



# Customer satisfaction in short food supply chains: A multiple criteria decision analysis approach

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## ABSTRACT

In this paper, we study customer satisfaction in short food supply chains. Specifically, we address how elements of the marketing mix of short food supply chains drive customer satisfaction. Our empirical work is based on a survey adopting a method known as the multicriteria satisfaction analysis. Our results show that the process of sales and the producers are the most important marketing mix elements and receive strong indications of customer satisfaction, thus offering a competitive advantage for short food supply chains. Pricing, place, purchase environment, and promotion can be described as potential threats to short food supply chains. Finally, the product is rated as low in importance but high in satisfaction, which suggests that consumers take its premium quality for granted. Our results suggest that emphasis should be placed on the processes of sales and producers.

## 1. Introduction

In recent years, alternative forms of food supply chains (e.g., farmers markets, roadside sales, farmers' shops) have been increasingly perceived as more sustainable, ethical and trustworthy alternatives to global chains (Benos et al., 2022; Giampietri et al., 2018). Such food supply chains, which are known as short food supply chains (hereafter SFSCs), are emerging as a response by consumers to the prevailing global food markets, characterized by standardized production, long food miles and the dominance of big retailers (Giampietri et al., 2018; Wang et al., 2021). Besides, a number of policy initiatives (e.g., the Farm to Fork Strategy) encourage producers to be involved in SFSCs as a way to contribute to the sustainability development agenda (European Commission, 2011, 2020; FAO, 2012; United Nations, 2016).

SFSCs offer advantages (e.g., perceived sustainability and low food miles; Wang et al., 2021) and benefits for consumers (e.g., quality and trust in the producers; Giampietri et al., 2018; González-Azcárate et al., 2021). However, SFSCs also have shortcomings, such as limited variety, inaccessibility and inconvenience (e.g., González-Azcárate et al., 2021; Paciarotti & Torregiani, 2021). Such disadvantages might jeopardise the market success of SFSCs. Moreover, recent studies demonstrate that direct food sales are reaching a 'plateau' (Plakias et al., 2020; Richards et al., 2017). By understanding the elements that drive or threaten customer satisfaction, SFSCs can increase resilience, overcome such

disadvantages and boost sales (Churchill Jr & Surprenant, 1982; Kumar et al., 2013; Wicaksono & Illés, 2022). However, earlier work that examines drivers of customer satisfaction in SFSCs is scarce. The few studies that address customer satisfaction reveal that product and service quality increase customer satisfaction (Carzedda et al., 2018; Lülf-Baden et al., 2008; Rosa & Nassivera, 2013).

To better understand the success of SFSCs we offer insight into how elements of the marketing mix of SFSCs drive customer satisfaction. We conduct our empirical work by following the multicriteria satisfaction analysis (MUSA), which is a method used to measure customer satisfaction as the outcome of an assessment of business elements (Arabatzis & Grigoroudis, 2010; Manolitzas et al., 2021). MUSA offers the advantage of estimating the relative importance of customer satisfaction and performance for each marketing mix element. These combined estimations, arranged in action diagrams, can guide managerial decision-making by revealing the strong and weak points of customer satisfaction.

## 2. Background

### 2.1. Short food supply chains (SFSCs)

SFSCs are defined as 'a supply chain involving a limited number of economic operators committed to cooperation, local economic

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development, and close geographical and social relations between producers, processors and consumers' (European Union, 2013). Another key element defining SFSCs is the minimal or, ideally, the absence of intermediaries (Kneafsey et al., 2013). Therefore, SFSCs incorporate elements of geographical, social and organizational proximity (Malak-Rawlikowska et al., 2019; Vittersø et al., 2019). There are several types of SFSCs, including farmers' markets, roadside sales, home deliveries, cooperative shops and solidarity groups (Renting et al., 2003; Vittersø et al., 2019). In the literature, such retail formats (e.g., farmers' markets and direct purchases from the producer) are also known as alternative food networks, alternative distribution channels, alternative food channels or short supply chains (Carzedda et al., 2018; Dhaoui et al., 2020; Lombardi et al., 2015). While some conceptual differences may exist across the types of supply chains, in this study, we consider them as variations of SFSCs. SFSCs reduce the market intermediaries and bridge the distance between consumers and agricultural producers (Reich et al., 2018). However, while there is general consensus that SFSCs constitute a sustainable supply chain form (Vittersø et al., 2019; Wang et al., 2021), some studies show that their environmental performance is inferior to that of conventional retail channels (Majewski et al., 2020; Malak-Rawlikowska et al., 2019), perhaps because of logistical insufficiencies (Paciariotti & Torregiani, 2021). Nevertheless, SFSCs contribute to economic and social sustainability by offering fair prices and bargaining power to producers, while encouraging territorial development (Malak-Rawlikowska et al., 2019; Mundler & Laughrea, 2016).

