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An Assessment of the Impact of the COVID-19 Pandemic on Consumer Behavior Using the Analytic Hierarchy Process Model

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Abstract: Consumer behavior is dynamic and can shift rapidly due to various factors. The COVID-19 pandemic introduced unprecedented market disruptions, prompting unique consumer reactions. Our foundational study dissected factors affecting consumer habits, laying the groundwork for a focused analysis of how individual consumption was impacted during the pandemic. Significantly, psychological influences emerged as a key determinant of consumer behavior in our prior findings, leading us to centralize the pandemic's effect in our recent research. We undertook this analysis using data from 559 participants from the Republic of Croatia. Utilizing the Analytic Hierarchy Process (AHP), typically applied in analyses of decision making in businesses, we ranked the influences on consumer purchasing patterns amidst the pandemic. Our findings underscored the profound influence of these factors on consumer behavior and the resulting implications for sustainable development. This highlights the urgency for businesses to adopt flexible strategies that also support overarching sustainability objectives. The objective of the study is to analyze the impact of the pandemic on individual consumption and to understand the key psychological factors influencing consumer behavior. The main contribution of this work is the identification and ranking of pandemic influences using the AHP model, as well as understanding the implications of these behavioral changes for future planning.

Keywords: consumer behavior; COVID-19 pandemic; consumer habits; Analytic Hierarchy Process

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1. Introduction

The COVID-19 pandemic broke out in 2019, changing people's approach in all aspects of thinking, living and working, business organization, business process management, and market participation [1]. The pandemic changed consumer behavior as well as approaches in marketing and sales. Some companies experienced a significant drop in turnover, while others used the crisis as a chance for success. Social distancing measures, movement restrictions, and quarantines were introduced almost everywhere. All this has had a significant impact on consumers, as well as their way of thinking and behaving.

In the context of the pandemic, the tourism and hospitality sector suffered the most losses while e-commerce experienced the greatest increase in its history. The changes that occurred in consumer consciousness during the pandemic are not necessarily of a short-term nature [2]. They can be long-term in terms of sales channels and distribution channels, all the way to changes in shopping habits and the types of products purchased. Newly formed consumer habits may in the future continue through an increased use of food delivery, online shopping, and virtual socializing.

It is necessary to investigate the phenomenon of consumer behavior change during a crisis, which includes changes in consumer preferences, purchasing channels, ways of thinking, changes in product consumption, as well as new values that consumers emphasize [3]. We need to understand these changes so that companies can more easily

prepare for similar future situations and more easily adapt to consumer needs. Considering the rapid change in consumer behavior in a short period, it shows the inherent fluidity of consumer behavior [4].

Statista, 2023 [5], highlights that certain product categories, such as household necessities or food products, are likely to experience greater changes in consumption than others, such as luxury goods. In terms of luxury goods, crises have a minimal impact on their purchase, while the COVID-19 pandemic could change this dynamic [6]. There is also an expected increase in the purchase of certain medical products, but also a question of access to these products [1]. Many individuals have been stockpiling products due to fears of shortages in the market [2]. The pandemic has driven digitalization like never before and has influenced the creation of different consumer habits [7]. The prices of some products have significantly increased due to the pandemic, while the prices of others have fallen, depending on the product and industry [8]. Reduced production capacities and logistical problems have led to delivery delays as well as shortages of certain products in the market [9].

Consumer behavior is unpredictable; however, the factors that influence their behavior are social, cultural, personal, and psychological. These need to be analyzed to try to predict changes in consumer behavior in the future due to natural disasters, pandemics, wars, and crises, and non-verbal communication with consumers sometimes plays a key role [10].

This study is a continuation of our research [11] investigating the influence of certain factors on consumer behavior. The study showed a significant impact of psychological factors as well as a long-term change in purchasing habits. By expanding the mentioned study, the extent of the impact of the COVID-19 pandemic on consumer buying habits will be determined, and a model of predictable consumer behavior will be created, in the event of similar crisis situations. This study analyzes scientific literature related to consumer behavior with an emphasis on the COVID-19 pandemic. The aim of the study is to determine the impact the COVID-19 pandemic had on consumer behavior and their purchasing habits.

To investigate this, extensive desk research was conducted, as well as the implementation of a survey questionnaire which was later used by applying the Analytic Hierarchy Process method.

When analyzing multicriteria decision making, the AHP method holds a special place. It is first mentioned by its creator Thomas L. Saaty, where the AHP method is detailed and accurately described [12–14]. The AHP model is a structured technique used for managing, organizing, and analyzing complex decisions, involving mathematics and psychology [15]. It is applied when making group decisions in various areas of operation and action within companies [16]. AHP has proven to be a great help to the private and public sectors as a tool that helps in making key decisions in business and daily work. Decidophobia is the fear of making decisions, and the role of the AHP model is to facilitate these decisions. It is not just a decision making model but also a guide to solving a specific problem. The impact of individual factors is very difficult to predict, and they often have a stochastic nature, requiring more complex processes for making business decisions. Therefore, we will use the AHP method to analyze the impact on consumer habits due to the influence of psychological factors, with an emphasis on the COVID-19 pandemic [11]. To implement the AHP model, a hierarchical approach to problem solving is needed, from defining and analyzing it, proposing possible solution options, and choosing one of the options [17]. Such an approach will enable us to assess the impacts on consumer purchasing due to the COVID-19 pandemic. Entrepreneurs and decision makers in other sectors will have opportunities available in terms of approaching consumer habits and adapting their marketing activities at times when crisis situations occur (pandemics, wars, economic and financial crises, natural disasters) more easily. Every crisis should be seen as an opportunity for success, and this is where adaptability and speed in decision making will come into play. Using the AHP method, this study aims to determine the market influences that

have affected the instability of supply and demand for products and to rank the most important ones.

The COVID-19 pandemic has had an unprecedented impact on various aspects of human life, including but not limited to public health, economic stability, and consumer behavior. While extensive research has focused on the immediate repercussions of the pandemic, a crucial aspect that merits further investigation is the effect of COVID-19 on sustainable development. Sustainable development aims to meet the needs of the present without compromising the ability of future generations to meet their own needs, and the ongoing pandemic presents both challenges and opportunities in this context. The intersection of consumer behavior and sustainable development during the COVID-19 pandemic have noteworthy implications for sustainable development. One significant shift is the surge in online shopping, as people aim to minimize physical contact to mitigate the spread of the virus. While this transition has been convenient for consumers, it raises questions about environmental sustainability. An increased demand for home deliveries has led to a corresponding rise in vehicle emissions, packaging waste, and energy consumption. Moreover, the pandemic has led to an increase in single-use items such as plastic bags, disposable cutlery, and personal protective equipment like masks and gloves, all of which present a challenge for waste management and long-term environmental sustainability. On the other hand, the reduction in commuting and international travel has led to a temporary decline in carbon emissions, providing a glimpse into the kind of lifestyle changes that could contribute to more sustainable patterns of consumption and production. The crisis has also underscored the importance of social sustainability, especially as it relates to labor practices and income stability. Consumers are increasingly attuned to how businesses treat their employees during these challenging times, and there is a growing demand for fair labor practices, both in terms of wages and workplace safety. Thus, the pandemic has made considerations of sustainability more critical than ever, both for individuals and organizations.

As already mentioned, this study is an extension of our previous work, and the sample of same 559 respondents from the Republic of Croatia was used to obtain more credible data. This paper includes the theoretical framework of consumer buying habits and the impact of the COVID-19 pandemic on their behavior, providing hypotheses and using the Analytic Hierarchy Process as a multicriteria decision making method, methods used in the research, results and discussion, and the conclusions of the paper.

1.1. Significance of the Study

This research aims to define consumer behavior in the Republic of Croatia as a reaction to psychological influences, with an emphasis on the COVID-19 pandemic and how consumers are behaving during the pandemic while shopping. Since the COVID-19 pandemic is a relatively new phenomenon, this type of research is crucial in understanding consumer psychology.

Consumer behavior is activated due to various influences and is often unpredictable. Everyone is different, and these stimuli affect each of them differently. For marketing professionals and companies, it is essential to understand how individuals behave in times of wars, pandemics, natural disasters, and other market disruptions to offer the product that the market demands in a timely manner. If the changes in consumer buying habits are similar due to these influences, it will be much easier to plan for satisfying consumer needs.

Consumer behavior is important for understanding market trends and predicting future changes. The pandemic has affected all spheres of life; people think and behave differently, and the world is no longer the same. By investigating changes in consumer behavior during the pandemic, we can better understand how consumers adapt to crisis situations and how they will behave in similar situations in the future. This research will also help companies to better understand how consumer behavior changes in crisis situations, enabling them to better prepare and adapt. This can affect their marketing, sales, supply chain strategies, and many other aspects of their business. It can be useful

for policy makers in formulating strategies and interventions for crisis management. This could include policies promoting economic recovery, consumer protection measures, and other policies relating to consumer behavior.

The research can contribute to the development of models that can predict how consumer behavior will change in future crises. These models can be useful for companies, policy makers, and academic researchers.

1.2. Literature Review

In the current times of great changes, with a fast-paced life, various information and opportunities are available to consumers. With the development of technology and the internet to emphasize social networks, consumers are exposed daily to a variety of different stimuli that trigger their senses. Creating a need is a prerequisite for initiating a purchase action. The COVID-19 pandemic has changed the world, changed people, and changed the way of thinking. Like any other crisis, consumers have a similar pattern of behavior. In times of any crisis, the resilience of the economy and financial system is important, and the goal is to maintain consumption at the desired level. In communication with consumers, IT and other communication tools were key to building resilience [18].

When we talk about consumers themselves, their preferences have changed significantly. Ghodsi et al., 2022 [19], found that consumers' behavior changes within their towns affect their attitudes towards online shopping, and that people who are aware of the dangers of the pandemic shop online more frequently. Movement restrictions and the distancing of people have significantly affected consumers, who had to learn to improvise. Consequently, consumers have moved actions to inside the home by accepting online technologies, from learning and working to entertainment [20]. Difficulties in finding simple consumer products, or the inability to go shopping in stores, have developed online shopping skills that make use of the delivery of food and other products [21].

The impact of the COVID-19 pandemic has spurred a rapid growth in the use of digital technologies and online shopping, and even the most skeptical have accepted the changes that have occurred [22–30]. Older people no longer refuse to purchase via mobile methods, and many online shopping activities have increased [31]. In his research, Milaković, 2021 [32], presents studies showing that consumer adaptability to online shopping directs the relationship between consumer resilience and shopping satisfaction. The study by Hartono et al., 2021 [33], shows that consumers who are more rational and economical and care more about health are more willing to accept online shopping. Younger consumers are prone to apply all variables to adjust their attitudes and behaviors when shopping, while older consumers were more rational and economical, as well as more eager to preserve their health, and were more ready to help others affected by the pandemic [33]. The conclusion of Hansson et al., 2022 [34], is that younger consumers will predominantly continue to shop online, while the older population will continue to shop both online and physically in the post-pandemic period.

Tyrväinen and Karjaluoto, 2022 [35], proved that consumers did not buy products online during the pandemic because they have a positive attitude towards this type of shopping, but because they were forced to shop online. In their research, Moorthy et al., 2022, argue that ease of use and situational factors had a significant impact on accepting online shopping during the pandemic [36]. The descriptive analysis of consumer behavior carried out by Meiser et al., 2023 [37], shows that when choosing a way of shopping, respondents prefer physical shopping in relation to online, whether it is a pandemic or non-pandemic period.

