Sustainability-initiatives in food supply chains from stakeholders' perspectives: an analysis of predictors of cognition-based trust and trust initiatives

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Abstract

This paper (draft) aims to improve our understanding of the role of trust in the context of sustainability initiatives, from multiple supply-chain (consumer and producer) perspectives, employing a set of logistic regression models. First, it analyzes consumer preferences regarding sustainability initiatives that food supply chain stakeholders (farmers, retailers, food processors, food service providers) could potentially implement from a consumer perspective, to increase consumer trust. This consumer perspective is then contrasted with a producer perspective, where we aim to understand the drivers of producers' trust into externally provided sustainability initiatives (certification for sustainable production practices, GlobalGAP). The consumer study is based on a survey from among 2,193 consumers in 6 countries (Finland, Israel, Italy, Poland, Spain, and the UK), to be contrasted with a survey from among 658 Kenyan producers (farmers), thereby assessing universal antecedents of trust.

Keywords: Consumer trust, producer trust, food supply chain stakeholder initiatives, logistic regression.

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1. Introduction

Society has strong expectations on policymakers and industry to foster the necessary sustainability transition (Geels, Kern & Clark, 2023). In the case of the agri-food sector, which is responsible for about a third of Greenhouse-Gas-Emissions (Acampora et al., 2023), these expectations are paired with a varying degree of trust into the different stakeholders in the supply chain (Macready et al., 2020). This paper focuses on the evaluation of different "stakeholder initiatives" from the perspective of national consumers, focusing on trustworthiness and socio-demographics to explain consumers' ranking of stakeholder initiatives. These hypothetical stakeholder initiatives as potentially desired by consumers are contrasted with sustainability initiatives evaluated from the perspective of producers, with the purpose of comparing mutual drivers, and assessing potential trustworthiness factors as proximal antecedents of trust (Tomlison et al., 2020). We explore different logistic regression models, to assess what consumers perceive as the most important actions (rankings) of areas of action and sustainability initiatives (e.g. transparency initiatives), and to assess what producers perceive as relevant for adopting sustainable production initiatives (GlobalGAP certification[4]).

The remainder of the paper is structured as follows. Section 2 discusses briefly relevant literature on trust, section 3 presents the methods and estimation approach we adopt. Section 4 describes the data and presents the sample. Section 5 discusses the results. Section 6 concludes.

2. Literature

Trust is a psychological state of mind, relating to the intention for accepting vulnerability (Rousseau et al., 1998). A growing multi-disciplinary literature has contributed to our understanding of agents' mental trust building processes (Grebitus et al. 2015; Bozik et al. 2017; Devaney et al. 2016; Kim et al. 2018; Hollebeek et al. 2019; Sharma et al. 2020). This literature typically distinguishes cognitive-based trust and affective-based trust (McAllister, 1095), while focusing on trustworthiness factors that give rise to interpersonal trust as proximal antecedents of trust (Corbitt, Thanasankit & Yi, 2003; Tomlinson et al., 2020). These

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[4] "For consumers and retailers, the GLOBALGAP certificate is reassurance that food reaches accepted levels of safety and quality, and has been produced sustainably, respecting the health, safety and welfare of workers, the environment, and in consideration of animal welfare issues." http://www.iso.org.in/globalgap.php

trustworthiness factors include behavioral integrity and values congruence, also clarifying the notion of trust as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" (Mayer et al., 1995: 712).

The distinction of trustor, trustee and object of trust (Schilke et al., 2024) is at the heart of our paper. We take both sides, the trustor and trustee, to better understand drivers of trust. In the first case, consumers are trustees vis a vis producers (farmers, processors, retailers) acting as trustors creating trust through specific objects (trust-focused sustainability initiatives). In the second case, producers (farmers) are trustees managing their trust vis a vis a certifying agent acting as trustor (GlobalGAP), with the sustainable production certification being the objective of trust (GlobalGAP certification). This jointly contrasting perspective (Figure 1) is novel, since previous work has typically considered independently the consumer as trustee perspective (McReady et al., 2020), or the producer (Kibet et al, 2018; Nupueng et al., 2023).