Several factors may drive consumer responses to SFSCs, and we group them into product, service and consumer-related characteristics. The product-related characteristics that drive positive consumer responses are quality, taste, healthiness, freshness, organic certification and price (Bavorova et al., 2016; Cembalo et al., 2015; González-Azcárate et al., 2021; Lombardi et al., 2015; Polimeni et al., 2018). However, some studies suggest that price, quality and labeling may act as potential barriers (González-Azcárate et al., 2021; Qi et al., 2017). Consumers may further prefer products from SFSCs because of their perceived sustainability, environmental friendliness or support for the local economy (Dhaoui et al., 2020; Vittersø et al., 2019; Wang et al., 2021). Service-related characteristics of SFSCs are also reported as important drivers of or barriers to purchase. Trust, information provision and social relationships with the producer are shown as drivers for SFSC success (Giampietri et al., 2018; Migliore et al., 2015; Polimeni et al., 2018; Vittersø et al., 2019). However, studies also report the lack of reliable producers and inadequate information provision as disadvantages of SFSCs (Cembalo et al., 2015; González-Azcárate et al., 2021). The limited variety and availability of products, inaccessibility, and inconvenience are discussed as further disadvantages of SFSCs (Benos et al., 2022; González-Azcárate et al., 2021; Qi et al., 2017). Consumer-related characteristics include values, beliefs and demographics. Frequent customers of SFSCs are most likely to be female, older, wealthier, conscious of their health and the environment, ethical consumers, benevolent locavores and universalists (Benos et al., 2022; Lombardi et al., 2015; Reich et al., 2018).

## 2.2. Customer satisfaction in SFSCs

Customer satisfaction is a critical element of business strategy that affects post-purchase behavior (Churchill Jr & Surprenant, 1982; Gómez et al., 2004; Olsen et al., 2014). Customer satisfaction influences loyalty, word of mouth and re-purchasing/revisiting intentions; consequently, it can have an impact on a firm's financial performance (Kumar et al., 2013). There are several ways to study customer satisfaction, including the disconfirmation of expectations and the behavioural approach (Grigoroudis & Siskos, 2010; Oliver, 2010). In a modelling context, customer satisfaction refers to the aggregate measure of customer evaluations of the main elements and attributes of a firm or a brand (Gustafsson & Johnson, 2004). Similarly, most approaches to food

retailing utilise customer evaluations of product and service attributes (Gómez et al., 2004; Yokoyama et al., 2022). The key food attributes are price, taste, colour, smell and texture (Goić et al., 2021; Wicaksono & Illés, 2022; Yokoyama et al., 2022). In addition, the critical service attributes are convenience, accessibility, variety, opening hours, availability, cleanliness, information, cashiers and waiting time (Goić et al., 2021; Hunneman et al., 2021; Wicaksono & Illés, 2022; Yokoyama et al., 2022).

Studies addressing customer satisfaction in SFSCs are scarce, with only a few revealing the importance of customer evaluations of the perceived product and service quality (Carzedda et al., 2018; Lülfs-Baden et al., 2008; Rosa & Nassivera, 2013). For SFSCs, the key product attributes are taste, organic production method, local origin, ethical content, genuineness, fragrantcy and freshness (Carzedda et al., 2018; Lülfs-Baden et al., 2008; Rosa & Nassivera, 2013). The key service attributes are accessibility, cleanliness, payment method, parking and opening time, interior and exterior decoration, promotion activities, competence and friendliness of the personnel, product information and presentation, and the atmosphere in the store (Lülfs-Baden et al., 2008; Rosa & Nassivera, 2013).

## 2.3. Conceptual framework

To study customer satisfaction, we use the conceptual foundations of multicriteria decision analysis (MCDA). In this context, consumers are assumed to be cognitive decision makers that derive value or satisfaction from the attributes of goods or services in an additive way (Fishburn & Keeney, 1975; Von Winterfeldt & Fischer, 1975). This means that the global value function for a good or a service is the weighted sum of the partial value functions of its attributes. From the wider family of MAUT methods, we choose MUSA as the most suitable for studying customer satisfaction.

Rooted in the assumptions of the UTA method (Jacquet-Lagrange & Siskos, 1982; Siskos et al., 2016), the MUSA (multicriteria satisfaction analysis) method assumes that overall customer satisfaction depends on customer evaluations based on a set of criteria, for example, product and service attributes. More specifically, the overall or global value attributed to a good or service by a customer is the weighted sum of the partial values of its attributes. This approach is similar to those of previous studies in food retailing, wherein customer evaluations on product and service attributes form the baseline for studying customer satisfaction (Gómez et al., 2004; Yokoyama et al., 2022). MUSA aggregates individual judgments into a collective value function using a mathematical programming modelling approach. Therefore, customer satisfaction is viewed as a multivariate evaluation construct. This method follows previous economics, social psychology and management theories (Fishbein & Ajzen, 1974; Fishburn & Keeney, 1975; Lancaster, 1966) that model consumer behaviour and satisfaction using a set of multiple attributes.

Following Grigoroudis and Siskos (2010), we further recognise that customer satisfaction takes the form of a multi-level hierarchal construct called a value-hierarchy or a value-tree. In this paper, we follow a two-level criteria approach. The first-level criteria constitute the main satisfaction dimensions and the second-level form the sub-criteria (Grigoroudis & Siskos, 2010). Analysis of the first-level criteria provides information on how each criterion affects overall customer satisfaction, whereas analysis of the second-level sub-criteria provides information on how they affect each first-level criterion.

Consequently, we adopt a hierarchal multivariate approach to study customer satisfaction in SFSCs. Following previous studies in the retail literature (Blut et al., 2018; Chou et al., 2020; Purohit et al., 2021), we use customers' evaluations of marketing mix elements as the main drivers of customer satisfaction. The marketing mix is a basic tool and its integration into the marketing plan is instrumental in satisfying customers' needs (Zineldin & Philipson, 2007). Specifically, we adopt the extended marketing mix (the 7Ps: product, place, promotion, pricing,

producers, process of sales and purchase environment) approach in the context of SFSCs, as it is more suitable for retail and service (Constantinides, 2006). We approach the marketing mix elements as first-level criteria that affect overall customer satisfaction. At the second level, these criteria are further analysed in relation to 20 satisfaction sub-criteria derived from earlier literature on food retailing and SFSCs (Carzedda et al., 2018; Goić et al., 2021; Hunneman et al., 2021; González-Azcárate et al., 2021; Rosa & Nassivera, 2013; Yokoyama et al., 2022). The hierarchy of customer satisfaction criteria and sub-criteria is shown in Fig. 1.