Consumers who find it less complex to buy food online are more likely to be satisfied with this experience. Respondents with higher education, who are familiar with online food shopping, do not consider online shopping very complex [38]. Topolko Herceg, 2021 [39], emphasizes that online shopping with delivery will probably continue even after the pandemic, because consumers will remember online sellers who made their quarantine easier. The analysis conducted by Diaz-Gutierrez et al., 2023 [40], showed that most people

plan to return to their pre-pandemic shopping behaviors in stores but will continue to shop online. The results also showed that the reduction in in-store shopping is much smaller (one-third to a half) than the increase in online shopping.

The findings of the studies by Soares et al., 2023, Truong and Truong, 2022, and Sachdeva, 2022, indicate that the COVID-19 pandemic affects online shopping behavior, as people fear infection when physically going shopping, and that online shopping is the best solution. Also, for a number of consumers, going to stores leads to anxiety and fear of infection, especially by touching objects and doubting hygiene protocols [41–43]. When people have enough knowledge about COVID-19, they actively carry out self-protection measures, which leads to more online shopping [44,45].

COVID-19 has also accelerated the digitization processes of supply chains and distribution channels [46]. However, regardless of the acceleration of digitization, during the pandemic there was a clear problem in the distribution of certain products, which led to their shortage in the market [47]. On the other hand, Aday and Aday, 2020 [48], note that in their research, they did not notice major problems in supply chains, but that with further development of the pandemic, it remains unclear how this will develop. The analysis by Alsuwailem et al., 2021 [49], emphasizes that the COVID-19 pandemic has affected demand and thus caused a lack of transport and has negatively affected supply chains. It is clear that the sensitivity of distribution was greater at the beginning of the pandemic, while later, it stabilized and started to function normally [50]. Due to this, resilience in distribution channels is extremely important in the event of market crises [51,52].

During the COVID-19 pandemic, people were less active due to working from home, movement restrictions, and fear of infection. The study by Ráthonyi et al., 2021 [53], shows that measures had a smaller impact on the psyche of those who were employed but had to work from home compared with the unemployed. Many experienced anxieties due to movement restrictions and reduced work activity [54,55]. To reduce anxiety and fear, people began to connect more through social networks and media, thus reducing the trauma caused by social distancing [56]. Fearing infection, a significant number of people opted for private transport over public or chose non-motorized transport, which also influenced their shopping habits [57].

When the pandemic started, many people were buying products in panic due to a fear of shortages, creating unnecessary stockpiles, which was particularly visible in the first weeks after the pandemic was declared [58–68]. The problem of panic buying is most evident in everyday consumption products such as toilet paper and similar items [69–71]. After a turbulent start, the market stabilized, and people realized that there would be no shortages of products, so they returned to their usual shopping habits [72].

The negative impact on the economy of individual countries due to the COVID-19 pandemic should not be overlooked. In their research, Labadze and Sraieb, 2023 [73], point out that the pandemic negatively affected the profitability of companies, especially in countries with strict pandemic policies, and those financial results varied by sectors. Here, communication between companies, the state, and consumers played a major role. Traders needed to clearly emphasize that their priority was the protection and health of consumers [74–76]. In their research, Ikram et al., 2022, emphasize the strong impact of the pandemic on the export of goods and services, logistical performance, and ISO 9001 and ISO 14001 certificates [77]. The tourism sector, due to social distancing and travel restrictions, as well as other small business sectors, also felt a strong negative impact [78,79]. On the other hand, consumers reduced their consumption due to job loss or fear of losing their job [76]. The option of online shopping somewhat mitigated the overall impact of the consumption shock, thus increasing the resilience of the economy [80,81].

During every crisis, there are changes in purchasing habits and the quantities of products purchased by consumers, which was clearly visible during the COVID-19 pandemic [82,83]. In their research, Rayburn et al., 2021 [84], and Park et al., 2021 [85], highlight that during the pandemic, customers began to question their buying decisions and changed their behavior patterns. They started buying local brands [86,87]. Kotler, 2020 [88], noted

that the period of the pandemic (deprivation and anxiety) is leading to new consumer attitudes that are changing the nature of today's capitalism. Citizens are re-examining what they consume, how much they consume, and how the pandemic has affected class and inequality issues. In Denmark, Germany, and Slovenia, food consumption is decreasing due to the pandemic [89], while in China, food consumption is increasing [90]. Due to distribution problems and a shortage of products on the market, emphasis should also be placed on the financial availability of products [91]. It is noticeable that consumers are changing their preferences when shopping and that they cook more at home and eat out less [92,93]. Also, consumers felt the greatest discomfort during the pandemic if they physically went shopping [94].

During the COVID-19 pandemic, consumers' eating habits also changed. In their study, Renzo et al., 2020 [95], highlight a visible perception of weight gain in 48.6% of the Italian population. A large part of the population ate unhealthily due to the lockdown and reduced outdoor activities, leading to increased consumption of snacks and alcohol [96–100]. On the other hand, health awareness was higher for consumers who lost their jobs or had lower incomes [101]. Regarding the purchase of certain products, consumers in the Eurozone are more pessimistic compared with respondents in the US and China [102]. In addition to promoting and increasing product availability, innovations in the food sector and emotions play a significant role in overcoming the crisis [103,104].

1.3. Research Objectives and Hypothesis

When there are disruptions and crises in the market, it is almost impossible to control consumer behavior. The challenge (the existing problem) is that it is very difficult to monitor consumer behavior, especially in times of crisis. We determine one (1) main impact that influence consumer behavior in the time of COVID-19 pandemic: psychological factors.

In this study, we set four (4) hypotheses to test what influences on consumer behavior were caused by the COVID-19 pandemic and what buying habits changed (Figure 1). For this purpose, four hypotheses were tested:

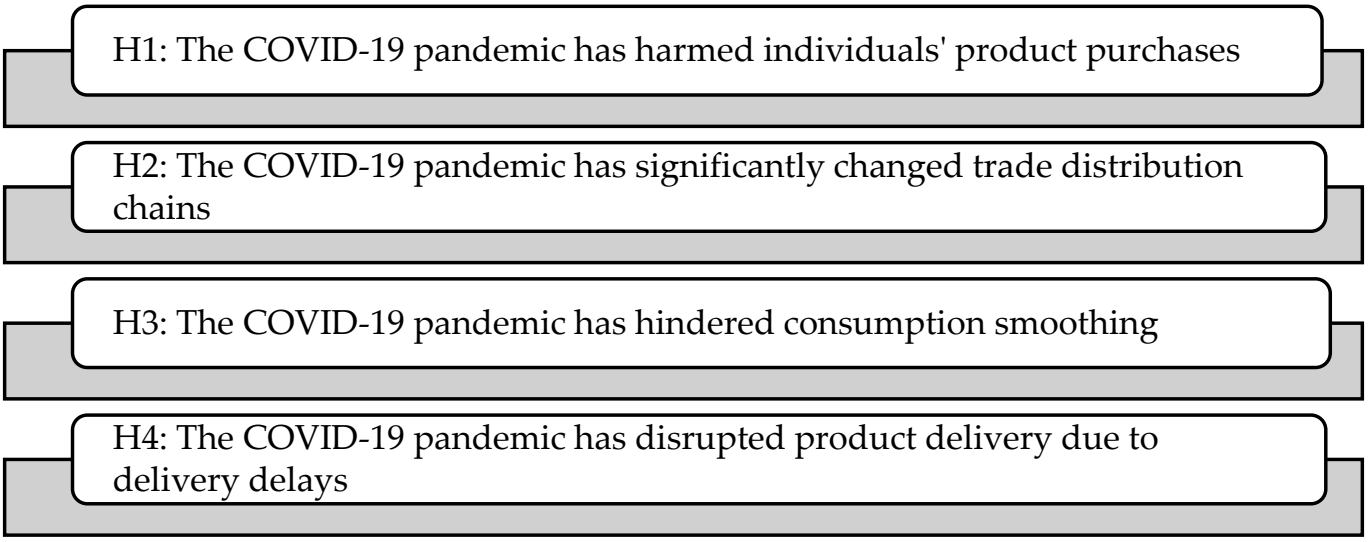

Figure 1. Hypotheses of the study.

H1. *The COVID-19 pandemic has harmed individuals' product purchases;*

H2. *The COVID-19 pandemic has significantly changed trade distribution chains;*

H3. *The COVID-19 pandemic has hindered consumption smoothing;*

H4. *The COVID-19 pandemic has disrupted product delivery due to delivery delays.*

2. Materials and Methods

The research methodology is significant, as it provides a structured and organized approach to proving the set hypotheses. It allows other authors to replicate the research results so that they can confirm or deny them. It also gives information on how data were collected and analyzed to determine their consistency and reliability. It is very important that the research is transparent and not biased. In this study, a comprehensive comparison was made with other authors conducting similar research to come to a comprehensive conclusion.

The methodology used in this study involves both primary and secondary research, based on which specific conclusions were drawn. By reviewing the scientific literature (studies, papers, textbooks/books, statistical data, analyses), secondary data was obtained. Furthermore, a survey questionnaire was conducted as a continuation and upgrade of the previously conducted research [11], and the obtained data were used by applying the AHP method. To improve the quality of the research, assistance from artificial intelligence tools was utilized to a minor extent.

A survey was conducted in the Republic of Croatia in 2023, where a questionnaire was sent to 1127 individuals who were drawn from the researchers' private database by random selection. This database consisted of 2000 registered active users of social networks, email databases, and other research databases. A unique number was assigned randomly using an online random number generator to obtain 1127 respondents, to whom we later sent the questionnaire. Out of the mentioned sample, 559 respondents filled out the survey questionnaire properly (anonymously), and these respondents served as a further basis for the continuation of the research. The private database was constructed through rigorous data collection methods that comply with ethical standards. This includes an existing sample of respondents in the Republic of Croatia, compiled from various verified sources that ensure a broad representation across different demographic groups. We acknowledge that participant subjectivity can impact the results. To mitigate this, our questionnaire was designed to be as objective as possible, employing multiple-choice questions and Likert scales to quantify attitudes and behaviors. The use of the Analytic Hierarchy Process (AHP) also adds a layer of objectivity to the study, as it relies on mathematical principles for decision making and ranking influences. Our selection process aimed for a representative sample from the broader population. The randomization ensures that each potential respondent has an equal chance of being selected, thus minimizing biases. However, we acknowledge that no selection process can eliminate all forms of bias. To account for this, we conducted sensitivity analyses to assess the robustness of our findings under different assumptions and possible biases. While random selection contributes to reliability, it is not the only metric we used to ensure the quality of our data. Each response underwent a validation process that involved cross-verification with other data points to check for consistency.

Given that this research uses the same database as our previously published research [11], it is essential to explain the differences in detail. Although the same database of questions and surveys is being used, it must be stated that entirely different hypotheses are being tested in this study compared with the previous one. The database contained multiple sub-databases, and its scope was too broad to be part of a single scientific paper. Each paper investigates different aspects and dimensions of consumer behavior. Our first paper [11] focuses on general factors influencing consumer behavior, while this study focuses specifically on the influences of the COVID-19 pandemic on consumer behavior. This is not mere repetition or fractionation of the same research but two distinct scientific approaches using the same dataset for different purposes. In both scientific studies, it is clearly stated that the analyses are derived from the same dataset. However, the authors have clarified how the methods and objectives of the analyses differ in each case, and thus,

we do not believe there is an ethical issue. Transparency in disclosing this information reflects our commitment to ethical standards in research.

