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Consumer food sustainability before and during the Covid-19 Crisis: A quantitative content analysis and food policy implications

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ABSTRACT

Sustainability is one of the major challenges that societies are facing. The question of why and how consumer food sustainability related issues (e.g., food waste, sustainable food shopping behavior, among others) are placed on the public agenda is therefore of high interest to food policy makers. Drawing from media agenda setting theory, this study provides the first analysis of how relationships between consumer food sustainability-related frames appear in the media. Focusing on the COVID-19 crisis, it is examined how the media framed food sustainability issues in 2019 and 2020. 271 newspaper stories are investigated through a rather new approach to quantitative content analysis that incorporated binary coding, optimal scaling, and path analysis. The study's findings point to various significant relationships between frame contents and implications and similarly bring to light the moderating effects of the COVID-19 crisis and 'article authorship' on a number of these relationships. The findings contribute to the understanding of how public opinion regarding food sustainability develops and can help food policymakers and authorities seeking to develop, position, and address issues relevant to food sustainability.

1. Introduction

Consumer food sustainability is one of the major challenges facing the globe (e.g., Garnett 2013; Bellotti and Panzone 2016; Baldy 2019). Consumer food consumption and production account for approximately one-third of households' environmental impact (Lazzarini et al. 2018). Sustainable consumer food policies cannot be pursued without the active involvement and understanding of consumer food sustainability issues, which both include consumer internal factors such as sustainable shopping (Achón et al. 2017), consumer sustainability consciousness (Katzeff et al. 2020), sustainable food consumption and waste (Gollnhöfer et al. 2019) and external factors such as demand for sustainable production methods (Messner et al. 2020) and sustainable selling methods (Griffen 2020). The question of why and how consumer food sustainability related issues are placed on the public agenda is therefore of high interest to food policy makers (e.g., Ma et al. 2020; Fernando et al. 2014; Mayer 1991).

Consumer food sustainability is a complex concept that may involve environmental, economic, and social dimensions (Conrad and Blackstone 2021; FAO 2018). When food policy and consumer researchers have sought to understand consumer sustainability practices they have often taken a 'micro-level' perspective by investigating consumer

motivations and decision making processes (e.g., van Doorn and Verhoef 2011; Grunert et al. 2014; Katzeff et al. 2020). However, as argued by McDonagh et al. (2012) and Humphreys and Thompson (2014), such micro-level perspectives often ignore the 'bigger picture' of how public opinion about sustainability issues develops. In that respect, we propose that the media may shape the public's perceptions and opinions on public interest topics (Geschke et al. 2010; Hansen 2020), such as food sustainability (Bellotti and Panzone 2016). Media agenda setting theory holds that the relative emphasis the media assign to various issues may influence the degree of salience these topics have for the general public (Birkland and Schwaebler 2019; Naser 2020). The theory distinguishes between two levels of agenda setting. The first level examines the transfer of issue salience from the media to the public agenda, while the second level explores which attributes of those issues that are important (Kiousis et al. 2007; Kiousis and McCombs 2004; McCombs 2004). During the first level, a society may establish a consensus about which issues are important. This can be accomplished by political debate or focusing events, which can be understood as events that call attention to a problem that reasonably can be considered as harmful (Kingdon 1995; Váně and Kalvas 2013; Birkland 1998) and which is known to policy makers, the media and the public almost simultaneously (Kingdon 1995). The second level may include reactions from policy makers,

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interest groups, and changes in media framing, among others (Hansen 2020; Birkland 1997). Media framing theory suggests that varying the presentation and framing of an issue may elicit perceptual changes in people that drive them to focus on diverse implications (e.g., Majer et al. 2019; Bellotti and Panzone 2016).