### 3. Materials and methods

#### 3.1. Participants

The survey took place in Greece ( $N = 766$ ) between December 2020 and January 2021 following a convenience sampling approach conducted through social media (Facebook). Greece is a relevant country for the study because SFSCs are popular among the population and are rooted in Greek tradition (Koutsou & Sergaki, 2019; Partalidou & Anthopoulou, 2017); however, they became particularly important during the economic crisis as producers were trying to overcome intermediaries (Koutsou & Sergaki, 2019; Partalidou, 2015). Initiatives included informal networks for distributing olive oil, vegetables, wine, honey, homemade pasta and other products, and the growth of farmers' markets and cooperative shops (Koutsou & Sergaki, 2019; Partalidou & Anthopoulou, 2017). After excluding participants who stated that they had never purchased foods from SFSCs, 753 participants (98.3 %) were retained for the formal analysis.

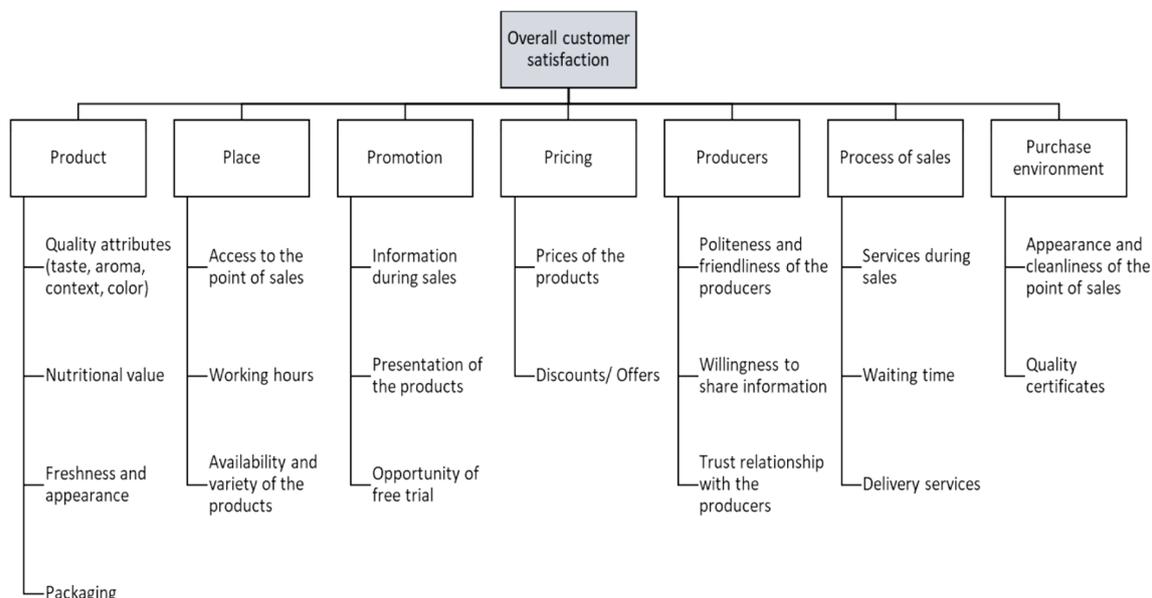
Table 1 presents the socio-demographic characteristics of the sample and its consumption patterns in relation to SFSCs. The majority of the respondents were female (59.2 %), between 18 and 30 years old (48.3%), with a bachelor's degree (45.6 %), earning <1,000 euro per month (59.2 %) and responsible for grocery shopping (82.9 %). The SFSCs that respondents most frequently bought products from were open markets (77.0 %) and direct purchases from producers (49.1 %). The most common products bought from SFSCs were vegetables (77.2 %), fruits (71 %), honey (65.5 %), eggs (54.2 %) and olive oil (42.8 %).

**Table 1**  
Socio-demographic traits and consumption patterns of the sample.

	N	%		N	%
<b>Gender</b>			<b>Frequency</b>		
Male	307	40.8	Seldom	210	27.9
Female	446	59.2	Sometimes	292	38.8
<b>Education</b>			Often	186	24.7
Primary/ Secondary	177	23.5	Very often	65	8.6
Bachelor	343	45.6	<b>SFSCs used</b>		
MSc/ PhD	233	30.9	Open markets	580	77.0
<b>Household</b>			Direct purchase	370	49.1
1 member	134	17.8	Cooperative shops	174	23.1
2 members	212	28.2	Farmer markets	160	21.3
3 members	129	17.1	E-commerce	93	12.4
4 members	210	27.9	Touristic spots	56	7.4
> 4 members	68	9.0	<b>Products bought from SFSCs</b>		
<b>Income</b>			Vegetables	581	77.2
< 1,000 euro	446	59.2	Fruits	535	71.0
1,000 to 2,000 euro	246	32.7	Honey	493	65.5
2,000 to 3,000 euro	28	3.7	Eggs	408	54.2
< 3,000 euro	33	4.4	Olive oil	322	42.8
<b>Age</b>			Cheese	254	33.7
18–30 years old	364	48.3	Legumes	241	32.0
31–45 years old	225	29.9	Wine	227	30.1
46–60 years old	140	18.6	Fish	200	26.6
> 60 years old	24	3.2	Olives	199	26.4
<b>Responsible for grocery shopping</b>			Meat	175	23.2
Yes	624	82.9	Pasta	171	22.7
No	129	17.1	Herbs	135	17.9
			Sweets	95	12.6
			Jams	85	11.3