In this study, a well-established methodology will contribute to the accuracy and credibility of the results relating to the impact of the COVID-19 pandemic on consumer behavior. It helps understand how the COVID-19 pandemic has affected various types of products, allows for detection of changes in consumption of luxury and medical products, provides an insight into trends of product stockpiling, and assesses changes in the use of online distribution channels during the pandemic. Therefore, a high-quality methodology represents the foundation for achieving reliable and relevant research results.

The use of random sampling for the consumer sample is an effective approach for this research for several reasons. It guarantees that every consumer in the population has an equal probability of being selected. Random sampling shows great efficiency in the research process when the sample size and a higher response rate play a significant role in order for the mentioned method to have an advantage over others [105]. This aspect is crucial, as it contributes to ensuring that the sample is a good representation of the entire population, thereby strengthening the validity of the conclusions drawn from the research. Random selection reduces bias. Without random selection, there is a risk that the researcher, either intentionally or unintentionally, may select a sample that is biased in some way. This bias can skew the results of the research and lead to inaccurate conclusions. Random selection facilitates statistical analysis. Since each consumer had an equal chance of being selected, researchers can use inferential statistical methods to draw conclusions about the population based on the sample. When random selection is used, other researchers can repeat the study using the same selection method. This allows for the verification of results and the reliability of the research. With random selection, every consumer has an equal opportunity to be chosen to participate in the study, which may reduce ethical problems associated with participant selection. Should the sample accurately represent the whole population, the findings derived from this sample can be confidently generalized to the entire population. Random sample selection can reveal interesting patterns that might not have been discovered with targeted participant selection.

The survey questionnaire was conducted online (using Google forms). The questionnaire was sent to respondents via social networks, mobile applications (Viber and WhatsApp), and via email addresses.

Our primary method for gathering quantitative data was through structured questionnaires, which employed multiple-choice questions and Likert scales. These allowed us to numerically evaluate the preferences and behaviors of the respondents. In addition to the structured questions, we included open-ended questions in the survey to capture qualitative insights. These allowed respondents to elaborate on their choices, offering context that could not be captured through quantitative means alone. We used mixed-methods questionnaires that incorporated both quantitative and qualitative questions to allow for immediate triangulation of data. Quantitative data were analyzed using statistical models, while qualitative data were coded and subjected to thematic analysis. The qualitative data were sorted into themes, which were then compared against the quantitative data to find patterns or discrepancies. Where possible, qualitative findings were statistically cross-verified with the quantitative data to assess their consistency. The AHP model was used to quantitatively rank the criteria, including those identified through qualitative data, adding another layer of rigorous analysis. AHP is an excellent tool that facilitates decision makers' tasks in private, business, and public environments [106]. Also, another advantage of the AHP method is that it relies on the strength of the classic AHP model and can be adapted to the requirements of a particular problem [107]. AHP is an optimal approach for finding a combination of effective marketing techniques to assess the impact of a pandemic on consumer habits [108].

This blended approach provided us with a nuanced understanding of consumer behavior under the impact of the COVID-19 pandemic. By integrating both types of data,

we validated the findings from multiple angles, enhancing the reliability and validity of our results.

In Tables 1 and 2, more women than men participated in the survey. Respondents from 18 to 45 years old were represented in larger numbers than older respondents. Most respondents were employed and had a marital partner, so here, we can talk about respondents with a degree of life- and financial stability. Many respondents had a monthly financial income above 800 euros and above 1099 euros. The participants involved in the survey were chosen randomly without any intent to guide or influence their perspectives. Also, we can see a statistical description of the responders' sample with mean, standard error, median, standard deviation, range, and other traditional parameters. Given that consumer research is an all-encompassing process and considering that the entire population experienced direct or indirect effects on their behavior owing to the COVID-19 pandemic, respondents were incorporated from a wide-ranging study area.

Table 1. Demographic information of the respondents.

Sex	**No**
Male	201
Female	358
Age range	**No**
18 to 25	134
26 to 35	117
36 to 45	173
46 to 55	79
Older than 56	56
Occupation or Job status	**No**
Jobless	148
Employed	411
Relationship status	**No**
Not married	241
Married	318
Monthly earnings	**No**
Max 499 euro	127
500 to 799 euro	83
800 to 1099 euro	153
More than 1099 euro	196

Table 2. Descriptive statistics.

	Sex	**Age**	**Job Status**	**Relationship Status**	**Monthly Earnings**
Mean	279.5	111.8	279.5	279.5	139.8
Standard Error	78.5	20.6	131.5	38.5	23.7
Median	279.5	117	279.5	279.5	140
Standard Deviation	111.0	46.0	186.0	54.4	47.3
Sample Variance	12324.5	2113.7	34584.5	2964.5	2240.9
Range	157	117	263	77	113
Minimum	201	56	148	241	83
Maximum	358	173	411	318	196
Sum	559	559	559	559	559
Count	2	5	2	2	4
Confidence level (95%)	997.4	57.1	1670.9	489.2	75.3

The implementation of the survey is shown in the following picture (Figure 2), where the values from our previous analysis of the impact of various effects on consumer habits are shown [11]. The final values indicate the priority of the influence of personal factors on consumer habits. However, we based the analysis on the priority vectors of alternatives according to the criteria [11]. Although social media carried the most weight, in this analysis, we decided to assess the impact of the COVID-19 pandemic for two reasons. First, because of the attractiveness of the topic. Second, the priority vectors for the variants according to the social network and the COVID-19 criteria are the same, and the largest out of all measured factors. Through a detailed analysis of the specified priority vectors of both criteria, we observed the impact of COVID-19 on the growth of the use of social networks, which was in favor of the greater weight of social networks that we see in Figure 2.

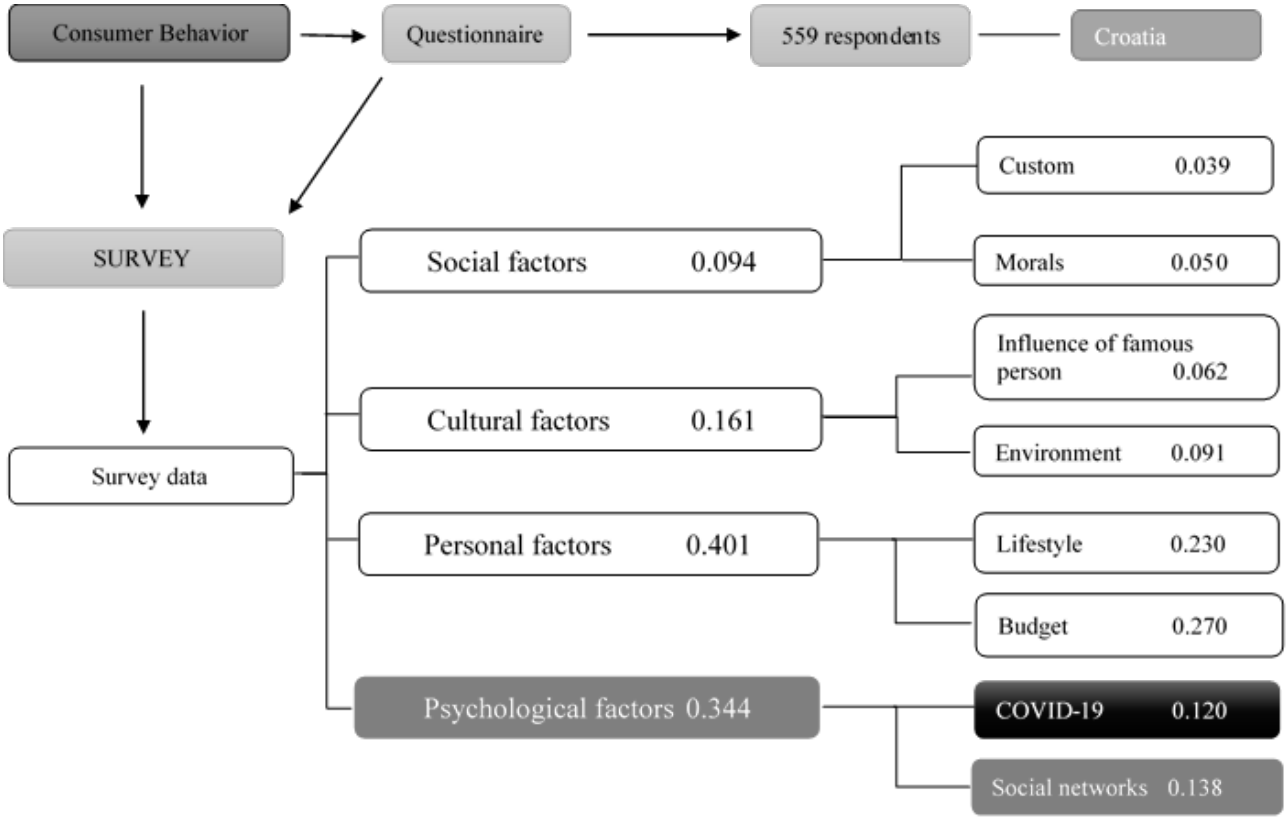

Figure 2. Survey implementation scheme [11]. Note: the numbers show the weight vector values for each of the consumer habit factors.

All the above materials show the different impacts of the COVID-19 pandemic on the consumption of individuals. The authors' task is to classify these influences into four groups. The aim is to estimate the isolated impact of COVID-19 on individual consumption. We will use a multicriteria decision making approach (MCDA) to make the right decision [109,109]. The best tool for multiple decision making is the AHP method. Although the AHP method is burdened with subjective evaluation of criteria and alternatives, it has been widely used for decades thanks to its numerous possibilities and adaptability to different problems. Šostar and Ristanović, 2023 [11], highlight numerous advantages of the AHP method. First, it significantly speeds up the decision making process. According to them, the AHP method stands out for its ability to aid effective decisions. Moreover, its logical approach to problem structuring is highly versatile and practical. It provides a method for quantifying the relationship between the goal, criteria, and alternatives. The instruments of the AHP method have demonstrated their efficacy in attributing pairs of weights and prioritizing criteria, aiding in making an informed decision. We will use some of these tools to estimate

the impacts of COVID-19 on individuals' spending by calculating their weight and then ranking them by size.

Multicriteria decision making (MCDM) is a method used to assess multiple contrasting criteria in order to identify the best choice among various alternatives, with all the constraints, preferences, and priorities faced by decision makers [110]. Wallenius et al., 2008; Salavati et al., 2016; and Li et al., 2016 [111–113], discussed recent accomplishments in the field of multicriteria decision making and utility theory, as well as the ways and possibilities of using the AHP method in practice. The AHP method has been widely used in the research of many authors [114–124] due to its ability to make the best decision while reducing the complexity of the decisions themselves.

The aim of this paper is to determine consumer behavior and changes in consumer purchasing habits because of the COVID-19 pandemic using the AHP method. Therefore, it is necessary to highlight authors who have actively used the same method to address issues in marketing [125–138].

Jurik, 2020 [17], views the decision making process as a chronological series of activities from defining the problem to choosing an alternative solution according to certain criteria. This prompted us to create a flowchart (Figure 3) for assessing the influence of COVID-19 indicators on individual consumption, highlighting important steps, from the selection of indicators to their consolidation [139,140]. Each step will be explained below.