Figure 1: Trustor-Trustee-Objects interrelationships in supply chains
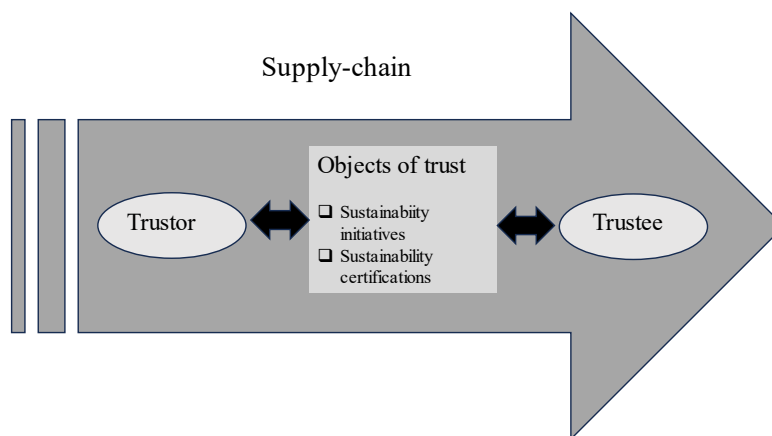
3. Methods

Our econometric specifications include multiple logistic regression models for assessing the agents' evaluation of different objects (sustainability initiatives and practices).

3.1. Logistic regression models

First, in trying to understand object of trust from consumers' perspective, we explore how socio-demographics and other variables help explain the ranking of "industry stakeholder initiatives", in cases where the consumers have been asked to rank different types of initiatives (e.g. animal welfare, price transparency). We consider traditional binary logit and multinomial logit regressions, as well as rank-ordered logit models (Beggs, 1981; Palma, 2017).

Our dependent variable ($Initiative$) in the first stage refers to the consumers trustworthiness in the initiatives implemented by three types of food chain stakeholders – (i) food manufacturers, (ii) foodservices (restaurants and caterings), (iii) retailers – during the year of 2020, in consumers surveyed in 6 countries (5 EU countries, plus Israel). Each of the stakeholders in the food chain define different initiatives (see in the appendix Tables A1, A2 and A3) and consumers were tasked to pick what they perceived as their relevant top 3 among these initiatives.

Since our dependent variable is dichotomous, we fit the model with a maximum likelihood probit model at the consumer i level as specified in equation (1):

$$Initiative_i = c + \beta_1 Log(age_i) + \beta_2 Gender_i + \beta_3 Country_i + \beta_4 Education_i + \varepsilon_i \quad (1)$$

where $Initiative_i$ is a dichotomous variable equal to 1 if the consumer has chosen an initiative ranked in its top 3 (and 0 otherwise), c is the constant term, $Log(age_i)$ is the age of the consumer and it is expressed in natural logarithm. $Gender_i$ indicates the gender of the consumer, $Country_i$ indicates the country in which the consumer lives, and $Education_i$ is the consumers' highest level of education. All these socio-demographic variables are factor (or categorical) variables, and they are included in the model as a series of indicator variables. For each of these variables, we fix a reference modality[5] and interpret the other coefficients with respect to the reference modality. β_1 to β_4 are the coefficients associated with the previous variables and $\varepsilon_{it} \sim N(0,1)$ is the error term.

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[5] To define the reference modality for each of these variables, we select the modality that has the largest number of observations. Thus, the reference modalities are defined as: female (1,101 observations) for gender, bachelor (659 observations) for education, and Israel (368 observations).

Because we have consumer-level data, where consumers are nested in countries (Finland, Israel, Italy, Poland, Spain, and the UK), we group data by country nests. The estimated models are the same in terms of specification, but the dependent variable differs according to each of three food chain actors, taking in each case the same eleven sustainability initiatives into account for ranking. Our dependent variable (Y_i) varies thus by stakeholder type (food processors, foodservices, retailers), and is a function of consumersä trustworthiness into of the three food chain stakeholders providing credible sustainability initiatives. We fit the model for each stakeholder with a partial rank-ordered logit regression, for consumer i as specified in equation (1).

4. Data and descriptive statistics

Our source of data is a six-country survey on consumer perceptions in the food industry, which we refer to as the "EIT-Food survey". This survey was conducted in 6 countries (Finland, Israel, Italy, Poland, Spain, and the UK) under the project "Consumer Trust EIT-Food", a research project within the *EIT-Food network*[6]. This survey questionnaire consists of 40 questions related to consumer trust, reputation of supply chain stakeholders, and potential initiatives of different food chain actors aimed at potentially increasing trust. The data collection took place between August and September 2020, capturing 2,193 consumer responses.