Prior research has studied how focusing events such as hurricanes (Birkland 1997, 1998), oil spills (Humphreys and Thompson 2014), global climate change (Liu et al. 2011; Schäfer and Schlichting 2014) and nuclear power plant accidents (Joppke 1993), among others could lead the media or the public to identify new related problems, or to pay greater attention to existing ones within these domains. As reflected in prior research, media agenda setting theory has primarily been concerned with levels of media agenda setting within the same domain, leaving aside questions about whether there could be a relationship between levels in different domains. More specifically, while prior theory and research has concentrated on how an event in one domain may affect media framing within that domain could a focusing event in a particular domain also influence media framing in another domain? Following this thinking, we draw upon the theoretical elements in media agenda setting theory and media framing theory and apply them to the issue of consumer food sustainability (i.e., the studied domain of public interest) before and during the COVID-19 crisis (i.e., a focusing event). By doing so this study expands past sustainability research into what matters and inferences people talk or think about by investigating why they construct these implications in response to a focusing event (i.e., COVID-19).

This research makes substantial contributions to the consumer food policy and sustainability literature. We shed light on the ongoing debate on how consumer related issues are placed on the public agenda, which often develops from interplay with the political domain. Specifically, media agenda theory suggests that consumer, and other, issues may rise on the agenda through the political stream (i.e., political developments), the policy stream (i.e., political solutions) or the problem stream (i.e., problems are recognized by policymakers, the media and others) (Kingdon 1995). Investigating the COVID-19 as a focusing event this research increases understanding of how the problem stream may influence public media and opinion, and ultimately food policy making. We argue and show that external occurrences (such as the COVID-19 pandemic), and type of article authorship (reader-written or journalist-authored), may influence relationships between framing contents and implications in food policy-relevant domains such as consumer food sustainability.

Among other results, this research encourages food policy makers and authorities to focus on consumers' sustainability consciousness and feelings of responsibility for contributing to sustainable societal developments. Moreover, the results bring new arguments to food policy makers seeking to convince food companies to develop sustainable business practices.

2. Theoretical background on media agenda setting theory

The availability of media as an information resource is necessary for modern society and policy-making to function and for citizens to understand issues with relevance to their behavior and social life (Shirley et al. 2015; Geschke et al. 2010). The media's role can be particularly important when dealing with abstract issues, such as sustainability, where one's actions cannot necessarily be directly related to visible consequences (Dirikx and Gelders 2010). Indeed, sustainability is an issue that many are unable to grasp first-hand as analyses and descriptions of sustainability are primarily produced by science (Schäfer and Schlichting 2014). Known as the first-level agenda setting (Cheng 2016), media agenda setting theory is concerned with the transfer of salience from the media agenda to the public agenda. The second-level of agenda setting is concerned with those characteristics and properties that fill out the picture of each issue (McCombs 2004), thereby linking discussions of second level agenda settings to framing theory (McCombs

et al. 1997). The principle of framing theory is that a topic can be perceived differently and interpreted as having multiple effects (Bellotti and Panzone 2016). In modern society, the public regularly form views of and opinions about public topics bordered by messages that may present divergent views about the topics and their likely implications (Aklin and Urpelainen 2013; Dixon and Clarke 2013). Therefore, frames can assist readers "locate, perceive, identify, and label the flow of information around them" (Goffman 1974, p. 21).

As such, the media may influence the public perception of sustainability by treating topics of importance to sustainability and framing them in various ways (McComas and Shanahan 1999; Dirikx and Gelders 2010; Hansen 2020). Frames are "conceptual tools that media and individuals rely on to convey, interpret, and evaluate information" (Neuman et al. 1992, p. 60). By explicitly or implicitly selecting and dealing with attributes of complex topics, frames may influence how the public forms perceptions and opinions of various issues (McCombs et al. 1997) and what the consequences may be (Dirikx and Gelders 2010). Therefore, one should distinguish between frame contents and implications. Frame contents can be thought of as selecting some aspects of seeming reality to augment their salience, while frame implications are the proposed specific treatment recommendations (Entman 1993). In that sense, frame contents are principal ideas or narratives that structure the surrounding world and give meaning to different topics (Gamson and Modigliani 1989; Scheufele 1999), such as consumer food sustainability. Frame implications focus on how aspects of complex issues may be implemented, thereby making it likely for citizens to determine their significances (McCombs et al., 1997; Hansen 2020). By considering both frame contents and frame implications, framing exploration expands food sustainability research into what matters and inferences people talk or think about by investigating why they construct these implications.