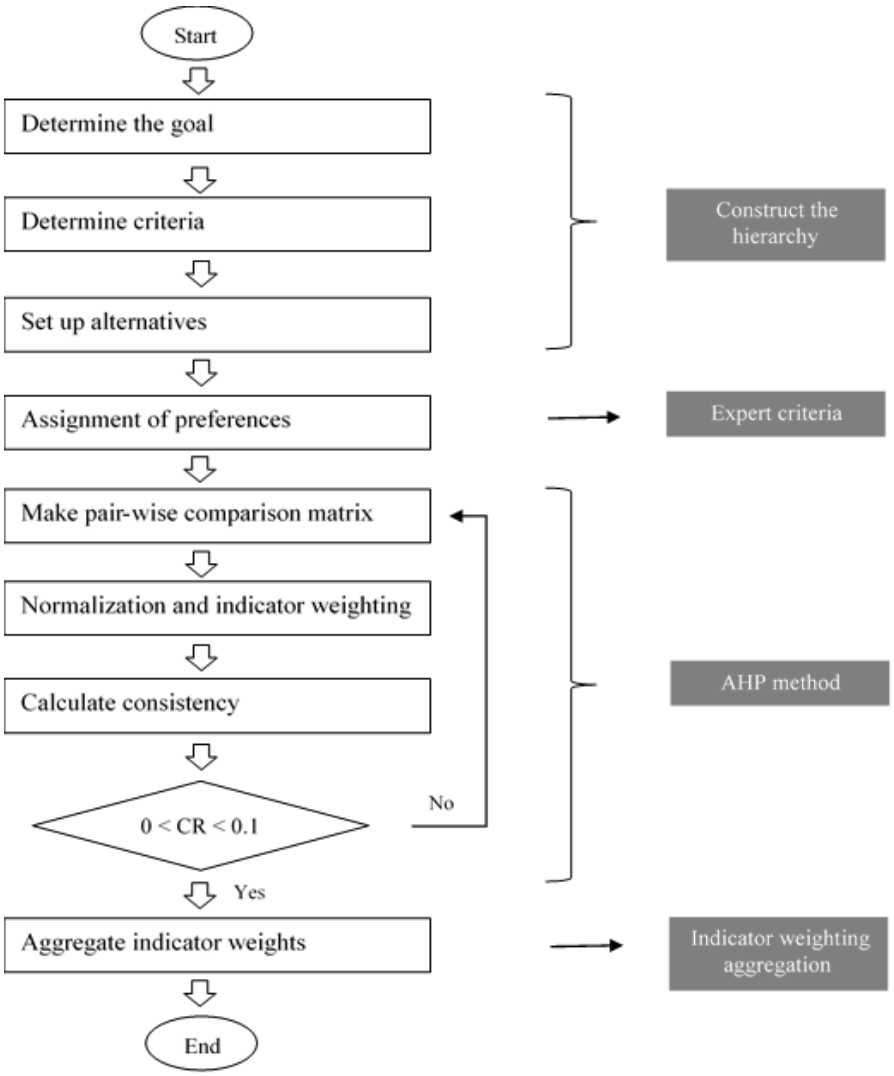

Figure 3. The AHP algorithm.

For the phase of constructing the hierarchy, it is necessary to identify the goal, criteria, and alternatives that will be used to quantify the ultimate impacts of COVID-19. All these elements of the hierarchy must be defined adequately from a consumption perspective, supporting decision making through a simplified form of a complex phenomenon. Why is it important that they are adequately defined? In the preference assignment phase, they all become input data for expert criteria that define a pairwise comparison between all of them. The preference allocation process is based on a survey of citizens in Croatia. The sample size was 559 surveys, and data collection was based on an online survey.

After constructing the hierarchy and obtaining the performance, expert criteria were used to define the importance of elements of the hierarchy using Saaty's preference scale [14]. This scale contains nine qualifications and shows the level of importance between the elements of the hierarchy, assigning weights to each of them through the AHP method.

The basic task of the experts (as in the previous analysis by Šostar and Ristanović, 2023) [11] is to ensure the logical consistency of the different levels of the hierarchy, which implies compliance with the criterion of transitivity of preferences. So, if COVID-19 remains a priority for psychological effects, and the topic of psychological effects determines consumer habits, then priority must be given to COVID-19 in determining consumer habits. The same analysis, with a consistency test, is used for the other elements in the hierarchical structure.

In the AHP stage, preferences are established following a pairwise comparison for-mat. Pairwise comparisons are performed for each element within the hierarchical structure. Pairwise comparisons (for N elements) will form a judgment matrix (A). Each element of the matrix (aij) is created by comparing the row elements Ai with the corresponding column elements Aj so that A = (aij), where i = 1, 2, . . ., and N and j = 1, 2, . . ., where N represents the number of criteria. The main diagonal of matrix A is equal to 1 (aii = 1 or ajj = 1). Below, the inverse ratings of those above appear. According to Saaty's scale, above the diagonal of the matrix A, there are values from 1 to 9, and below them are the corresponding inverse values [139,140].

Londoño-Pineda et al., 2021 [139], showed that in the next two steps, a normalized matrix is created, with weights for each criterion (W_i). First, each matrix value is divided by the sum of that column (Equation (1)). Then, the rows of all standardized values (sa_{ij}) are added. Finally, the values thus obtained are divided by the number of criteria (Equation (2)).

$$sa_{ij} = \frac{a_{ij}}{\sum_{i=1}^{N} a_{ij}} \; \forall j \in N \tag{1}$$

$$W_i = \frac{\sum_{j=1}^{N} sa_{ij}}{N} \; \forall i \in N \tag{2}$$

The new judgment matrix A has a new problem (Equation (3)): a problem of vectors and eigenvalues [137]:

$$A * \omega = \lambda * \omega, e^T = 1, \tag{3}$$

where A is the matrix of pairwise comparisons of the dimension nxn, w is the eigenvector representing the ranking or order of priority, λ is the maximum eigenvalue, which is the measure of the consistency, and e is the unit vector [139,140].

The final step in this phase involves calculating consistency. According to Saaty, 1990 [138], the consistency coefficient (*CR*) is the ratio between the consistency index (*CI*) and the random index (*RI*) and is shown in Equation (4). Calculated values of the RI are presented in Table 3.

$$CR = \frac{CI}{RI} \tag{4}$$

Table 3. The values of the random index (RI) [138].

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14
RI	0	0	0.58	0.89	1.11	1.25	1.35	1.40	1.45	1.49	1.51	1.48	1.56	1.57

Equation (5) is used for the consistency index:

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (5)$$

where λmax is the maximum eigenvalue (obtained by multiplying the vector of total sums from the matrix of paired comparisons with the vector of weighted values from the normalized matrix), and n represents the number of parameters.

If CR < 0.10, there is consistency, while if CR > 0.10, consistency does not exist; then, the entire process (assignment of preferences, pairwise comparisons) should be repeated until a reliable measurement model of the elements of the hierarchical matrix is achieved.

In the last stage, the aggregation of weights, the weight of each criterion is calculated by adding the selected alternatives' weights so that the final sum is equal to 1.

Solving a set goal or problem through several iterations of the hierarchical AHP algorithm increases the quality and efficiency of decisions [11,141].

Summarizing all the positive experiences we had through our analysis and research, one of the most relevant methods in multiple decision making is the AHP method. Perhaps we could best present the advantages of the AHP model by considering Saaty's features of the AHP model [15]:

- Unity.
- Complexity.
- Interdependence.
- Hierarchic structure.
- Measurement.
- Consistency.
- Synthesis.
- Tradeoffs.
- Judgement and Consensus.
- Process Repetition.

Modeling the AHP Hierarchical Structure

The AHP method facilitates the decision making process and leads to the analysis of decision making problems through several hierarchical levels. In essence, the AHP hierarchical structure starts by defining the objective, then the criteria are ranked, and finally, one or more alternatives are selected from the defined set of alternatives. This hierarchical structure represents a logical structure of interconnected components. The principles of logical consistency involve consistency between objectives, criteria, and variants. The first step is to calculate the priority of the criteria for a given problem. In the second step, alternative priorities are calculated according to the given criteria. In the last step, alternative priorities are determined for the defined problem [142].

In our example (Figure 4), at the top of the hierarchical structure, there is a problem that consumers face. This is the goal of our analysis: to assess how COVID-19 affects individual consumption. Based on the problem of the AHP method, criteria are defined to identify the problem, i.e., COVID-19. The following criteria were singled out: C1—Product Demand, C2—Consumer Habits, C3—Online Buying, C4—Income, C5—Saving, C6—Lack of Products, C7—Delivery Delay, C8—Panic Buying. The results are obtained from several predetermined alternatives that represent options for solving the problem: A1—Product Consumption, A2—Distribution Chains, A3—Smoothing Consumption, and A4—Product

Supply. The final decision must be the best solution for the defined problem, and it is made based on the highest-ranking alternative.

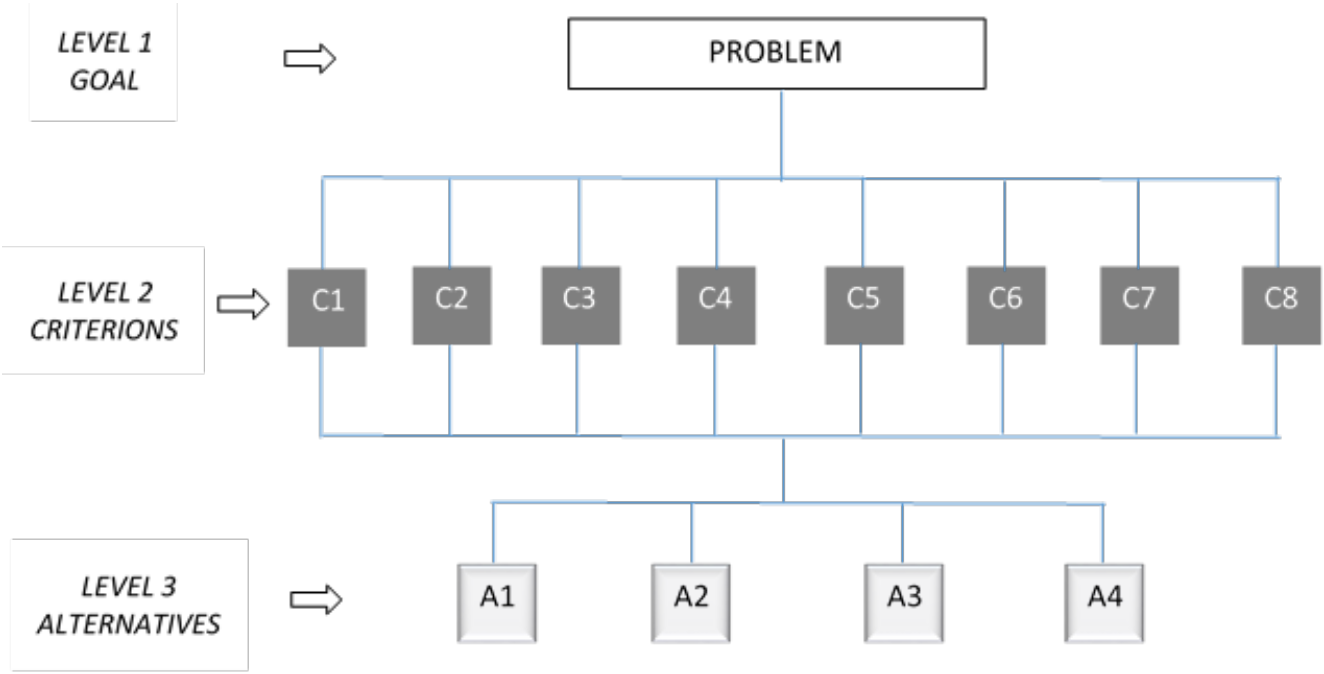

Figure 4. The Analytical Hierarchy Process model: distribution channel objectives and actions hierarchy.