#### 3.2. The multicriteria satisfaction analysis (MUSA) method

The MUSA method is a multiple criteria decision aid approach that follows the principles of ordinal regression. MUSA was developed by Grigoroudis and Siskos (2002, 2010; the mathematical model is provided in the latter text). The MUSA method reports estimated weights and average satisfaction indices for the criteria and sub-criteria. The estimated weights represent the relative importance of the criteria in driving overall satisfaction. For the sub-criteria, the estimated weights reveal the relative importance of the selected sub-criteria towards each criterion. Estimated weights have a relative form, meaning that the sum of the weights (and sub-weights) is equal to one. The average



**Fig. 1.** Hierarchy of satisfaction criteria.

satisfaction index indicates the level of customer satisfaction for each criterion and sub-criterion in a 0–100 % range. The estimated weight can be considered an importance indicator, whereas the average satisfaction index is a performance indicator.

Similar to the importance–performance map analysis (Ringle & Sarstedt, 2016), plotting the average satisfaction indices against criteria weights leads to action diagrams (see Fig. 2) that highlight the strong and weak points of customer satisfaction. The criteria of high importance and strong performance offer a competitive advantage for customer satisfaction, and thus offer a leverage opportunity. The criteria of high importance and poor performance require attention and efforts towards direct improvement and, thus, are classified as an action opportunity. The criteria of strong performance and low importance require a transfer of resources to other criteria with lower satisfaction levels and are thus classified as a transfer of resources. Finally, the criteria of low importance and poor performance, classified in the status quo quadrant, constitute potential threats to customer satisfaction, as the low importance can be further associated with the poor performance. The action diagrams can be considered a SWOT analysis: the leverage opportunity and the action quadrants show the strengths and the weaknesses, respectively, while the transfer resources and status quo quadrant correspond to the opportunities and the threats, respectively. Moreover, the action diagram is a form of gap analysis, since it can show the difference between ‘what customers want’ (importance) and ‘what customers get’ (performance).

In a similar fashion, an action diagram can be developed for the sub-criteria by multiplying the weight of each sub-criterion by the weight of a corresponding criterion to assess their relative importance. This way, each sub-criterion is evaluated according to its importance for overall customer satisfaction. Therefore, the action diagram for sub-criteria classifies them according to their relative performance and relative importance for overall customer satisfaction.

The MUSA method has the advantage of estimating both the importance and the performance indices. Therefore, it can indicate which criteria and sub-criteria score high in customer satisfaction. However, a high-satisfaction index might not be enlightening about the contribution of those elements/attributes to the overall customer satisfaction. For this, the MUSA method provides the relative importance of each criterion/sub-criterion. The main advantage of obtaining both importance and performance measures is that the combination of those results in the action diagrams is a holistic approach that can prove very

useful for managerial decision making. From a methodological point of view, MUSA can handle ordinal data, contrary to other regression-type approaches, which are based on an arbitrary quantification of customer satisfaction data. Therefore, it can provide more accurate and reliable results.

### 3.3. Questionnaire design

The questionnaire consisted of two parts. The first part included questions addressing the socio-demographic background of the respondents (gender, age, education, household size, income, household responsible). The second part included questions measuring customers’ purchasing habits and satisfaction. Purchasing habits were gleaned by questions addressing the frequency of buying foods from SFSCs (with responses ranging from ‘never’ to ‘very often’), the foods consumers usually purchased from SFSCs and the SFSCs they typically used. SFSCs were described to participants as food chains with no intermediaries. Participants who reported never buying from SFSCs ( $N = 13$ ; 1.7 %) were not included in the analysis. The third part assessed satisfaction using the criteria and sub-criteria measured on a five-point Likert scale (from dissatisfied to satisfied). For a detailed presentation of the questions assessing customer satisfaction, see Appendix II. Fig. 3 presents an example of a question addressing satisfaction in relation to a criterion. At the end of this part, respondents were asked to state their overall level of satisfaction with SFSCs. Prior to the main data collection, the questionnaire was pre-tested on 30 respondents for coherence and comprehension.

## 4. Results

Table 2 presents the weights and satisfaction indices. The most important criteria for customer satisfaction were the process of sales (17.8 %), producers (14.3 %), pricing (14.2 %) and place (14.1 %), whereas promotion (13.4 %), product (13.2 %) and purchase environment (13.0 %) demonstrated lower levels of relative importance. The most important sub-criterion for the process of sales was the service during sales (53.1 %), followed by the waiting time (33.4 %) and delivery services (13.5 %). For producers, the most important sub-criterion was a trust relationship with producers (68.2 %), while politeness and friendliness (17.9 %) and willingness to share information (13.9 %) were less important. Regarding pricing, the price of products (85.2 %) was the most important sub-criterion and discounts and offers (14.8 %) was the least. For place, the most important sub-criterion was the availability and variety of products (74.0 %), while working hours (13.3 %) and access to the point of sales (12.7 %) were less important. For promotion, the presentation of products (71.3 %) was the most important sub-criterion, while information during sales (15.4 %) and the opportunity for a free trial (13.3 %) were less important. The most essential product sub-criterion was the freshness and appearance of products (57.3 %), followed by quality attributes (taste, aroma, context and colour) (15.8 %), nutritional value (13.9 %) and packaging (13.0 %). Regarding the purchase environment, appearance and cleanliness at the point of sale (87.2 %) was the most important attribute and quality certificates (12.8 %) was the least.