The descriptive statistics are reported in Table 1. For each dependent variable (i.e. stakeholder in terms of food processors, foodservices, and retailers), consumers were asked to express their level of trust into the stakeholder's ability to provide a trust-enhancing sustainability initiative. Consumers were shown up to 11 initiatives, and were tasked to rank the top 3 in relation to perceived trustworthiness.

Table 1 – Descriptive statistics

	Description of variables	Type of variables	Mean (over full sample)
Dependent variables			
Food manufacturers	Communicate	Categorical	6.68
	Information		6.02
	Transparency		5.35

	Traceability		5.98
	Label		4.80
	Certification		6.66
	Honest		5.70
	Price		5.40
	Environment		6.53
	Employees		6.60
	Transparent chain		6.44
Restaurants and caterings or foodservices	Communicate	Categorical	6.50
	Information		6.03
	Traceability		5.27
	Local		4.90
	Certification		5.94
	Honest		5.06
	Price		4.20
	Environment		5.92
	Employees		5.40
	Waste		5.77
Retailers		Categorical	
Independent (socio-demographics) variables			
Age	Age of the consumer	Nominal	3.84
Gender	Whether the consumer is a female (reference modality), or a male	Categorical	1.50
Education	Consumer's highest level of education: no qualification, or < lower secondary, or lower secondary, or upper secondary, or bachelor, or > bachelor, or other	Categorical	4.20
Country	In which country the consumer lives: Finland, or Israel, or Italy, or Poland, or Spain, or the UK	Categorical	3.49

Source: EIT-Food survey, authors' calculations.

5. Econometric results

In a next step, before estimating ordered probit models/ ologit (distinguishing which order the consumer assigned to the top 3 rated farmer initiatives, and the 4th order specifying a preference for lower than top 3), we first run simple probit models, for exploring the role of socio-demographics in driving whether a certain sustainability initiative is either in the consumers' top 3 initiatives, or not. More specifically, to assess the role different predictors (consumer socio-demographics) have for different initiatives that each of the stakeholders were expected to take, the following probit regressions distinguish between the case where the dependent variable equals to 1 when the initiative was ranked among the top 3 initiatives of the consumer, versus 0 when a given initiative was ranked lower than in the top 3.

Table 2: Probit model for farmer initiatives (without reference modalities)

VARIABLES (socio-demographics)	binary_knowfarmer
Log(age)	-0.478***
	(0.0843)
Gender	0.140**
	(0.0586)
Shopper	-0.0282
	(0.0260)
Country	-0.0515***
	(0.0171)
Education	-0.0151
	(0.0153)
Constant	1.297***
	(0.339)
Observations	2,193
chi2	53.89

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Furthermore, separate models were estimated for a given initiative (here regarding pricing transparency), for all of the stakeholder types, including farmers, processors and foodservice providers.

Table 3: Probit models for initiative "price" for all stakeholders (without any reference modalities)

VARIABLES	Farmers	Food processors	Restaurants & caterings
	binary_price	binary_pricem	binary_pricec
Log(age)	0.229***	0.536***	0.317***
	(0.0796)	(0.0825)	(0.0792)
Gender	0.146***	0.109**	0.146***
	(0.0546)	(0.0550)	(0.0542)
Shopper	-0.113***	-0.0626**	-0.0703***
	(0.0247)	(0.0247)	(0.0244)
Country	0.0473***	0.0218	0.0223
	(0.0164)	(0.0163)	(0.0162)
Education	0.00401	0.0152	0.0184
	(0.0140)	(0.0143)	(0.0139)
Constant	-0.690**	-2.452***	-1.256***
	(0.324)	(0.336)	(0.322)
Observations	2,193	2,193	2,193
chi2	43.10	56.06	35.71

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

In a further estimation step, we explore the socio-economic and country-level drivers, only for the top ranked initiative, applying multinomial logit regression. More specifically, the No. 1 initiative selected by consumers is modelled (with reference category) as an unordered categorical response out of the maximum available 11 total initiatives the consumers were asked to assess.