3. Results and Discussion

The data processing of the survey questionnaire allowed us to expand the analysis of various factors of consumer habits [11] to include the impact analysis of only one criterion, the COVID-19 pandemic, on individual consumption. The selection of the influence of this criterion put us in a position to create a new hierarchical structure of the AHP model. The new problem/objective of analysis becomes COVID-19, taking the place of the previous one—consumer habits. There are two reasons why we decided to take this step. The first is that the topic of COVID-19 is always current and represents a good basis for decision making in crisis. The second reason is that in the initial assessment of the impact of the effects, viewed through the evaluation of the criteria for the selection of alternatives, the dominant criterion was COVID-19. On the other hand, a well-designed survey and presentation of the problem during the pandemic period gave us a good basis for various analyses. The results allowed us to present the perspectives of consumer access to the market and timely adaptation in new crisis conditions. Also, the results gave us the basis for understanding the behavior of individual consumers and the continuation of our research in that direction.

Figure 5 shows that during the COVID-19 pandemic, the decision to reduce the purchase of luxury products was most prevalent, while the reduction in purchasing health-related products and daily consumption products was minimal. It is also visible that many respondents did not reduce their purchases of any of the mentioned product groups. During the pandemic, many people experienced job loss or wage reductions, leading to decreased disposable income. As a result, they might have opted to save money and cut back on non-essential purchases, like luxury items. The pandemic shifted consumer priorities towards health and wellness. People were more likely to spend on health and hygiene products and food and groceries, and less on luxury items. With social distancing measures and lockdowns in place, consumers spent more time at home, reducing the need for luxury items such as designer clothing, accessories, or high-end electronics. The pandemic increased the focus on health and wellness, leading to a surge in purchases of health-related

products such as sanitizers, masks, vitamins, etc. Daily consumption products like food and hygiene products are essential, and their demand generally remains stable, regardless of the economic situation. The fact that many respondents did not reduce their purchases in any of the product groups could be attributed to various factors such as financial stability, the nature of their job (some sectors were less affected by the pandemic), or personal beliefs and habits. It is important to note that consumer behavior is multifaceted and influenced by a complex set of factors that could include socio-demographics, psychological factors, and individual circumstances.

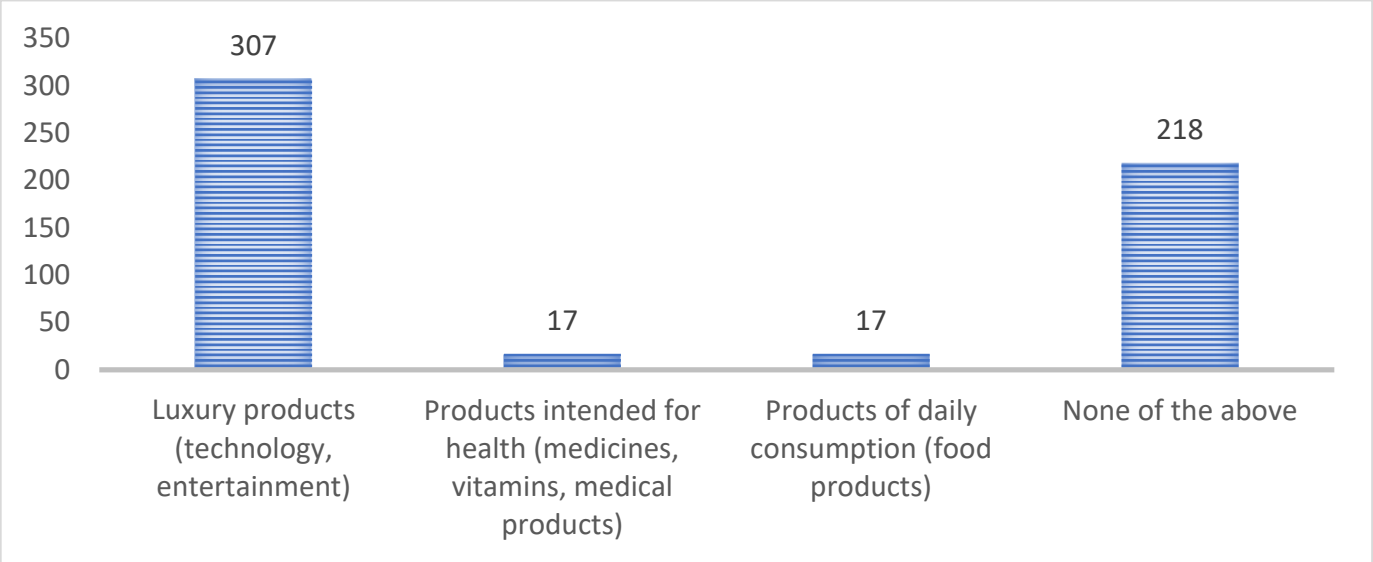

Figure 5. Reduction in product purchases during the COVID-19 pandemic (number of responders).

Figure 6 shows that during the COVID-19 pandemic, there was a significant increase in the purchase of health-related products and everyday consumption products, while the increase in the purchase of luxury products was minimal. It can also be seen that many respondents did not increase their purchases in any of the mentioned product groups. During times of crisis or uncertainty, consumers tend to focus on securing goods that are essential for survival. This includes food, medical supplies, and other items used in daily life. Hence, an increase in the purchase of health-related products and everyday consumption products can be seen. The pandemic has had severe economic impacts, leading to job losses and reduced income for many people. This uncertainty can cause consumers to cut back on non-essential spending, such as luxury goods. As a result, the purchase of luxury products is minimal. Health has become a significant concern during the COVID-19 pandemic. As a result, consumers may be more likely to invest in health-related products to protect themselves and their families, explaining the increase in the purchase of these products. Due to the enforcement of lockdown measures, individuals have been spending more time at home, which has resulted in a surge in the usage of daily commodities. The COVID-19 pandemic has notably expedited the expansion of e-commerce, as numerous consumers have shifted towards online shopping in adherence to social distancing regulations. This could explain why many respondents did not increase their purchases in any of the mentioned product groups, as they might have switched to online shopping.

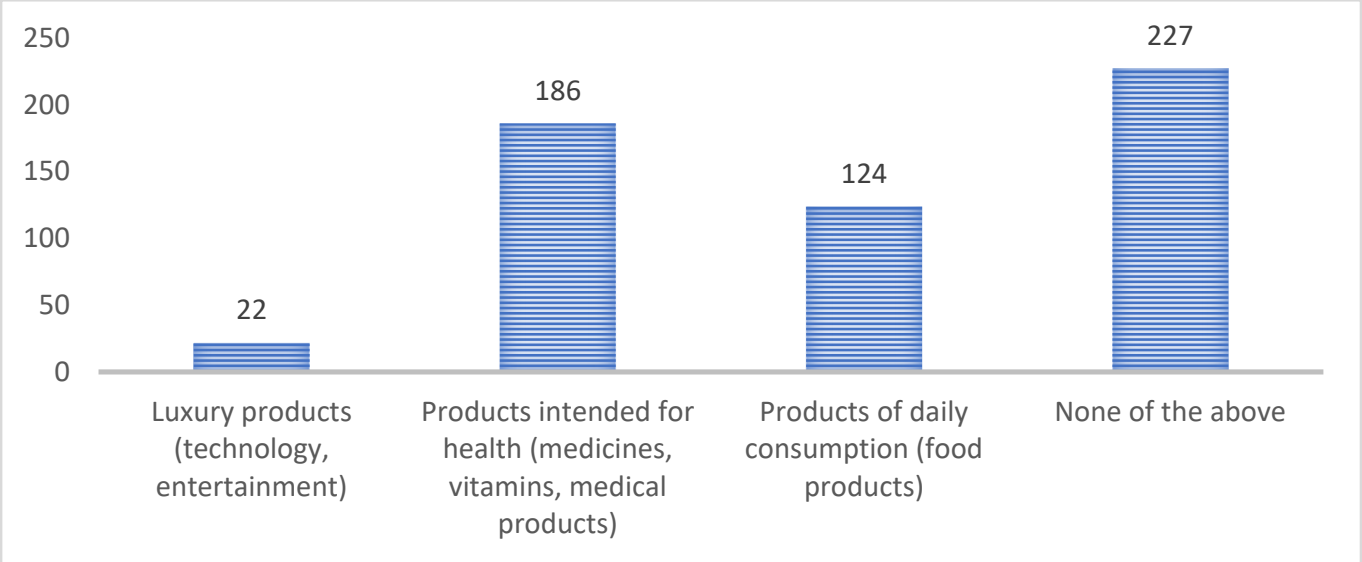

Figure 6. Increase in product purchases during the COVID-19 pandemic (number of responders).

Figure 7 shows that during the COVID-19 pandemic, the role of online shopping as a distribution channel increased, while physical shopping increased only in a negligible number of cases. Also, almost half of the respondents did not change their shopping method. Many people turned to online shopping to minimize their potential exposure to the virus in crowded places such as stores and markets. Online shopping offers the convenience of home delivery, a broader range of product options, and the ability to shop at any time, without the need to commute or queue. Many countries imposed lockdowns and social distancing measures that limited the operations of physical stores and restricted people's movement, making online shopping a more feasible option. The pandemic has also resulted in an overall increase in internet usage due to remote work and online education, making people more accustomed to using digital platforms for various purposes, including shopping.

Figure 7. Increase in the use of purchasing and distribution channels during the COVID-19 pandemic (number of responders).

As we can see in Figure 8, it is evident that the monthly income of the respondents remained stable and that the COVID-19 pandemic did not affect their income. The respondents might have been in industries or job roles that were not heavily affected by the pandemic. Certain sectors like technology, health care, and essential goods saw stability or even growth during the pandemic. Many governments implemented measures such as stimulus checks, unemployment benefits, and other financial aid programs to support their citizens during the pandemic. These measures could have helped maintain the income levels of the respondents. The transition to remote work allowed many businesses to continue operating during the pandemic, which ensured that their employees continued to earn their usual income. The respondents may have had sufficient savings or investments to maintain their income level during the pandemic.

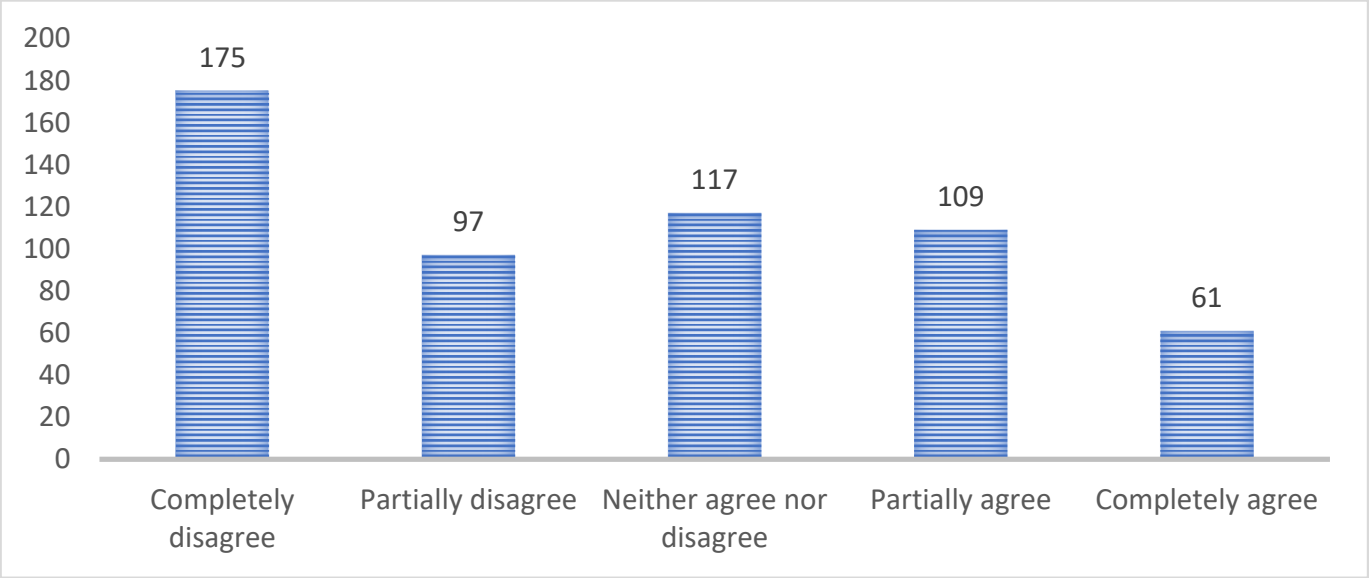

Figure 8. The COVID-19 pandemic has affected my monthly income. (number of responders).