3. Research methodology

3.1. Theoretical background on COVID-19 research

In 2020, the COVID-19 crisis dramatically affected the world and peoples' way of living. One area of particular interest for food policy-makers is consumer attitudes towards sustainable food consumption and interest in food sustainability issues during the crisis. While some suggest that the COVID-19 pandemic can be seen as an economic shock with possible spill-overs to the demand side (Guerrieri et al. 2020), others stress that the pandemic affects consumers directly because the health risk of going to public spaces like shops, restaurants and malls may influence consumption patterns (Andersen et al. 2020; Amicarelli et al. 2021). Janssen et al. (2021) found that changes in consumer eating behavior were driven by contextual factors such as lockdown conditions and personal factors such as anxiety related to COVID-19. According to HealthFocus (2020), consumers are now more willing to pay for healthier and better food for the environment. Other results indicate that the COVID-19 crisis has not dented consumers' sustainability interest (GlobalData 2020). Sourcing, processing, and social impacts of food still hold importance or even became more important during the COVID-19 crisis (Griffen 2020; HealthFocus 2020; Baldy 2019). This is supported by other recent studies suggesting that consumers have changed the way they perceive sustainable food consumption, food waste, and other issues related to food sustainability. For instance, Filimonau et al. (2021) found that the pandemic has prompted an increased preference towards consuming (more) sustainable food at home. Qian et al. (2020) suggest that the COVID-19 crisis has encouraged consumers to making efforts to reduce food waste. As another example, findings obtained by (Eriksson et al. 2021) indicate that consumers now perceive sustainability as being increasingly important and that they are now willing to pay more for sustainably packaging.

Also, the COVID-19 pandemic points to a connection between a healthy natural environment and human health. There seems to be consensus that environmental issues such as reduced biodiversity,

degradation, ecosystem imbalance, and wildlife trade make the emergence of pandemics more likely (OECD 2020). In that respect, environmental threat perceptions may lead consumers to change their opinions and behavioral intentions toward environmental issues (Cheng, 2016; Johnson and Scicchitano 2000).

Based upon the above notions, we explore how Danish newspapers framed consumer food sustainability in 2019 (before the COVID-19 crisis) and from March 2020 – December 2020 (i.e., during the COVID-19 crisis in 2020). By conducting a quantitative content exploration of 271 newspaper stories, this study investigates possible relationships between frame contents and frame effects. Furthermore, it is explored whether the COVID-19 crisis and ‘article authorship’ might have contributed to differences between these relationships.

3.2. Pilot study and media frames

A number of studies have identified the importance of several foods and sustainability-related frame contents, including consumer responsibility frame (e.g., Evans et al. 2017; Bengtsson et al., 2018), consumer sustainability consciousness frame (e.g., Lammers et al. 2019; Berglund and Gericke 2016; Grunert et al. 2014), and consumer values and norms frame (e.g., HealthFocus, 2020; Gollnhöfer et al. 2019), among others. Frame implications may include, for example, sustainable production methods (e.g., Griffen 2020; FAO 2018; Serhan and Yannou-Lebris 2020), sustainable selling methods (e.g., Griffen 2020; GlobalData 2020; Gollnhöfer et al. 2019), sustainable food shopping behavior (e.g., Achón et al. 2017; Katzeff et al. 2020), and sustainable food consumption and waste (Messner et al. 2020; Conrad and Blackstone 2021). Frames might highly differ across different topics and should be reflected about specific issues, events, or actors (Entman 2004). Although prior research has identified the relevance and importance of both sustainability frame contents and frame implications, no previous studies have analyzed how the media may suggest relationships between consumer food sustainability contents frames and implications in response to a focusing event. However, better insights into such associations may add to our understanding of how media framing contents and implications arises. This is important as media story framing (its structure and content selection) may have considerable impacts on the way the public perceives subjects and problems and the outcomes (Price et al. 1997; Semetko and Valkenburg 2000).