The SFSC customers exhibited a high level of overall satisfaction (83.4 %). Marketing mix elements with the highest satisfaction index were product (85.8 %), the process of sales (84.9 %) and producers (83.0 %). Pricing (75.4 %), place (73.8 %), promotion (72.9 %) and purchase environment (67.3 %) received lower satisfaction indices. The product sub-criterion with the highest satisfaction index was the freshness and appearance of products (94.2 %), followed by quality attributes (taste, aroma, context and colour) (90.1 %), nutritional value (86.6 %) and packaging (68.1 %). For the process of sales sub-criteria, customers were mostly satisfied with services during sales (93.9 %), followed by waiting times (91.1 %) and delivery services (78.9 %). For producers, a trust relationship with producers (94.6 %) was the sub-criterion with the

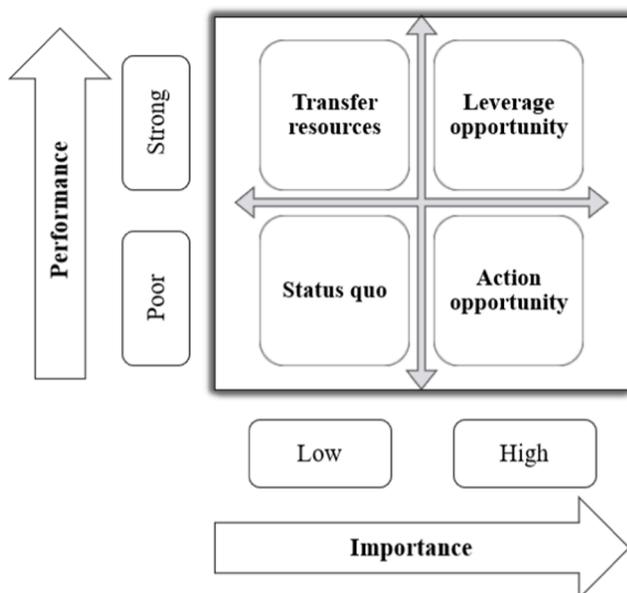


Fig. 2. Action diagram (adapted from Grigoroudis & Siskos, 2010).

12. When I buy foods from Short Foods Supply Chains I am satisfied by:

	Dissatisfied	Rather Dissatisfied	Neither Satisfied Nor Dissatisfied	Rather Satisfied	Satisfied
Quality attributes (taste, aroma, context, color)					
Nutritional value					
Freshness and appearance					
Packaging					
<b>Overall by the Product</b>					

Fig. 3. Example of a satisfaction evaluation question presented to the respondents.

Table 2  
Weights and satisfaction indices.

Criteria	Sub-Criteria	Weights (%)	Satisfaction Indices (%)
Product		13.3	85.8
	Quality attributes (taste, aroma, context, color)	15.8	90.1
	Nutritional value	13.9	86.6
	Freshness and appearance	57.3	94.2
Place		14.1	73.8
	Packaging	13.0	68.1
	Access to the point of sales	12.7	69.5
Promotion		13.3	72.9
	Working hours	13.3	69.0
	Availability and variety of the products	74.0	93.8
Pricing		13.3	75.7
	Information during sales	15.4	75.4
Producers		14.2	75.4
	Presentation of the products	71.3	92.0
Process of sales		14.2	75.4
	Opportunity of a free trial	13.3	75.7
Purchase environment		14.2	75.4
	Prices of the products	85.2	93.9
Global customer satisfaction		14.8	71.8
	Discounts/ Offers	14.8	71.8
Process of sales		14.3	83.0
	Politeness and friendliness of the producers	17.9	87.5
	Willingness to share information	13.9	82.3
Purchase environment		17.8	85.0
	Trust relationship with the producers	68.2	94.6
	Services during sales	53.1	93.9
Purchase environment		13.0	67.3
	Waiting time	33.4	91.1
	Delivery services	13.5	78.9
Purchase environment		87.2	91.7
	Appearance and cleanliness of the point of sales	87.2	91.7
Purchase environment		12.8	60.1
	Quality certificates	12.8	60.1

highest satisfaction index, while politeness and friendliness (87.5 %) and willingness to share information (82.3 %) obtained smaller scores. Regarding pricing, the prices of products (93.9 %) was the sub-criterion with the highest satisfaction index, while discounts and offers (71.8 %) had the smallest. For the sub-criteria concerning place, customers were mostly satisfied with the availability and variety of products (93.8 %), while access to the point of sales (69.5 %) and working hours (69.0 %) received lower scores. For promotion, the presentation of products (71.3 %) was the sub-criterion with the highest satisfaction index, followed by the opportunity of a free trial (75.7 %) and information during sales (75.4 %). Regarding the purchase environment, appearance and cleanliness at the point of sale (91.7 %) was the sub-criterion with the highest satisfaction index, whereas quality certificates (60.1 %) had the smallest.

The action diagram produced by the MUSA method for the main

satisfaction criteria is illustrated in Fig. 4. The process of sales and the producers are placed in the leverage opportunity quadrant and, thus, are considered a competitive advantage of SFSCs. The product is placed in the transfer resources quadrant. The rest of the marketing mix elements (place, promotion, pricing and purchase environment) are located in the status quo quadrant, constituting potential threats.