It is also important to emphasize that the study shows that buying habits have not significantly changed and that respondents did not stockpile products due to the media's "bombardment" of the public with attempts to create a false sense of panic. It is apparent that the stockpiling of products by individuals was only in isolated cases.

Figure 9 shows that respondents agree with the statement that the COVID-19 pandemic has increased product prices. COVID-19 caused disruptions in the global supply chain due to lockdowns, reduced workforce, and restrictions on transport and travel. These disruptions often lead to shortages of materials or products, causing a spike in prices. Businesses have faced increased operational costs due to the implementation of safety protocols, sanitization requirements, and increased costs for personal protective equipment for staff. These additional costs can be passed onto the consumer in the form of higher prices. In some cases, governments have been printing money to help stimulate the economy during the pandemic, which can lead to inflation and higher prices. Restrictions and safety measures have increased the cost of transporting goods, which can also contribute to the rise in product prices. As we can see from the research, the greatest price increase occurred for health care products and food, while the smallest was for luxury products. These data certainly leads us to the conclusion that some companies took advantage of the situation of an increased demand for these products and immorally raised their product prices without a justified reason. Ethical behavior of companies is also remembered rewarded by consumers. The ethics of company management and corporate governance rests on the fact that the overall good of the company is the fiduciary duty of managers [143].

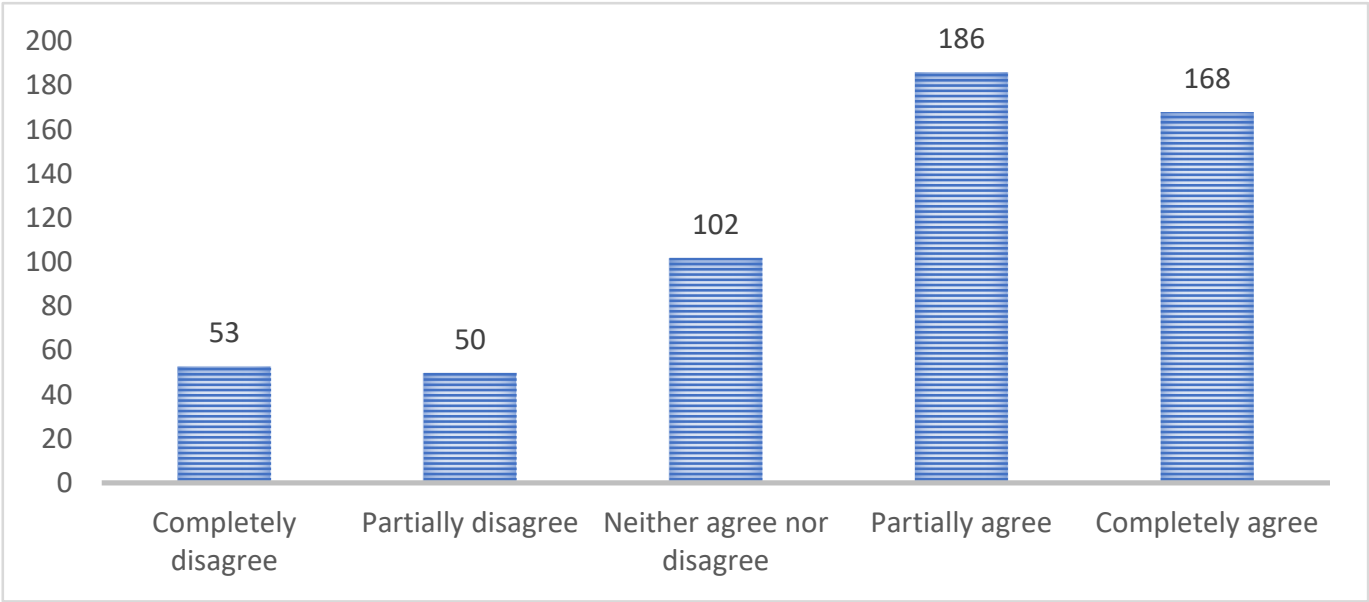

Figure 9. The COVID-19 pandemic has affected the rise in product prices. (number of responders).

As we can see in Figure 10, it is evident that there were supply chain issues during the COVID-19 pandemic, leading to product shortages in the market. Many factories around the world had to temporarily shut down or significantly reduce their capacity due to the pandemic, either to comply with lockdown measures or because their workers got sick. With various countries implementing travel restrictions and quarantine measures, the transportation of goods became more difficult and slower. Air, sea, and land transport were all affected, which caused significant delays in shipping products from manufacturers to retailers, and finally to consumers. Certain goods such as personal protective equipment (PPE), home workout equipment, and home office supplies experienced a surge in demand. This sudden increase in demand put further pressure on the already strained supply chains and caused additional delivery delays. Increased scrutiny and controls at border crossings to prevent the spread of the virus also contributed to delays.

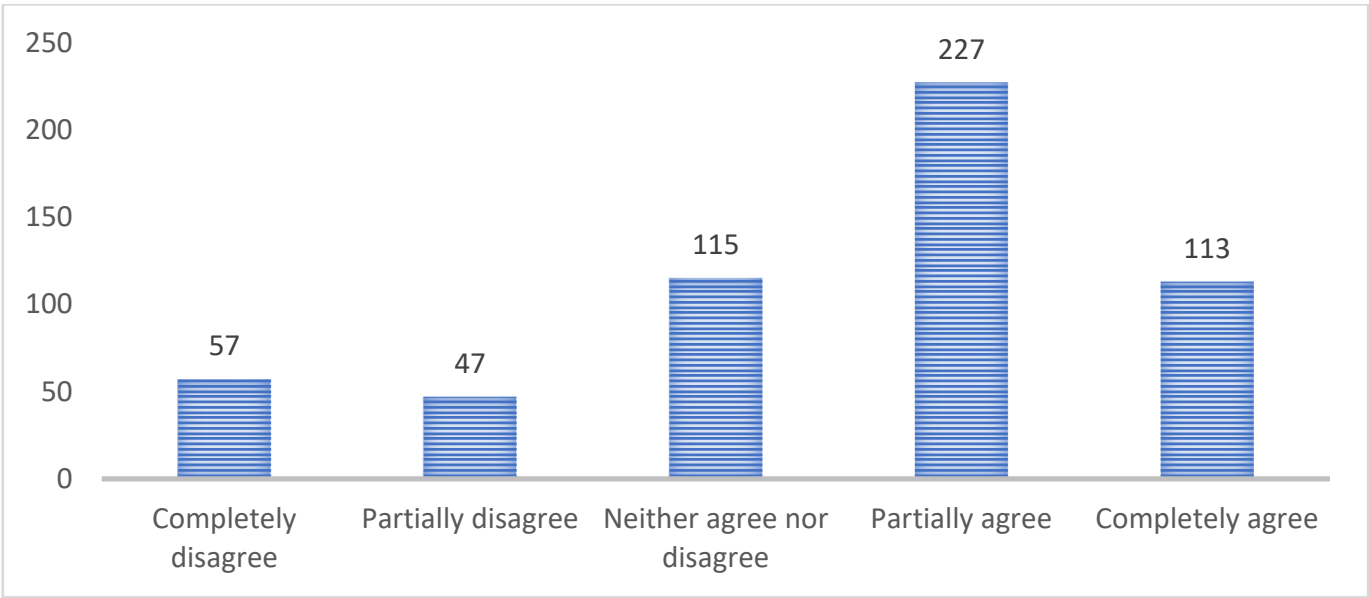

Figure 10. The COVID-19 pandemic has caused delays in product delivery. (number of responders).

Given that the survey consisted of questions of a closed and open type, the results show that during the COVID-19 pandemic, the purchase of luxury goods decreased significantly, and people focused on what was essential for life. Furthermore, the respondents emphasized that people began to eat healthier and wasted less food and other products. The reduced consumption of luxury goods and other products significantly contributed to the reduction in harmful environmental impacts and gave more importance to environmental protection and ecology. Due to travel restrictions and quarantines, there was a decrease in traffic and industrial activities, resulting in reduced emissions of carbon dioxide and other greenhouse gases. The COVID-19 pandemic affected the reduction in consumption, the subsequent decline in production, and the distribution channel issues, leading to overall decreased purchasing, consumption, and environmental pollution. Reduced industrial activity and traffic led to a significant improvement in air quality in many urban areas. The reduction in human activity in natural habitats allowed some animal species to resettle or expand their territories. The pandemic has prompted many individuals and organizations to reconsider their habits, including the way they travel, consume, and work. This may have long-term implications for sustainable development, especially if there is encouragement to reduce travel, increase the use of digital tools, and reduce consumption. The pandemic has highlighted the importance of global collaboration in addressing common challenges. This could serve as an incentive for increased collaboration in addressing global environmental challenges, such as climate change.

The results of a survey conducted on a sample of 559 respondents to determine the impact of the COVID-19 pandemic on the behavior of individual consumers indicate that there are several different elements to this impact. This confirms the first hypothesis (H1). The evaluations of the given alternatives showed the dominance of online shopping among individual consumers, thus confirming the second hypothesis (H2). The assessed criteria confirm that incomes and savings have remained relatively stable thanks to government support measures, while global price flows have affected consumption imbalances. In this way, the third hypothesis of the model (H3) was confirmed. Analysis of the hierarchical structure of the AHP model confirmed the absence of availability of products on the market because of restrictions on movement, work, and travel, thereby confirming the fourth hypothesis (H4).

The analysis results clearly show that the impact of the COVID-19 pandemic on individual consumption is varied, with a dominant negative impact on (i) product supply and (ii) delivery delays. In the hierarchical structure, the impact of COVID-19 on individual consumption in the Republic of Croatia is set as a goal or problem. We evaluated the dependence that exists between the criteria and the alternatives—how the criteria affect consumer habits, and what the alternatives are depending on the selected criteria. First, we created a complex hierarchical structure. We then assessed the impact of each element separately. In this step, we connected and combined these elements. Here, the strengths of the AHP model presented by Saaty are evident, like hierarchy, measurement, synthesis, and consistency.

As in our previous article [11], we created the hierarchical structures of the AHP model. We arranged the elements according to hierarchical levels (Figure 11). We compared them with each other according to different levels concerning the general goal. The matrix is complete, with paired professional ratings. Using the additive normalization method, priority vectors are determined for each matrix in the model. Applying this method (according to Figure 10), the Delay in Delivery (DD) is the most important goal criterion, the Lack of Products (LP) is in second place, Online Buying (OB) is third in rank, and Consumer Habits (CH) is fourth. The criteria of Product Demand (PD), Panic Buying (PB), Income (I), and Savings (S) had a lower level of impact from COVID-19. Ratio scores indicate that the matrix is correctly generated. The real eigenvector is high ($\lambda max = 8.833$), while the consistency ratio is less than 10% (CR = 0.084). Thus, the required consistency of this model was restored.