Table 4: Multinomial logit models for top-ranked initiative

	(1)	(2)	(3)	(4)	(5)	
	Communicate	**Information**	**Transparency**	**Traceability**	**Label**	**Certificati**
Log(age)	0.219	-1.372***	0.0960	-0.302	0.262	-0.5
	(0.351)	(0.258)	(0.411)	(0.416)	(0.287)	(0.
Male	-0.785***	-0.0118	-0.131	-0.114	-0.776***	-0.4
	(0.258)	(0.185)	(0.272)	(0.263)	(0.191)	(0.
Finland	0.905**	-0.442	1.066**	0.615	0.473	0.
	(0.405)	(0.360)	(0.472)	(0.534)	(0.315)	(0.
Italy	-0.316	0.202	-0.627	0.167	-0.944**	-0
	(0.513)	(0.310)	(0.601)	(0.562)	(0.372)	(0.
Poland	0.282	0.0582	0.0158	0.549	0.302	0.
	(0.433)	(0.320)	(0.577)	(0.496)	(0.329)	(0.
Spain	-0.467	0.101	0.628	0.284	0.208	-0
	(0.459)	(0.297)	(0.466)	(0.485)	(0.304)	(0.
UK	0.0792	-0.111	0.549	1.017**	-0.164	-0
	(0.443)	(0.347)	(0.494)	(0.473)	(0.358)	(0.
< Lower secondary	-0.658	0.993***	1.235**	-1.121	0.652	0.
	(0.767)	(0.362)	(0.559)	(1.058)	(0.398)	(0.
> Bachelor	0.277	0.379	1.163***	0.132	0.185	0.
	(0.409)	(0.293)	(0.422)	(0.437)	(0.306)	(0.
Other	0.600	-0.218	0.772	-0.823	0.256	0.
	(0.569)	(0.583)	(0.696)	(1.052)	(0.470)	(0.
Lower secondary	0.0134	0.452	1.154***	0.154	0.571**	0.
	(0.436)	(0.291)	(0.420)	(0.470)	(0.286)	(0.
No qualification	0.151	0.249	-13.18***	-0.187	0.906	1.
	(1.116)	(0.872)	(0.536)	(1.168)	(0.681)	(0.
Upper secondary	0.516	0.268	0.668	0.509	0.296	0.4
	(0.344)	(0.251)	(0.421)	(0.329)	(0.257)	(0.
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Constant	-2.445*	4.065***	-3.190*	-1.128	-1.824	1
	(1.351)	(0.960)	(1.750)	(1.544)	(1.111)	(
Observations	2,193	2,193	2,193	2,193	2,193	2

9

The above preliminary results need to be further developed (marginal effects), yet stakeholder initiatives related to information provision, certification and honesty ("Be honest about the products they produce (e.g. organic or free-range)") were highly rated.

In the next step, this consumer perspective is then contrasted with a producer perspective, where we aim to understand the drivers of producers' trust into externally-provided sustainability initiatives (certification for sustainable production practices, according to GlobalGAP standards). Over 600 farmers in Kenya were asked during November-December 2023 to provide feedback on perceived impacts that this sustainability initiative (certification standard) has from the perspective of the farmer. The key question of interest (subsequently to become the main dependent variable under investigation) is: *"To what extent has GLOBALG.A.P. certification led to an improvement in trust in dealing with the buyers of your produce (avocados, mangos)?"* (5 point Likert-scale).

The following summary statistics (Table 5), show that certified farmers have been longer in operation than non-certified farmers, and certified farms are also larger than non-certified farms.

Table 5. Mango farmer characteristics

	All	**Non-certified**	**Certified**
	(N=351)	**(N=337)**	**(N=14)**
Male (=1)	0.64	0.63	0.71
Number of years farming	12.2	11.9	19.4
Farm a legal entity (=1)	0.48	0.47	0.71
Single farmer (=1)	0.99	0.99	1
Size of farm (acres)	4.66	4.6	6.08
Acres owned	4.91	4.96	3.77

Acres leased	0.2	0.17	0.69

As Table 6 suggests, all non-certified farms are run by a single farmer, and third of certified avocado farms are group-owned. This is relevant since the organizational form (cooperative) has frequently been used as a proxy for trust (social capital).

Table 6. Avocado farmer characteristics

	All (N=327)	Non-certified (N=285)	Certified (N=42)
Male (=1)	0.57	0.54	0.74
Number of years farming	9.6	9.3	11.3
Farm a legal entity (=1)	0.69	0.64	1
Single farmer (=1)	0.95	0.99	0.67
Size of farm (acres)		2.39	
Acres owned		2.22	
Acres leased		0.36	

Beyond the above farmer characteristics, a battery of risk-attitude questions (Likert-scale) were asked, which we aim to use as socio-demographic explanatory factors for assessing farmers' perceived trustworthiness into the buyer trustworthiness ("*GLOBALG.A.P. certification led to an improvement in trust in dealing with the buyers*").