Fig. 5 presents the action diagram for the sub-criteria. The competitive advantages of SFSCs (in the leverage opportunity quadrant) include the price of products, appearance and cleanliness at the point of sale, the presentation of products, services during sales, waiting time, a trust relationship with producers and the freshness and appearance of products. On the other hand, producers' willingness to share information, their working hours, delivery services, the information provided during sales, access to the point of sale, discounts/offers, packaging, and quality certificates could be potential threats to SFSC customer satisfaction (the status quo quadrant). Finally, quality attributes, nutritional value and the politeness and friendliness of producers are located in the transfer resources quadrant.

5. Discussion

Our findings show that producers and the process of sales constitute elements of the marketing mix providing a competitive advantage for SFSCs. While producers are known to be an important marketing mix element of SFSCs (Giampietri et al., 2018; Migliore et al., 2015), the process of sales may result in inconvenience and, thus, may have a variable impact on customer satisfaction (González-Azcárate et al., 2021). We further show that product freshness and appearance, price and trust in producers form additional competitive advantages for SFSCs (Bavorova et al., 2016; Cembalo et al., 2015; Giampietri et al., 2018; González-Azcárate et al., 2021). Further, the availability and variety of products also offer a competitive advantage for SFSCs, a finding in contrast to previous studies that consider them as barriers (González-Azcárate et al., 2021; Qi et al., 2017). Finally, service characteristics such as during assistance during sales, waiting time, the presentation of

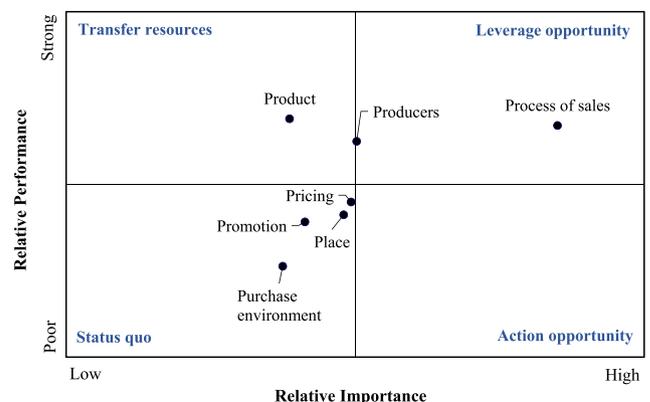


Fig. 4. Action diagram for main criteria.

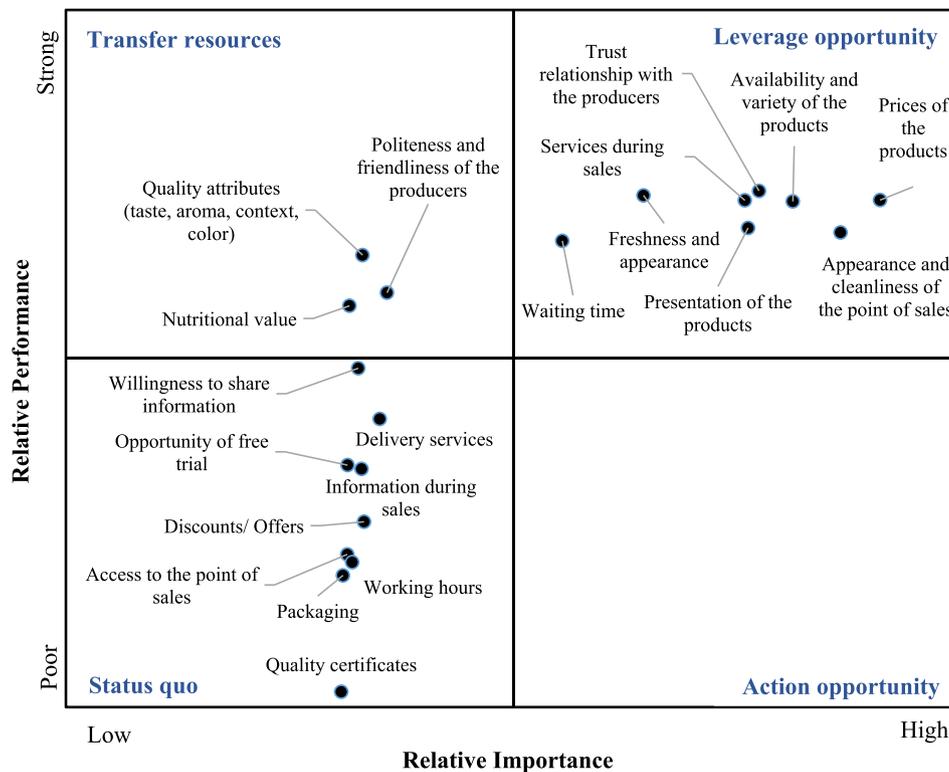


Fig. 5. Action diagram for sub-criteria.

products and appearance and cleanliness at the point of sales are also a source of competitive advantage. Such characteristics have not been the focus of earlier research addressing consumer satisfaction with SFSCs.

The marketing mix elements of pricing, place, purchase environment and promotion form potential threats for SFSCs. Regarding pricing, while it may seem contradictory that it is a potential threat, relative to prices that form a competitive advantage, the threat comes from the performance of discounts/offers. Thus, an explanation behind earlier findings suggesting the price of SFSCs as a barrier (e.g., González-Azcárate et al., 2021; Qi et al., 2017) may be that the focus is on the overall pricing strategy instead of the actual product prices. Considering place, the sub-criteria of accessibility, working hours, information sharing by producers and information provided during sales are threats to SFSCs, confirming earlier literature (Cembalo et al., 2015; González-Azcárate et al., 2021). However, it should be noted that information has also been seen as an advantage in the literature (Polimeni et al., 2018), which suggests its pivotal role in influencing consumer satisfaction. Other potential threats to SFSCs are delivery services, the opportunity for a free trial, quality certificates and packaging. Such elements have not received any particular attention in the extant literature.