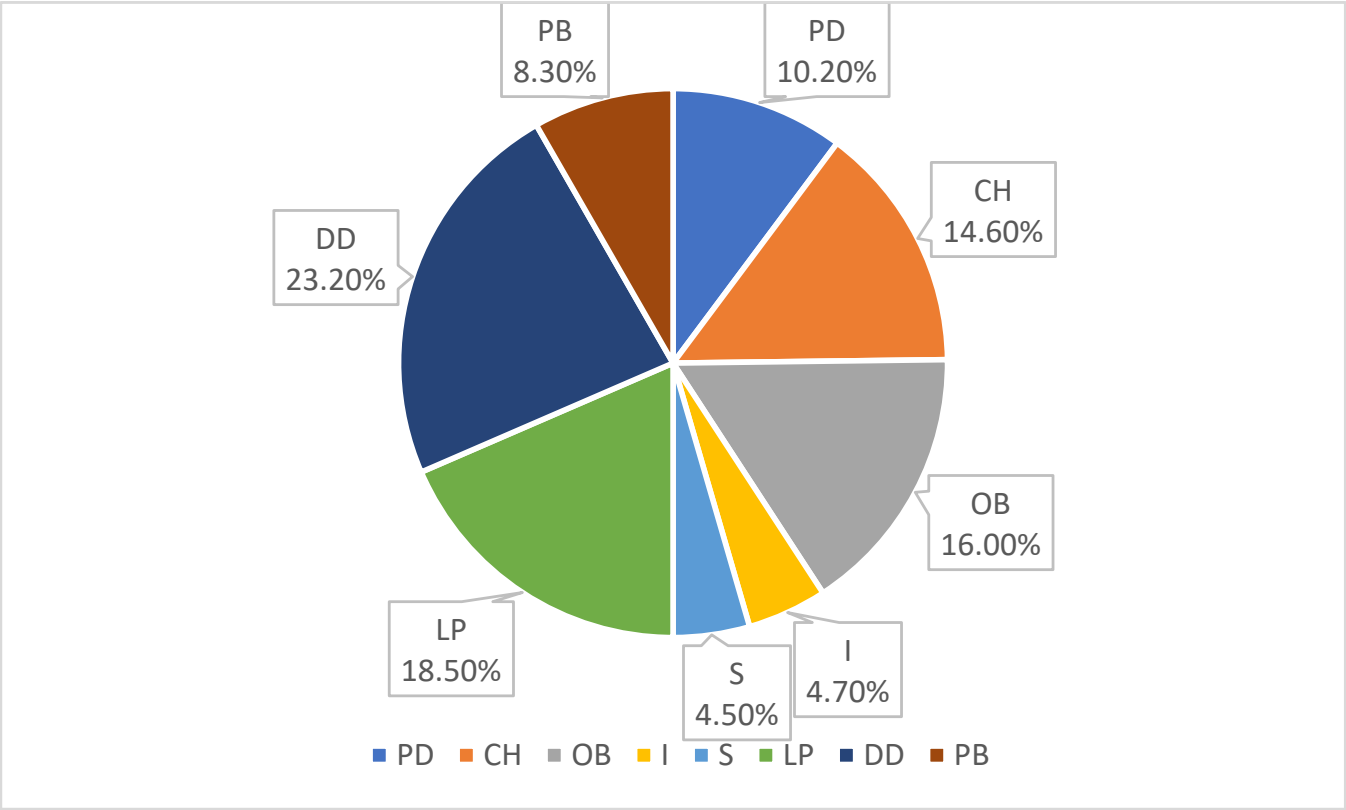

Figure 11. Priority vectors for criteria in standard AHP method, using the additive normalization method. Note: PD—Product Demand, CH—Consumer Habits, OB—Online Buying, I—Income, S—Savings, LP—Lack of Products, DD—Delivery Delay, PB—Panic Buying.

From the point of view of the two dominant criteria (DD and LP), according to Table 4, the best alternative is the product supply (PS). The second best is different between the two criteria. For DD, it is product consumption (PC), and for LP, it is the distribution chains. The worst alternative in the model is Smoothing Consumption (SC).

Table 4. Priority vectors for variants by criteria.

Alternatives/Criteria	PD	CH	OB	I	S	LP	DD	PB
PC	0.387	0.269	0.237	0.248	0.177	0.168	0.264	0.275
DC	0.198	0.222	0.173	0.195	0.140	0.231	0.183	0.198
SC	0.140	0.128	0.138	0.137	0.264	0.117	0.139	0.140
PS	0.275	0.381	0.452	0.419	0.419	0.484	0.481	0.387

Note: PC—Product Consumption, DC—Distribution Chains, SC—Smoothing Consumption, PS—Product Supply, PD—Product Demand, CH—Consumer Habits, OB—Online Buying, I—Income, S—Savings, LP—Lack of Products, DD—Delivery Delay, PB—Panic Buying.

We then calculated the consistency index (CR), since the eigenvalue (EV) method is an integral part of the standard AHP method. We measured the correctness of ranked priorities. The values that are important for a correct reading are found in Table 5, namely, maximum matrix eigenvalues (λmax), coincidence index (RI), consistency index (CI), and consistency rate (CR) [11].

Table 5. Degree of pairwise comparisons consistency via the method of eigenvalues.

	MATRIX							
	V1	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**
λmax	4.12	4.22	4.12	4.22	4.14	4.12	4.22	4.12
RI	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
CI	0.04	0.07	0.04	0.07	0.05	0.04	0.07	0.04
CR	0.05	0.08	0.04	0.08	0.05	0.05	0.08	0.05

From Table 5, we can notice that the consistency rate (CR) reaches values within tolerance, i.e., lower than 0.10, for all alternatives estimated according to the criteria. This means there is no need to re-evaluate the variants (see AHP algorithm ahead).

The priority vector evaluation involves measuring the alternatives' priorities for the criteria and for the goal. The priority vectors of certain criteria are multiplied by the values of the priority vectors of the alternatives. Thus, the final priority vectors are obtained.

Synthesizing the priority vectors of alternatives in relation to all criteria (Figure 12), we found that the impact of COVID-19 is greatest on Product Supply (PS), smaller on Product Consumption (PC) and Distribution Chains (DC), while the least impact is on Smoothing Consumption (SC).

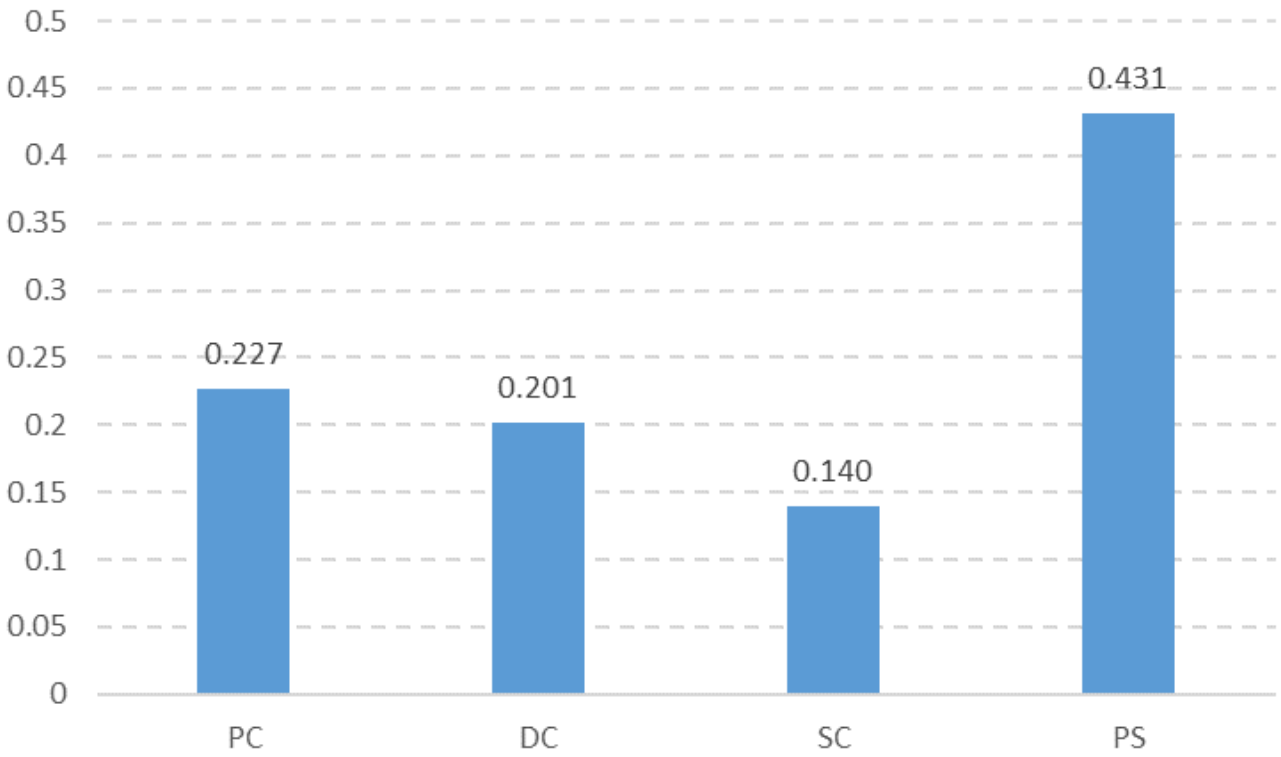

Figure 12. Final priority vectors in standard AHP method, using the additive normalization method. Note: PC—Product Consumption, DC—Distribution Chains, SC—Smoothing Consumption, and PS—Product Supply.

The final verification of the hierarchical structure of the AHP method is sublimated into tables of weight vectors, both for alternatives and criteria. In the final table (Table 6), the last field in the Priority column (sum of all alternatives) corresponds by value to the last field in the Weight Vectors row (sum of all criteria). That value is equal to 1. This means that the entire process was carried out methodologically correctly.

Table 6. Total weight and rank of variants.

	PD	CH	OB	I	S	LP	DD	PB	Priorities	Range
PC	0.03	0.04	0.03	0.01	0.01	0.03	0.04	0.02	0.20	3
DC	0.02	0.03	0.05	0.01	0.01	0.05	0.06	0.01	0.23	2
SC	0.01	0.02	0.02	0.01	0.01	0.02	0.03	0.01	0.14	4
PS	0.04	0.06	0.06	0.02	0.02	0.08	0.10	0.04	0.42	1
Weight vector	(0.10)	(0.15)	(0.16)	(0.05)	(0.05)	(0.19)	(0.23)	(0.08)	1.00	
rang	5	4	3	7	8	2	1	6		

Note: PC—Product Consumption, DC—Distribution Chains, SC—Smoothing Consumption, PS—Product Supply, PD—Product Demand, CH—Consumer Habits, OB—Online Buying, I—Income, S—Savings, LP—Lack of Products, DD—Delivery Delay, PB—Panic Buying.