Among mango farmers, there is a strong positive correlation in attitudes on trust, price data access and the cost of certification (Table 6). Farmers who think that certification improves access to market price data also think that certification increases trust with buyers. Farmers who think that the costs of certification are justified think that certification increases trust and that there is better access to market price data. In addition, farmers who believe that certification helps with getting the produce on the market also believe that certification improves risk management (Table 7).

Table 7. Correlation of attitudes related to certification. Mango farmers, Part I.

	Better access to bank finance	Better access to market price data	Increase in trust with buyers	Costs of certification are justified	Better compliance with labor laws	Required for exports outside Africa

Better access to bank finance	-				
Better access to market price data	0.1833	-			
Increase in trust with buyers	0.3783	**0.7668**	-		
Costs of certification are justified	0.2246	**0.9873**	**0.7368**	-	
Better compliance with labor laws	0.2999	0.1273	0.0558	0.2753	-
Required for exports outside Africa	0.2428	0.3726	0.3157	0.3137	-0.3253	-

The attitudes are on a scale from 1 to 5, where 1=Strongly disagree, 2=Disagree, 3=Undecided, 4=Agree, and 5=Strongly agree.

Table 8. Correlation of attitudes related to certification. Mango farmers, Part II.

	Improved farm workers' health	Better risk management	Increase in employees' financial benefits	Increased farmer visibility	Helps to get the produce to the market	Improved communication (improving worker welfare)
Improved farm workers' health	-					
Better risk management	0.1194	-				
Increase in employees' financial benefits	-0.0204	0.7231	-			

Increased farmer visibility	-0.0287	0.0555	0.6163	-		
Helps to get the produce to the market	0.2002	**0.8881**	0.6422	0.0274	-	
Improved communication (improving worker welfare)	0.2964	0.2605	0.1336	0.1879	0.4885	-

The attitudes are on a scale from 1 to 5, where 1=Strongly disagree, 2=Disagree, 3=Undecided, 4=Agree, and 5=Strongly agree.

For avocado farmers, there is a strong positive correlation in attitudes on bank finance access and trust (Table 5). Farmers who think that certification leads to better access to bank finance also think that certification increases trust with buyers. In addition, there is a strong positive correlation in attitudes on how certification affects workers' welfare with respect to, for example, health and financial benefits. (Table 6).

Table 9. Correlation of attitudes related to certification. Avocado farmers, Part I.

	Better access to bank finance	**Better access to market price data**	**Increase in trust with buyers**	**Costs of certification are justified**	**Better compliance with labor laws**	**Required for exports outside Africa**
Better access to bank finance	-					
Better access to market price data	-0.2627	-				
Increase in trust with buyers	**0.8052**	-0.3354	-			
Costs of certification are justified	0.2274	-0.1203	0.1105	-		

| Better compliance with labor laws | 0.2735 | 0.1526 | 0.1069 | 0.4607 | - | |
| Required for exports outside Africa | -0.4579 | 0.6668 | -0.3542 | -0.2016 | -0.1526 | - |

Notes. The attitudes are on a scale from 1 to 5, where 1=Strongly disagree, 2=Disagree, 3=Undecided, 4=Agree, and 5=Strongly agree.

Table 10. Correlation of attitudes related to certification. Avocado farmers, Part II.

	Improved farm workers' health	Better risk management	Increase in employees' financial benefits	Increased farmer visibility	Helps to get the produce to the market	Improved communication (improving worker welfare)
Improved farm workers' health	-					
Better risk management	0.5812	-				
Increase in employees' financial benefits	**0.9724**	0.5700	-			
Increased farmer visibility	0.5313	0.5190	0.5034	-		
Helps to get the produce to the market	-0.2584	-0.1166	-0.3721	0.0609	-	
Improved communication (improving worker welfare)	**0.9245**	0.6491	**0.9661**	0.5834	-0.4003	-

Notes. The attitudes are on a scale from 1 to 5, where 1=Strongly disagree, 2=Disagree, 3=Undecided, 4=Agree, and 5=Strongly agree.