The role of product as an element that is unimportant for customer satisfaction but that nonetheless exhibits enhanced performance may contradict earlier literature (Carzedda et al., 2018; Lülfs-Baden et al., 2008; Rosa & Nassivera, 2013). Our account of this finding is that consumers take the high quality of products offered by SFSCs for granted, which thus leads to high levels of satisfaction (Cembalo et al., 2015; González-Azcárate et al., 2021). In a similar vein, quality attributes (e.g., taste, aroma, context and colour), nutritional value and the politeness and friendliness of the producers are elements that have strong performance in but low relative importance for customer satisfaction. While this finding may contradict earlier work (Cembalo et al., 2015; Migliore et al., 2015), it suggests that the performance of such elements is taken for granted by consumers and, thus, they do not play an important role as drivers of customer satisfaction.

Another interesting aspect to highlight is that no element of the

marketing mix was classified as an action opportunity. This suggests that any effort to improve customer satisfaction should target the elements classified as potential threats, which require more resources and can be more challenging as a task. These results further explain why earlier studies suggest that sales in SFSCs have reached a 'plateau' (Plakias et al., 2020; Richards et al., 2017). Sales performance is related to customer satisfaction (Kumar et al., 2013) and the lack of available opportunities for improving customer satisfaction might hinder further development.

## 6. Conclusion

Our study contributes to the literature on customer satisfaction in SFSCs (Carzedda et al., 2018; Lülfs-Baden et al., 2008; Rosa & Nassivera, 2013). Specifically, we identify the marketing mix elements of SFSCs that contribute to customer satisfaction, and we further provide guidance on their assessment. The approach we follow by categorizing the elements in terms of both their relative importance and performance offers a more holistic understanding that, unlike earlier studies, provides a different perspective on interpreting how such elements contribute to customer satisfaction—but mostly on how they should define marketing strategy for SFSCs. Specifically, the action diagrams derived from the MUSA method allow for the identification of the necessary actions or priorities that SFSC stakeholders need to take.

Our results uncover managerial implications regarding marketing strategy for and the overall development of SFSCs. Specifically, elements belonging to the status quo quadrant require the greatest attention since they are potential threats. Therefore, from a marketing strategy point of view, SFSCs need to focus on improving pricing, promotion, place and purchase environment. Conversely, less emphasis should be placed on the product since consumers consider quality performance to be de facto. Such findings suggest that consumers need to be reminded about the high quality of products from SFSCs. Finally, producers and the process of sales are the elements that offer leverage opportunities for SFSCs and can create points of differentiation in marketing strategy.

Our study has limitations that point to future research directions. Our data collection followed a convenience sampling approach and occurred in a specific geographical context (Greece), so the generalisability of our findings cannot be assured. Another limitation is that each element of the marketing mix depends on the choice of sub-criteria chosen to formulate that element; thus, the results must be interpreted by considering the sub-criteria included in this study. Additional sub-criteria, such as sustainability concerns (Benos et al., 2022; Wang et al., 2021), could be incorporated in future research to facilitate a better understanding of the actual contribution of SFSCs to customer satisfaction. Further, our study does not account for post-purchase customer satisfaction, such as customer loyalty and word of mouth. Future research could use such measures as proxies of customer satisfaction in connection with the approach followed in our empirical study. Finally, we do not account for different types of SFSCs and food products, which could also form points of differentiation worth addressing in future research.

**Appendix A. The two-level MUSA method**

The MUSA method aims to achieve the maximum consistency between an additive value function  $Y^*$  and the customers' judgments  $Y$ . Introducing a double-error variable, the ordinal regression equations take the following form:

$$Y^* = \sum_{i=1}^n b_i X_i^* + \sigma^+ + \sigma^- \text{ with } \sum_{i=1}^n b_i = 1 \text{ for } i = 1, 2, \dots, n$$

$$X_i^* = \sum_{j=1}^{n_i} b_{ij} X_{ij}^* + \sigma^+ + \sigma^- \text{ with } \sum_{j=1}^{n_i} b_{ij} = 1 \text{ for } j = 1, 2, \dots, n_i$$

The overall value function is represented as  $Y^*$  and the value functions of the criteria and sub-criteria as  $X_i^*$  and  $X_{ij}^*$ , respectively. The errors of overestimation and underestimation are  $\sigma^+$  and  $\sigma^-$ , respectively. The number of criteria is  $n$ , while the number of the sub-criteria for the  $i$ -th criterion is  $n_i$ . The weights of the  $i$ -th criterion and of the  $j$ -th subcriterion of  $i$ -th criterion are  $b_i$  and  $b_{ij}$ , respectively. All the value functions  $Y^*$ ,  $X_i^*$ , and  $X_{ij}^*$  are normalised in  $[0, 100]$ , i.e.,  $y^{1^*} = x_i^{1^*} = x_{ij}^{1^*} = 0$  and  $y^{a^*} = x_i^{a^*} = x_{ij}^{a^*} = 100$ , where  $\alpha$ ,  $\alpha_i$ , and  $\alpha_{ij}$  are the sizes of the ordinal scales  $Y$ ,  $X_i$ , and  $X_{ij}$ , respectively. To linearise and reduce the complexity of the mathematical program, we use the following transformation equations to remove the monotonicity constraints for  $Y^*$ ,  $X_i^*$ , and  $X_{ij}^*$ :

$$z_m = y^{*m+1} - y^{*m} \text{ for } m = 1, 2, \dots, \alpha - 1$$

$$w_{ik} = b_i x_i^{*k+1} - b_i x_i^{*k} \text{ for } k = 1, 2, \dots, \alpha_i - 1 \text{ and } i = 1, 2, \dots, n$$

$$w_{ijk} = b_i b_{ij} x_{ij}^{*k+1} - b_i b_{ij} x_{ij}^{*k} \text{ for } k = 1, 2, \dots, \alpha_{ij} - 1, j = 1, 2, \dots, n \text{ and } i = 1, 2, \dots, n$$