A deductive approach developed the frame subjects and frame inferences applied in this study (Dirikx and Gelders 2010; Semetko and Valkenburg 2000). First, a review was conducted of prior research, reports, and popular newspapers related to consumer food sustainability issues. The review suggested various frame subjects and implications (Table 1). Subsequently, a pilot study comprising 50 randomly picked newspaper articles (2019–2020) on consumer food sustainability was conducted. The purposes of the pilot study were to (1) provide a preliminary empirical investigation of the appropriateness of the developed research questions, which all distinguish between frame contents and implications (see section 3.3) and (2) determine whether (a) the developed frame contents and implications could be detected in newspaper articles and/or (b) additional frame contents/implications needed to be considered. The pilot study supported the distinction between frame contents and implications as a viable approach to categorize the contents of the newspaper articles. In addition, the pilot study substantiated media presence of both frame contents and implications suggested by past research and reports. The pilot study did not suggest any frame contents/implications not also proposed in the literature review. In the pilot study, the newspaper articles were coded based on the same method as in the main study (see Methodology section). Specifically, six content frames and eight implication frames were identified (see Table 1).

Table 1
Food sustainability frames.

Frame type	Frame contents and implications	Literature examples
<i>Frame contents</i>		
Consumer responsibility	This frame attributes responsibility for food sustainability to the consumer.	Evans, Welch, & Swaffield, 2017; Bengtsson et al., 2018; Grunert, 2011
Responsibility - other stakeholders	This frame attributes responsibility for food sustainability to the government, the community, a defined group of people, or an individual.	Garnett, 2013; Aiking & de Boer, 2004; Kidwell, Farmer & Hardesty, 2013; Closs, Speier, & Meacham, 2011
Human interest factors	This frame brings a human face or an emotional angle to the presentation of a consumer food sustainability problem or issue.	Manni, Sporre & Ottander, 2017; Srivastava & Srivastava, 2020; Oldewage-Theron et al., 2018
Economic factors	This frame reports how food sustainability is related to the economy of individuals, groups, institutions, companies, regions, or countries.	FAO, 2018; Crittenden et al., 2011; Döring et al., 2015; Oosterveer & Sonnenfeld, 2012
Consumer sustainability consciousness	This frame emphasizes how food sustainability may be related to consumer motivation, knowledge, or expectations.	Lammers, Ullmann, and Fiebelkorn 2019; Berglund & Gericke, 2016; Grunert, Hieke & Wills, 2014
Values and norms	This frame emphasizes how food sustainability may be related to consumer values and social norms.	HealthFocus, 2020; Verbeke & Vermeir, 2008; Thøgersen, 2001; Gollnhöfer, Weijo & Schouten, 2019
<i>Frame implications</i>		
Sustainable production methods	Suggests that food production should be sustainable.	GlobalData (2020); Griffen, 2020; FAO 2018; Serhan & Yannou-Lebris 2020; Garnett, 2013
Sustainable selling methods	Suggests that food retailers should use sustainable selling methods.	Griffen, 2020; GlobalData, 2020; Gollnhöfer, Weijo & Schouten, 2019; Giesen and Leenheer, 2019
Sustainable education and knowledge	Suggests that consumers' understanding and knowledge of food sustainability should be improved.	Peschel et al., 2016; Kowasch and Lippe, 2019; Evans, Welch, & Swaffield, 2017
Sustainable information	Suggests that consumers should be provided with more information about food sustainability issues.	O'Rourke & Ringer, 2016; Grunert, Hieke and Wills 2014; Lazzarini, Visschers & Siegrist, 2018
Sustainable food shopping behavior	Suggests that consumers' food shopping behavior should be sustainable.	Achón et al., 2017; Katzeff et al., 2020; Blake, Mellor & Crane, 2010
Sustainable food consumption and waste	Suggests that consumers' food consumption and food waste behavior should be sustainable.	Messner, Richards & Johnson, 2020; Conrad & Blackstone, 2021; Garnett, 2013
Revised values and norms	Suggests that values and norms relating to consumer food sustainability issues should be revised.	Verbeke & Vermeir, 2008; Gollnhöfer, Weijo & Schouten, 2019
Food taxes/restrictions	Suggests that taxes or restrictions should be imposed on ‘non-sustainable’ food items.	Broeks et al., 2020; FAO, 2018; Bonnet, Bouamra-Mechemache & Corre, 2018

