

Understanding consumers' water consumption preferences and environmental consciousness

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Abstract Water is arguably nowadays one of the most important commodities of increasing socio-economic and political value. Several studies have investigated the factors influencing consumers' perceptions of water quality and water service quality and conclude that are shaped by a constellation of factors; both internal and external. This work is focused on identifying basic trends in consumer's preferences for drinking water. In particular, the main purpose of this work is to investigate a potential correlation between the behavior of consumers choosing drinking water tap or bottled, and their socio-demographic characteristics or/and their ecological consciousness towards major environmental challenges that clearly effect the availability and quality of drinking water. To address the research objective, a mixed methods approach was followed in a specific case study area in Greece. Data were obtained from a survey conducted on a random selected sample of 407 consumers in a period between June and September 2022 in the City of Kilkis. Multivariate data analysis was performed to explore the significant factors associated with consumers' choice of drinking water and identify consumer segments with similar consumption behavior based on their socio-demographic characteristics and their attitudes towards environmental issues. A Focus Group Discussion with local experts and policy makers was also useful towards gaining insight. Results demonstrate that the socio-demographic characteristics do not affect consumers purchasing behavior towards drinking water. On the contrary, there is a correlation between consumers' choice of drinking water and their ecological consciousness. Additionally, cluster analysis was used to distribute consumers with similar behavior towards drinking water and two groups were identified: (1) the "*Bottled water drinkers*" and (2) the "*Tap water (unfiltered) drinkers*". The findings can be very useful for all stakeholders involved, as it can contribute to improvements in water management and in consumer services. Finally, public acceptance of future innovative approach towards water reuse might be further stimulated.

Keywords: drinking water, bottled water, purchasing behavior, ecological consciousness,

1. Introduction

Water is arguably nowadays one of the most important commodities of increasing socio-economic and political value. Several studies have investigated the factors influencing consumers' perceptions of water quality and water service quality and conclude that are shaped by a constellation of factors; both internal and external (Romano and Masserini, 2020). Anadu and Harding (2000) for example elaborated on a significant variation between consumers' perception of water quality and real lived-consumption experiences. Reducing this gap between perceptions and reality requires an understanding of how perceptions are formed and the factors that influence them. All the information that consumer receive about drinking water and the provider's services are in interaction and contribute towards building a general purchasing behavior and preference for drinking water (Denantes and Donoso, 2021).

Several studies have investigated the factors influencing users' perception of water quality and their subjective judgment in order to analyze their preferences in water consumption. In many cases, these studies conclude that consumer's perceptions emerge from an interaction of multiple and diverse factors. Some of the key factors identified in the literature are sensory information (Debbeler et al., 2018; Hu et al., 2011), risk perception (Debbeler et al., 2018; Doria, 2010), trust (Pierce and Gonzalez, 2017) and water quality (Doria, 2010); to name a few. In addition, socioeconomic characteristics of the consumer, such as education, age, and income levels also seem to be determining factors. Moreover, household characteristics also influence their purchasing behavior (Javidi and Pierce, 2018).

According to the above, this work is focused on identifying basic trends in consumer's preferences for drinking water. Especially, it examines which factors affect consumers' purchasing behavior and tries to classify them into groups

with similar behavior as well as describe different levels of ecological consciousness based on demographic and other characteristics.

2. Methodology and Research Design

To address the research objective, a mixed methods approach was followed in a specific case study area in Northern Greece. A Focus Group Discussion with local experts and policy makers was useful towards gaining insight and enabling the construction of the survey with local residents-consumers.

2.1. Study area and sample size

The city of Kilkis with a total of 30.000 population was our study area. All residents of the City of Kilkis were considered as potential consumers of drinking water, eligible to participate in the survey. The exact number of inhabitants received from the census data of 2021 according to National Statistical Service of Greece. The sample was set at 407 people, for a confidence level of 95% ($\alpha = 0.05$) with the margin of acceptable error at 5%, according to the equations from Raosoft on determining the random sample size (www.raosoft.com/sample_size). The sampling unit was one person from each household and sample units were selected randomly.

The questionnaire consists of five parts: the first part includes questions regarding consumers' choice of drinking water, tap or bottled. The second part consists of questions related to consumers' opinions about the drinking water quality in their region. Next, the third part includes questions about consumers' knowledge, education, and awareness on drinking water and environmental issues. The fourth part consists of questions regarding consumers' willingness to use and pay for recycled/reused water. Lastly, the fifth part includes questions regarding consumers' psychographic and personal information such as gender, education, income, occupation etc.

Data were gathered through personal interviews based on a fully structured questionnaire, designed specifically for this research. All interviews were contacted by a team of interviewees that were trained prior to the distribution of the questionnaires during June and September 2022.