From the previous equations, the examined problem can be modelled as a linear program (LP) in the context of the MUSA method. The LP has the following form:

$$[min] F_1 = \sum_{q=1}^M (\sigma_q^+ + \sigma_q^-) + \frac{1}{n} \sum_{q=1}^M \sum_{i=1}^n (\sigma_{qi}^+ + \sigma_{qi}^-)$$

which is subject to:

$$\sum_{i=1}^n \sum_{k=1}^{t_{qi}-1} w_{ik} - \sum_{m=1}^{t_q-1} z_m - \sigma_q^+ + \sigma_q^- = 0 \quad \forall q$$

$$\sum_{j=1}^{n_i} \sum_{k=1}^{t_{qij}-1} w_{ijk} - \sum_{k=1}^{t_{qi}-1} w_{ik} - \sigma_{qi}^+ + \sigma_{qi}^- = 0 \quad \forall i, q$$

$$\sum_{m=1}^{a-1} z_m = 100$$

$$\sum_{i=1}^n \sum_{k=1}^{a_i-1} w_{ik} = 100$$

$$\sum_{i=1}^n \sum_{j=1}^{n_i} \sum_{k=1}^{a_{ij}-1} w_{ijk} = 100$$

$$z_m, w_{ik}, w_{ijk}, \sigma_q^+, \sigma_q^-, \sigma_{qi}^+, \sigma_{qi}^- \geq 0 \quad \forall m, i, j, k$$

**CRedit authorship contribution statement**

**Antonios Tiganis:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **Evangelos Grigoroudis:** Conceptualization, Methodology, Writing – review & editing. **Polymeros Chrysochou:** Conceptualization, Writing – review & editing.

**Declaration of Competing Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

**Data availability**

Data will be made available on request.

Where  $t_q$ ,  $t_{qi}$  and  $t_{qij}$ , are the  $q$ -th customer's judgment for the global and

partial satisfaction (including criteria and subcriteria), with  $y^{tq} \in Y = \{y^1, y^2, \dots, y^{tq}, \dots, y^a\}$ ,  $x_i^{tqi} \in X_i = \{x_i^1, x_i^2, \dots, x_i^{tqi}, \dots, x_i^{a_i}\}$  and  $x_{ij}^{tqij} \in X_{ij} = \{x_{ij}^1, x_{ij}^2, \dots, x_{ij}^{tqij}, \dots, x_{ij}^{a_{ij}}\}$ .

The stability of results is examined as a post-optimality analysis problem in the context of the MUSA method, which applies a heuristic approach to searching for near-optimal solutions. Specifically, during post-optimality analysis  $\sum n_i$  LPs are formulated and solved, each of them maximising the weight  $b_{ij}$  of every subcriterion, subject to all the constraints of the initial LP, and  $F \leq F^* + \varepsilon$ , where  $F^*$  is the optimal value of the objective function of the initial LP and  $\varepsilon$  is a small percentage of  $F^*$ . The final solution is calculated as the average of the optimal solutions of these LPs.

**Appendix B. Questionnaire scales and items**

**Table.** Questionnaire scales and items.

Measure	Items	Scale
Marketing mix element: Product	When I buy foods from short food supply chains, I am satisfied by: Quality attributes (taste, aroma, context, colour) Nutritional value Freshness and appearance Packaging Overall, by the product	5-point ordinal variable (from dissatisfied to satisfied)
Marketing mix element: Place	When I buy foods from short food supply chains, I am satisfied by: Access to the point of sales Working hours Availability and variety of the products Overall, by the place	5-point ordinal variable (from dissatisfied to satisfied)
Marketing mix element: Promotion	When I buy foods from short food supply chains, I am satisfied by: Information during sales Presentation of the products Opportunity of a free trial Overall, by the promotion	5-point ordinal variable (from dissatisfied to satisfied)
Marketing mix element: Pricing	When I buy foods from short food supply chains, I am satisfied by: Price of the products Discounts/offers Overall, by the pricing	5-point ordinal variable (from dissatisfied to satisfied)
Marketing mix element: Producers	When I buy foods from short food supply chains, I am satisfied by: Politeness and friendliness of the producers Willingness to share information Trust relationship with the producers Overall, by the producers	5-point ordinal variable (from dissatisfied to satisfied)
Marketing mix element: Process of sales	When I buy foods from short food supply chains, I am satisfied by: Services during sales Waiting time Delivery services Overall, by the process of sales	5-point ordinal variable (from dissatisfied to satisfied)
Marketing mix element: Purchase environment	When I buy foods from short food supply chains, I am satisfied by: Appearance and cleanliness of the point of sale Quality certificates Overall, by the purchase environment	5-point ordinal variable (from dissatisfied to satisfied)
Overall customer satisfaction	Taking into consideration the previous questions, overall, how satisfied are you when you purchase foods from SFSCs?	5-point ordinal variable (from dissatisfied to satisfied)

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