3.3. Research questions

Three research questions were developed. The research questions were developed in (a) accordance with our study purposes and previous research suggesting the distinction between frame contents and implications (e.g., Dirikx and Gelders 2010; Entman 1993), (b) our

proposition that focusing events, such as pandemics, could influence how the media may frame issues in other domains such as consumer food sustainability, and (c) research suggesting that article authorship (i. e., journalists/editors vs. readers) may influence the particular framing of public issues (e.g., [da Silva 2012](#); [Geschke et al. 2010](#)). The initial purpose of this study is to investigate probable relationships between frame subjects and frame implications, and therefore we explore as follows:

RQ1. What are the relationships between frame contents and frame implications?

Although editorial criteria, such as perceived relevance and importance may affect the associations between frame contents and implications, major external events or ‘shocks’ such as the COVID-19 crisis may influence them. External ‘shocks’, such as pandemics, natural disasters, or accidents, do not allow for preparation and may induce citizens to change their way of living, and indicate or symbolize that something is ‘wrong’ ([Kingdon 1995](#)), which in turn may create severe stress among citizens ([Moschis, 2007](#)). Stress may affect the public’s emotional and physical well-being and lead to revised life priorities and public discourse ([Gierveld and Dykstra 1993](#)), which might influence media framing of various topics ([Paveglio et al. 2011](#)). Moreover, unforeseen events or stress can invoke ‘allostasis’ or maladaptive developments that allow people to regain physiological permanence via the change in the internal environment ([Sinha and Jastreboff, 2013](#)). Examples of maladaptive processes could include changes in food consumption patterns and food preferences, among others ([Dallman et al. 2005](#); [Oliver and Wardle 1999](#); [Sinha and Jastreboff 2013](#); [Torres and Nowson 2007](#); [Hansen and Thomsen, 2021](#)). Although other events also happened in Denmark in 2019, they did not receive nearly the same media reporting as the COVID-19 crisis. From March 2020 (the beginning of the crisis) to December 2020, the COVID-19 crisis was covered in 300,611 articles in Danish media. In comparison, other major events such as the Queen’s eighty years birthday, the revitalized MeToo movement, and the Danish Finance Act was covered in just 4715–9094 media reports ([Infomedia 2021](#)). Consequently, we also aim to answer the following research question:

RQ2: To what extent does the publication date (2019 versus March 2020–December 2020) moderate the relationships between frame contents and implications?

Although editors and journalists often claim that newspaper articles are unbiased and accurate, the media has severally been accused of being biased reporting, reinforcing stereotypes, among other blames ([Geschke et al. 2010](#)). On the other hand, one of the functions of letters to the editor is that of catharsis ([Wahl-Jorgensen 2001](#)). Letters to the editors give the antagonist, and the displeased a chance to be heard and, as such, letters to editors are often emotionally laden or tend to focus on just a few issues ([AIU 2020](#)) and are also likely to offer sweeping framing implications and to convey subjectivist explanations to seeming issues ([Reinhart 2007](#)). Overall, readers’ posts are an indispensable form of public discussion ([Richardson and Franklin 2004](#)), facilitating beliefs and views exchange between diverse groups in society ([da Silva 2012](#)), which may influence public view of consumer food sustainable behavior. Newspaper articles are part of a multifaceted interplay between language, communication, and society ([Gee 1999](#)). Although journalists or editors write most newspaper stories, readers’ posts, including letters to the editor or readers-generated online materials, also constitute a significant proportion. Thus, journalists/editors and readers all contribute to how the individual media are presented to the public as a whole. Letters to the editor often refer to previous views and discussions brought up in the media and are often both reflective and subjective ([da Silva 2012](#)) and written by heavy readers with rather fixed opinions while targeting to influence public view and belief.