In a final step, our aim is to run a set of non-parametric tests on the main Likert-scale question under investigation, before employing ordered logistic regression focusing on the socio-demographic explanatory factors for assessing mango/ avocado farmers' perceived trustworthiness into the buyer trustworthiness ("*GLOBALG.A.P. certification led to an improvement in trust in dealing with the buyers*"). Finally, we then aim to contrast the consumer perspective on trustworthiness into stakeholder initiatives provided by supply chain stakeholders (farmers, processors, retailers, foodservice providers), with the stakeholder perspective (farmers only) to understand the drivers of producers' trust into externally-provided sustainability initiatives (certification for sustainable production practices). This contrasting of actor-based characteristics driving the trustworthiness into sustainability initiatives and practices is expected to provide useful insights into general factors (not country-specific) that contribute to our understanding of the antecedents of trust and trustworthiness (Tomlinson et al., 2020).

6. Conclusions

This draft has aimed to sketch out initial steps toward a more thorough analysis of rating and ranking data to model supply-chain actors' preferences for sustainability-initiatives and practices. Considering the discussion in the literature on the symmetry and stability on preferences using inferences on the underlying 'true' utility preferences of actors (Palma, 2017; Huls et al., 2022; Huseynov et al., 2023), further implementation of partial and other rank-ordered logit models is intended.

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Appendix

Table A1 – Top ranked initiatives associated with food manufacturers

Initiatives	Description	Top ranked initiatives			
		(1)	(2)	(3)	Not ranked
Communicate	Communicate directly with with consumers e.g. on social platforms	179	59	67	1,888
Information	Provide information about what is going on behind closed doors of factories e.g. through documentaries	292	154	113	1,634
Transparency	Improve transparency	408	235	170	1,380
Traceability	Make products traceable and make information about the traceability scheme easily available on the internet	210	247	133	1,603
Label	Use honest/accurate labelling	344	430	293	1,126
Certification	Use third-party certification schemes for e.g. organic products/animal welfare	76	139	127	1,851
Honest	Be honest about the products they produce (e.g. organic or free-range)	166	278	296	1,453
Price	Charge fair prices for their products	235	282	340	1,336

Environment	Support the environment	70	138	202	1,783
Employees	Treat their employees fairly	65	101	222	1,805
Transparent chain	Increase transparency along the whole production chain	125	107	207	1,754

Source: EIT-Food survey, authors' calculations.

Table A2 – Top ranked initiatives associated with restaurants and caterings

Initiatives	Description	Top ranked initiatives			
		(1)	**(2)**	**(3)**	**Not ranked**
Communicate	Communicate directly with consumers e.g. on social platforms	63	74	86	1,970
Information	Provide information about what is going on behind closed doors e.g. through documentaries	138	158	127	1,770
Traceability	Use products that are traceable along the food supply chain	262	257	233	1,441
Local	Use local produce	341	304	258	1,290
Certification	Use third-party certified products e.g. organic products/animal welfare	148	168	149	1,728
Honest	Be honest about the products they include (e.g. organic or free-range)	309	266	269	1,349
Price	Charge fair prices for their meals/food	493	361	343	996
Environment	Support the environment	134	147	208	1,704
Employees	Treat their employees fairly	181	256	286	1,470
Waste	Reduce waste	124	202	234	1,633

Source: EIT-Food survey, authors' calculations.

Table A3 – Top ranked initiatives associated with retailers

Initiatives	Description	Top ranked initiatives			
		(1)	**(2)**	**(3)**	**Not ranked**
Local	Increase the availability of local and domestic products	319	259	231	1,384
Rating	Encourage the use of a rating system where consumers can rate retailers	66	99	113	1,915

Traceability	Stock products that are traceable along the food supply chain	245	181	177	1,590
Transparent price	Making pricing practices more transparent	287	234	263	1,409
Honest marketing	Being honest in their marketing/advertising	256	242	243	1,452
Communicate	Improve communication with consumers	100	97	132	1,864
Waste	Reduce waste	233	229	205	1,526
Packaging	Increase the number of products with sustainable packaging	130	214	209	1,640
Hygiene	Improve in-store hygiene practices	239	252	213	1,489
Apology	Apologise to consumers when food products do not meet expected standards/are inadequate	122	144	158	1,769
Employees	Treat their employees fairly	196	242	249	1,506

Source: EIT-Food survey, authors' calculations.