2.2. Qualitative research

At this point we must mention that prior to the quantitative research, a Focus Group Discussion with local experts and policy makers from the City of Kilkis was contacted. In total 20 people were engaged during three focus groups using in-depth interviews helped the research team to gain insight into the main factors that define consumers profile towards drinking water. Research team used all the notes from the focus group and quotes to give nuance also to the results of the quantitative analysis.

2.3. Data analysis and Statistical Methodology

Multivariate analysis techniques were implemented for the 407 valid questionnaires collected, in order to reveal the key information included in consumers' responses. First, Cluster Analysis was performed to group consumers with similar patterns of scores with hierarchical and non-hierarchical methods that were developed to establish a consumers' purchasing behavior typology. According to Dalampira et al (2019), consumers can be segmented into groups according to environmental and food identities.

Next, a cross tabulation Chi-Square Analysis was used to categorize consumers who have a particular purchasing behavior according to their socio-demographic characteristics and their ecological consciousness.

3. Results

The average consumer's profile of this study is a female, forty-three years old with a university degree. She lives in an apartment, works full time as a private employee and her annual family income ranges between 8.801 and 13.200 euros.

A typology of the purchasing behavior of the consumers was created with the help of hierarchical and non-hierarchical clustering methods. There were no outliers from the 407 consumers that were contained in Cluster Analysis. The cluster analysis formed two groups of consumers that were named mostly by their drinking habits and patterns towards water. These are: the "**Bottled water drinkers**" representing 45.7% of the total sample and the "**Tap water (unfiltered) drinkers**", representing the majority 54.3% of the total sample size.

In regard to the first cluster, "**Bottled water drinkers**" they never drink unfiltered tap water, and they always drink bottled water when they are out of the house or when they travel. This particular group includes consumers who are affected by third parties' opinions and the brand name of the water seller, when it comes to the water buying decisions. They have low trust to the city water supply provider of the region, and they are not willing to buy, or trust tap water that will be bottled.

The consumers who belong to the "**Tap water (unfiltered) drinkers**" prefer to drink water from the municipality water network. They trust enough the water supply provider of their region and they get information about issues related to drinking water from the internet. In addition, they declare that outside the house or when they travel, they choose to purchase bottled water over tap water. Lastly, it is likely from them to use recycled urban wastewater (after biological treatment) from a public water reuse program.

The results of the Cross Tabulation Chi-Square Analysis elaborate on the profile of both clusters/types regarding their ecological consciousness (Table 1).

Table 1. Profile of each consumers' group regarding their ecological consciousness

Ecological Consciousness	Clusters	
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		"Bottled Water drinkers"	"Tap water (unfiltered) drinkers"	
Participation in environmental education programs	No	30,95%	40,78%	$\chi^2= 4.993$ df=1 p<0,005
Desire to participate in environmental education programs	Yes	20,14%	31,20%	$\chi^2= 10.925$ df=2 p<0,005
Packaging of bottled water/significant impact on the environment	Yes	36,60%	46,92%	$\chi^2= 5.801$ df=2 p<0,005
Implementation of water saving measures	Yes	23,34%	46,43%	$\chi^2= 76.621$ df=2 p<0,001
Using a shower, not a bath for personal hygiene	Selected	41,50%	18,45%	$\chi^2= 70.522$ df=1 p<0,001
Use water from environmentally friendly water source for household needs - Rainwater collection	Yes	24,32%	36,36%	$\chi^2= 40.035$ df=4 p<0,001
- Reuse of treated wastewater from biological cleaning	Disagree	18,42%	6,63%	$\chi^2= 77.248$ df=4 p<0,001
	Undecided	16,95%	35,87%	
- Gray water reuse at home	Disagree	24,32%	12,53%	$\chi^2= 70.652$ df=4 p<0,001
	Undecided	15,97%	32,92%	
Use recycled urban wastewater from a public water reuse program	Likely	16,21%	23,58%	$\chi^2= 68.250$ df=5 p<0,001
	Unlikely	17,69%	7,12%	
Buying food that comes from a farm that irrigates with recycled water	Undecided	21,37%	22,35%	$\chi^2= 33.871$ df=4 p<0,001
Buying a bottled water whose packaging comes from recycled plastic	Yes	29,23%	40,78%	$\chi^2= 7.734$ df=2 p<0,005
At what price	Less than bottled water	12,40%	46,00%	$\chi^2= 34.811$ df=4 p<0,001
	Same as bottled water	22,40%	18,40%	

Most consumers from both groups stated that they have not participated in any environmental education program but are willing to participate in the future. Also, consumers from both groups prefer showering over bathing as a water saving measure. They know that the packaging of bottled water has a significant impact on the environment, and most consumers are willing to buy bottled water whose packaging comes from recycled plastic. But while “*Bottled water drinkers*” are willing to pay the same price for recycled plastic bottled water as regular, “*Tap water*

(unfiltered) drinkers” want to pay less than the regular bottled water. In addition, consumers from both groups would use water from an environmentally friendly source such as rainwater. In contrast, while “*Bottled water drinkers*” are negative about using water derived from either reuse of biologically treated wastewater or gray water for domestic use, “*Tap water (unfiltered) drinkers*” are not keen on using water from the above sources. Furthermore, although it is possible for “*Tap water (unfiltered) drinkers*” to use recycled urban wastewater from a public water reuse program, “*Bottled water drinkers*” appear reluctant. Finally, consumers from both groups are unsure whether they would buy food from a farm that is irrigated by recycled water.

