing/ehndbx/eulerhermes_com/tr_TR/documents/allianz-rapor-dizgi.pdf

[37] Edvido. Pandemi sektörleri ve reklam harcamalarını nasıl etkiledi? 2020. Retrieved on 20.02.2021 from https://www.edvido.com/blog/pandemi-sektorleri-ve-reklam-harcamalarini-nasil-etkiledi

[38] Blanca MJ, Alarcon R, Arnau J, Bono R, Bendayan R. Non-normal data: Is still ANOVA a valid option? Psicothema, 2017;29:4:552-557. https://doi: 10.7334/psicothema2016.383

APPENDIX

Table 5. Details of the observations used in the experiments.

Districts	# of Observations	Total Food Order Count	Total Non-Food Order Count	Total Order Count	Total Food Expenditures	Total Non-Food Expenditures	Total Expenditures
ALTINDAĞ	**82**	**12933**	**4581**	**17514**	**129091,528**	**83708,98**	**212800,508**
Period-1	24	1724	678	2402	17292,225	13582,96	30875,185
Period-2	31	7915	2564	10479	73989,283	44922,14	118911,423
Period-3	27	3294	1339	4633	37810,02	25203,88	63013,9
ÇANKAYA	**306**	**106551**	**43914**	**150465**	**1149462,959**	**856250,65**	**2005713,609**
Period-1	94	10301	4663	14964	114501,387	94888,45	209389,837
Period-2	107	74048	29832	103880	781818,88	576852,44	1358671,32
Period-3	105	22202	9419	31621	253142,692	184509,76	437652,452
ETİMESGUT	**94**	**50780**	**21717**	**72497**	**497472,341**	**401823,39**	**899295,731**
Period-1	31	6451	2773	9224	58967,786	50172,99	109140,776
Period-2	32	32301	13391	45692	311700,185	245016,9	556717,085
Period-3	31	12028	5553	17581	126804,37	106633,5	233437,87
KEÇİÖREN	**137**	**33480**	**13378**	**46858**	**328190,329**	**249417,65**	**577607,979**
Period-1	43	3351	1452	4803	31317,054	28084,57	59401,624
Period-2	47	21306	7908	29214	194895,478	140705,24	335600,718
Period-3	47	8823	4018	12841	101977,797	80627,84	182605,637
MAMAK	**150**	**18562**	**8298**	**26860**	**179111,27**	**151745,08**	**330856,35**
Period-1	44	1702	832	2534	15275,925	16265,07	31540,995
Period-2	54	10902	4431	15333	96652,836	76871,86	173524,696
Period-3	52	5958	3035	8993	67182,509	58608,15	125790,659
SİNCAN	**53**	**2801**	**1488**	**4289**	**29413,33**	**27770,09**	**57183,42**
Period-1	14	317	152	469	2597,6	2679,61	5277,21
Period-2	22	1637	916	2553	15254,095	16577,49	31831,585
Period-3	17	847	420	1267	11561,635	8512,99	20074,625
YENİMAHALLE	**157**	**38288**	**15644**	**53932**	**402280,511**	**288745,73**	**691026,241**
Period-1	52	4347	1964	6311	42705,515	36736,76	79442,275
Period-2	54	23794	9223	33017	225468,057	167089,55	392557,607
Period-3	51	10147	4457	14604	134106,939	84919,42	219026,359
Grand Total	**979**	**263395**	**109020**	**372415**	**2715022,268**	**2059461,57**	**4774483,838**