Contrariwise, journalists regularly claim to report subjects and events accurately and unbiasedly ([Geschke et al. 2010](#)). Such differences between authorship types may lead to differences in frame subjects and inferences. Since readers’ posts may play a vital role in creating the public’s insight and opinion of consumer food sustainability, this study also explores whether the authorship of an article may influence relationships between frame contents and frame implications.

Therefore, we aim to answer the following research question:

RQ3: To what extent does whether the articles are authored by journalists/editors versus readers moderate the relationships between frame contents and frame implications?

3.4. Frame measures

We used a three-step approach to identify newspaper articles and to measure and code the frames used in this study ([Fig. 1](#)).

To determine the extent to which certain frames appeared in newspaper stories, we developed 43 questions in accordance with past research (e.g., [Dirikx and Gelders 2010](#); [Kline et al. 2006](#); [Semetko and Valkenburg 2000](#); [Hansen 2020](#)) (see Appendix). Each question was intended to add to the measurement of one of the six frame contents (consumer responsibility, responsibility - other stakeholders, human interest factors, economic factors, consumer sustainability consciousness, and consumer values and norms or one of the eight frame implications (sustainable production methods, sustainable selling methods, sustainable education and knowledge, sustainable information, sustainable food shopping behavior, sustainable food consumption and waste, revised consumer values and norms, and food taxes/restrictions). Sample questions were ‘Does the story suggest that consumers can alleviate the identified issues/problems?’ (consumer responsibility), ‘Is there a mention of consumer sustainability motivation?’ (consumer sustainability consciousness), ‘Does the story suggest that there is a need for educating consumers about sustainability issues?’ (consumer sustainability education and knowledge), and ‘Does the story suggest that consumers should reduce their food waste?’ (consumer sustainable food consumption and waste).

Next, three hundred and eight (308) unique newspaper stories were identified using the Danish database Infomedia. Infomedia is a news media corporation involved in the monitoring of nearly all Danish nationwide, regional, and local newspapers and other news/information sources, such as popular journals and magazines. The search strategy involved the use of key search terms, including ‘food’ and ‘consumer(s)’ and ‘sustainability/sustainable’ and the search was limited to the 2019

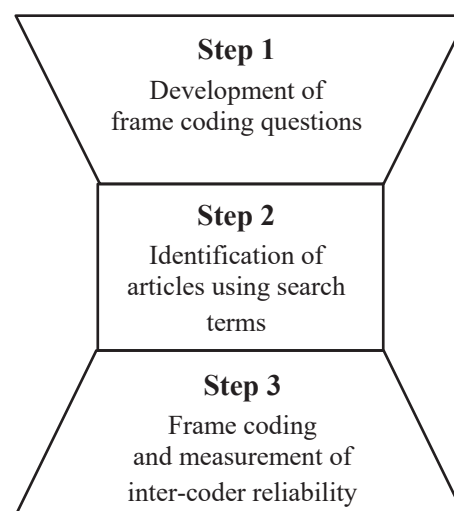


Fig. 1. Identification and measurement of frames.

(January 1 to December 31) – 2020 (March 1 to December 31) period. The rationale for the search time interval was that it coincided with the beginning of broader public attention to COVID-19 in Denmark, which confirmed the first case of COVID-19 on February 27, 2020 (Andersen et al., 2020). Of the 308 unique stories, 37 were excluded from further analysis since they were mainly statistical synopses of consumer buying patterns and the like. Of the 271 stories that formed the final sample, 129 related to 2019 and 142 to 2020. Moreover, 197 stories were journalists/editors written, and 74 stories were readers' posts (letters to the editor). The retrieved newspaper stories had on average 914 words. The shortest story had 167 and the longest 3559 words.