In addition, a cross tabulation chi-square analysis was performed separately for both consumers’ groups in order to create the profile of consumers who have a specific purchasing behavior regarding some of their personal characteristics.

As Table 2 indicates, the “Bottled water drinkers” are mainly male, graduated from high school, employed in the primary sector and their annual family income ranges between 13.201€ and 23.480€. “The Tap water (unfiltered) drinkers” are females, graduated from a University and they are also employees at the primary sector. Their annual family income fluctuates between 8.801€ and 13.200€.

Table 2. Profile of each group of consumers regarding their socio-demographic characteristics

Socio - Demographic Characteristics	Clusters		
	"Bottled Water drinkers"	"Tap water (unfiltered) drinkers"	
Gender	Male	22,11%	$\chi^2= 9.313$ df=2 p<0,001
	Female	22,11%	
	I prefer not to answer	0,73%	
Education Level	Jounior High School	3,93%	$\chi^2= 9.284$ df=4 p<0,005
	High School	19,65%	
	University	14,25%	
	Masters	6,63%	
Employment	Ph.D	2,70%	$\chi^2= 18.483$ df=10 p<0,005
	Education	9,82%	
	Public Sector	6,14%	
	Tourism	7,37%	
	Industry	1,96%	
	Private Sector	2,21%	
	Primary Sector	14,74%	
	Freelancer	2,21%	
	Health	0,98%	
	I do not work	0,49%	
Annual net, family income	IDOX	0,24%	$\chi^2= 25.842$ df=7 p<0,001
	Less than 7.300€	5,40%	
	7.300-8.800€	4,17%	
	8.801-13.200€	9,28%	
	13.201-23.480€	10,56%	15,72%

23.480-50.000€	5,40%	2,45%
More than 50.000€	0,98%	0,00%
I don't know	2,94%	4,42%
I don't answer	7,37%	3,19%

4. Discussion - Conclusion

The contribution of this research is to understand consumers' behavior towards drinking water which is arguably nowadays one of the most important commodities of increasing socio-economic and political value.

The main findings of this study illustrate that there is an especially important correlation between the factors that affect consumers when choosing drinking water and the adoption of a particular purchasing behavior. Even more importantly, consumers' knowledge, attitudes and behaviors could influence sustainable choices (Peschel et al. 2016). In addition, the analysis indicated that consumers attach high importance to both internal and external factors that influence their drinking water preferences. Thus, the results show that consumers nowadays are interested in the major environmental challenges that affect, among other things, the quality, and the availability of drinking water. A substantial number of consumers seems to pay close attention to materials and actions that have a significant impact on the environment. For this reason, they apply water saving measures in their daily life. However, the majority of consumers are still hesitant to use water, or buy food produced with the use of an environmentally friendly source, like the reuse of wastewater (after biological treatment) mainly from fear of the unknown.

Apparently, there is no correlation between consumers' drinking water choice behavior and their socio-demographic characteristics. On the contrary, the findings show that there is a correlation between consumers' choice of drinking water and their ecological consciousness. These findings also identify that consumers who prefer to drink tap water, try to save water in their daily activities, and are more likely to use recycled urban wastewater after the proper treatment.

In the light of these findings, it can be said that environmental consciousness is one of the most crucial factors which shapes consumer's behavior when choosing drinking water. Overall, the findings of the present study confirm that consumers' choice of drinking water is closely related to consumer's culture and identity as also was described by Dalampira et al (2019) when referring to consumers being more aware of the impact of all of their food choices on the environment a result of their changing identities.

However, in this study there are some limitations that need to be considered. First, the study even if it was conducted in a large scale, was carried out in the City of Kilkis, and it would be valuable to expand the sample size to other

cities or to rural areas. Another limitation is the natural limitation, meaning the survey was performed in a short period and may not illustrate the true beliefs and attitudes of consumers towards drinking water on a long-term scale. Finally, the study was performed during a specific period of the current health, economic and energy crisis and it would be intriguing to examine the factors that affect consumers' preferences for drinking water preferences on an extended period along and beyond crisis issues.

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