Table 6 presents the results showing the values of the criteria and alternatives. The figures in the last two rows of Table 6 show the criterion scores (values in parentheses and rank). Delivery Delay (0.23) was the most affected during the COVID-19 pandemic and significantly affected individual consumption. The dominant impact of the COVID-19 pandemic is the lack of products on the market (0.19). It is now clear that the impact of the pandemic on the global commodity market has been strong. This is indicated by the value of the alternative (the last two columns of Table 6 show the priorities and rank), where the greatest impact of the COVID-19 pandemic was on the product supply (0.42). The survey results also show that a large percentage (about 60 percent) of respondents pointed out that the COVID-19 pandemic affected the absence of products from the market and delays in delivery. Therefore, we find out that the dominant impact of the COVID-19 pandemic is on the supply side. This further means that it was necessary to focus measures and interventions on the supply side (delivery channels, suppliers, sales, and margins) instead of on the demand side (increasing interest rates). The next important impact of the COVID-19 pandemic is on both buying and payments. There, we can see that there has been an increase in online shopping (0.16), but at the same time, there is a significant impact on distribution trade chains (0.23). During the COVID-19 pandemic, online purchases and payments have grown significantly, primarily thanks to the progress of the ICT sector and government incentives to promote digitization. Also, a large percentage (over 50%) of respondents confirmed a greater share of online purchases.

The impact of the COVID-19 pandemic on the volume of purchases (0.10) and consumer habits (0.15) was not so strong. Respondents also confirmed that neither their shopping habits nor other habits had changed significantly, nor had they stockpiled (Panic Buying, 0.08). At first, the media reported stockpiling. The government successfully overcame this, using monetary incentives, on the demand side, and interventions from commodity reserves, on the supply side.

The decisive measures taken by the governments of many countries to protect jobs and wages have contributed to maintaining the living standards of their citizens. However, the successfully maintained income level came at the expense of new borrowing from less developed countries and debt monetization in developed countries. Thus, we find that the impact of the COVID-19 pandemic on Income (0.05) and Savings (0.05) is negligible. Hence, it is not surprising that the impact of the COVID-19 pandemic on Smoothing Consumption (0.14) is the smallest. Also, the monetary stimulus measures were aimed at protecting the banking sector, thereby additionally protecting citizens' deposits. Government measures have made it impossible to successfully forecast and smooth consumption by adjusting consumption patterns. Stimulus measures were necessary at the time, but they disrupted supply and demand in commodity markets, and at the same time made economic analysis difficult.

Respondents stated that they reduced their shopping during the COVID-19 pandemic due to fears of job loss and financial instability. They also believe that in the early stages of the pandemic, store shelves were empty, and that production and distribution issues

had an equal effect on their consumption. Fearing a shortage of food and health supplies, respondents highlight that at one point, they stockpiled, which later proved unnecessary. They point out that they turned to purchasing healthier products and eco-friendly products from local family farms, directly influencing these farms' sustainable development and promoting ecological and organic agriculture. They note less food wastage and more rational consumption. The majority of respondents confirmed that many of their changed shopping habits would continue post-pandemic. Respondents said that after the pandemic, they use bicycles more frequently as a mode of transportation or walk, thereby reducing car and public transport usage, benefiting their health, the air quality, and nature. Respondents concluded that the COVID-19 pandemic brought them a more socially responsible way of thinking about people, food, and the environment.

At the end of the analysis, our use of the AHP model had several advantages. The results of the AHP model proved to be satisfactory this time as well. The value of the consistency coefficient is below 0.10 (tolerance zone). This means that a new assessment of alternatives and criteria is not required.

All the mentioned results speak in favor of changes in consumer behavior during the COVID-19 pandemic. Wang and Huang, 2021 [144], highlight how the pandemic has disrupted economic stability and emphasize that guidelines for economic recovery in sustainable development should focus on green and inclusive growth where the environment and economic development must act in concert. We can confirm that the pandemic has had a significant impact on almost all the sustainable development goals of strategic documents and policies of all countries [145,146]. Consumers have become much more aware since the COVID-19 pandemic passed, and this has strong implications for the economy in the future [147]. The results of the study by Aghaei et al., 2021 [148], indicate that manufacturers, retailers, and suppliers should place emphasis on the supply and sale of sustainable products in order to attract customers. Many consumers have turned to more sensible shopping and have oriented themselves towards sustainable products that contribute more to environmental protection [149]. In addition to purchasing sustainable products, consumers have followed a sustainable concept of food consumption, where less household waste has been generated [150] Consumers are buying sustainable products more frequently and are more willing to pay a premium for them. They are also becoming increasingly attentive to environmental issues and are exhibiting more sustainable behaviors [151]. During the pandemic years, manufacturers have placed greater emphasis on the development of sustainable products that have minimal negative impact on the environment, and consumers have been encouraged to behave sustainably [152]. In their examination of consumer behavior, Salah et al., 2022 [153], explore the ways in which the COVID-19 pandemic has influenced both the retail industry and consumer attitudes towards sustainable practices and notice a shift in consumer preferences toward retail shopping, digital transactions, eco-friendly dietary habits, and a sustainable way of living. The research of Alwan et al., 2023, indicates that the growing prominence of e-commerce will require enhancements to existing supply chains which includes broadening the supplier network and instituting more sustainable supply chain practices [154].

This study has certain limitations that should be considered. Given that there are residents from rural areas who may not have accessible internet, or that it concerns an older population, it is possible that these demographics participated less in the sample. As the study was conducted in the Republic of Croatia, respondents in other countries might have reacted differently to the posed questions. Since the intensity of the COVID-19 pandemic has changed over time, responses to the same questions might have varied at different points during the pandemic. There is a possibility that, even though the survey is anonymous, some respondents might not have wanted to answer truthfully, or they may not remember all the details associated with their purchases. As a variety of factors influenced the supply and demand in the market during the COVID-19 pandemic, it is very difficult to identify all existing variables.

4. Conclusions

The COVID-19 pandemic has altered the manner in which individuals live, carry out their jobs, engage in shopping, and communicate. By studying these changes, companies can better understand them and more easily plan future marketing campaigns. The pandemic has accelerated digitization processes and approaches to consumer purchases in a digital environment. Some consumer habits remain even after the pandemic, and these habits will affect society and the economy.

The economic downturn caused by the pandemic might delay or divert financial resources intended for sustainable development. On the other hand, economic stimuli and recovery plans offer opportunities to invest in green technologies and infrastructure. The pandemic has highlighted inequalities in societies worldwide. Sustainable development aims for a more equitable society, and the pandemic has further emphasized the need for such efforts. Travel restrictions and quarantines have prompted lifestyle changes, such as working from home, which can have long-term positive environmental impacts if these practices continue. Global supply chain disruptions have prompted considerations for more local and sustainable production and consumption methods. While some habitats benefited from reduced human influence, excessive use of disinfectants and increased single-use plastic consumption might adversely affect the environment. The pandemic has heightened global awareness of the importance of adaptability, collaboration, and care for the planet. This could provide a catalyst for integrating sustainable practices into educational programs and the broader public. The rapid development of digital solutions and technologies in response to the pandemic might stimulate innovations supporting sustainability.

This analysis, as well as our previous one [11], was aimed at assessing multicriteria problems in the assessment of different impacts on the consumer. For this purpose, when deciding with multiple criteria (MCDM), we used the most applied model in the decision making process, the AHP model.

The preliminary assessment of various factors influencing consumer decisions demonstrated that in Croatia, personal factors outweigh other elements like psychological, social, and cultural. This time, we outlined a new objective. At the apex of the hierarchical structure of the AHP model, we placed COVID-19 as a psychological factor in the consumer decision making process. We gauged the impact of the COVID-19 pandemic on individual consumption using this AHP hierarchical structure.

This study provides more insights into the consumer perception literature during and after the COVID-19 pandemic. We have successfully identified new impact factors and examined the significance of the spread of the impact of COVID-19 on the consumer.

In our research, we showed that the greatest impact of the COVID-19 pandemic was measured on the goods market, where there were changes in the supply of goods (delay in delivery, lack of products on the market) and changed distribution channels (online purchases). It was proven that these factors exhibited different levels of influence. We found the increase in the impact of COVID-19 in terms of the types and groups of products consumers buy. Also, we observed a weak impact on the balancing of consumption, due to the interventions of the governments of all countries to preserve the wages and jobs of citizens. The mentioned trends indicate the stability of individuals' income. The rise in prices was caused due to more expensive raw materials for production, a more complicated supply chain, and unjustifiable price increases of necessary products during the COVID-19 pandemic. Companies have exploited the pandemic situation and tried to make a quick profit. As a result of this trend, the Republic of Croatia had to freeze the prices of basic food products.

Based on the results of this study, the impact of the pandemic on consumer behavior was significant only in some segments, but not definitive. The observed changes are a result of short-term reactions to crisis situations and circumstances that are not everyday occurrences, but rather long-term changes in customer habits and behaviors.

It is crucial for companies to monitor market trends, learn from existing crisis situations, and be prepared for the next market anomalies.

This study also offers a nuanced understanding of how the COVID-19 pandemic has impacted consumer behavior and, consequently, sustainable development. By employing the Analytic Hierarchy Process (AHP) model to assess various influences on consumer behavior, our findings contribute to a growing body of literature that seeks to navigate the complexities of sustainable development in the face of unprecedented global challenges. The shifts in consumer behavior observed during the pandemic, such as an increase in online shopping and the use of single-use items, have a complex set of implications for sustainability. On one hand, these changes present challenges like increased waste and energy consumption; on the other, they highlight opportunities for innovation in sustainable practices, from more efficient supply chains to eco-friendly packaging solutions. Importantly, our research underscores the need for businesses and policy makers to be agile and responsive to rapidly evolving consumer preferences in the context of sustainability. The pandemic has not only accelerated digitization but also highlighted the importance of ethical and sustainable business practices in consumer choices. As we navigate the long-term implications of the pandemic, understanding these shifts can inform more sustainable business strategies, public policies, and individual choices that align with the broader goals of sustainable development. In closing, as the world grapples with the ongoing challenges posed by the COVID-19 pandemic, this study serves as a timely reminder of the critical importance of aligning immediate responses with long-term sustainability goals. Companies, researchers, and policy makers can draw upon these findings to shape strategies that are both effective in the short term and sustainable for the future.

This research will have implications for industry and the academic community. Companies can use the insights to better align their strategies to suit the consumer behavioral changes due to the pandemic, like shifts in product preferences and online purchases. The study highlights how trade distribution chains have been disrupted. Businesses can reassess their supply chains for more resilience, especially during global crises. Understanding that personal factors are a leading influence on consumer behavior in Croatia, businesses can personalize marketing and engagement efforts more effectively. The findings regarding price inflation and exploitation can guide businesses in better pricing models that are ethically and economically sustainable. Companies can incorporate these findings into their risk management plans to be better prepared for similar global disruptions in the future. This study sets a precedent for future research around consumer behavior affected by global crises. These insights are not just relevant to businesses and economics but also to psychology, sociology, and public policy, encouraging cross-discipline scholarly work. The real-world implications of this study could be incorporated into academic syllabi related to marketing, consumer behavior, or business strategy. This study can help businesses make more informed decisions based on empirical evidence rather than instinct or historical trends. By understanding which segments are most affected, companies can tailor their marketing and operational strategies to meet these specific needs. Businesses can use the data to identify vulnerabilities in their operational models and develop contingencies for future disruptions. The study opens avenues for more targeted research on consumer behavior, psychology, and crisis management. This research bridges the gap between theoretical models (like AHP) and their practical applications, providing a robust case for their efficacy, and provides a regional perspective (Croatia), which can be juxtaposed with similar studies in different geographies for a more comprehensive understanding. By studying changes in consumer behavior during and after the pandemic, this study can provide insights into the long-term impacts of the pandemic on society and the economy. These long-term impacts can have significant consequences for everyone, from individual companies to the global economy.

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