Two coders were involved in coding the responses to the 43 questions; answering either yes (1) or no (0). The primary coder was a consumer research expert and the second coder was a non-expert skilled in societal issues. The inter-coder reliability was 91%, and the reliability on two sub-samples of 40 randomly selected articles was 91% and 93%, respectively, demonstrating satisfactory robustness of the coding. The main coder's content analysis forms the basis of the study's results. Of the 271 stories 105 were in nationwide newspapers, 71 were in regional newspapers, and 95 were in magazines, or similar publications.

3.5. Grouping procedures

The analysis of the dimensionality of the binary variables collected in this study was conducted through Categorical Principal Component Analysis (CatPCA). The purpose of CatPCA is to reduce a set of variables into a smaller set of components, while retaining most of the variance in the original variables. CatPCA generalizes PCA using optimal scaling to accommodate various types of variables, including binary ones. Specifically, CatPCA transforms categories of binary variables into numeric value variables. While there is no assumption of linearity between variable relationships (Meulman and Heiser 2001), CatPCA functions similarly to standard PCA by allowing the definition of dimensions. CatPCA maximizes the association between input variables while reducing the multi-dimensionality of the initial data matrix (Aragão e Pina et al. 2019). By reducing the multi-dimensionality, one can interpret a set of components rather than a large number of variables. Several recent studies (e.g., Saukani and Ismail 2019; Araújo e Pina et al. 2019) have applied CatPCA to data grouping.

3.6. Path analysis

The dimensions developed from the grouping procedure were used to estimate possible relationships between frame contents and frame implications. Use of the developed dimensions in subsequent analyses relies on the fulfilled assumption that these adequately represent the pre-described frames, see further below. We used SPSS AMOS 26 and path analysis to estimate relationships between frame contents and frame implications.

4. Results

4.1. CatPCA

Using the eigenvalue > 1 criterion complemented by scree tests, we developed and rotated a 14-dimension solution using the non-orthogonal rotation method Oblimin (with Kaiser normalization, to prevent relatively large loadings from dominating the rotation). Only items with factor loadings higher than 0.50 were assigned to the interpretation of the frame dimensions, a threshold commonly used by researchers (Pedhazur and Pedhazur-Schmelkin 1991; Semetko and Valkenburg 2000) (Table 2). The 14-dimension factor solution accounts for 78.3% of the variance, which is above the recommended 60% threshold (e.g., Hair et al., 2014). In addition, all items meet the 0.50 threshold, and no items load ≥ 0.50 on more than one dimension. An inspection of the matrix shown in Table 2 indicates that the 43 coding

items adequately represent the 14 frames when assigned to the CatPCA procedure.

4.2. Path analyses

The correlation matrix of the CatPCA dimensions (Table 3) shows a substantial number of significant correlations between frame contents and frame implications suggesting that estimating path relationships between these dimensions is a viable approach.

The use of CatPCA dimensions renders non-normality, which violates the distributional assumptions of the standard maximum likelihood (ML) estimator (Kaplan, 2009). Hence, we initially estimated the path model using generalized least-squares (GLS) estimation (Yuan and Tian 2015). The results indicate that the path model provides a reasonable absolute fit to the data ($\chi^2 = 40.02$, $df = 28$; $p = 0.07$). Then, we re-estimated the path model using the bootstrapping resampling procedure (500 samples; Efron and Tibshirani 1993). The Bollen-Stine (Bollen and Stine 1992) bootstrap-adjusted p -value was 0.20 suggesting that the path model is consistent with the data. Next, we applied the procedure suggested by Walker and Smith (2017) to compute model fit indices that are adjusted in accordance with the Bollen-Stine procedure. The results of this procedure indicate that the model was a reasonable fit to the data (CFI = 0.96; NNFI = 0.90; AGFI = 0.96; RMSEA = 0.020).

A comparison of the parameter estimates produced by GLS and bootstrapping showed similar significance levels for all estimated structural equation modeling paths. In the following, we report the results based on GLS estimates (Table 4).

4.3. Results pertaining to RQ1

Several significant relationships between frame contents and frame implications were identified (Table 4). The frame content 'consumer responsibility' was positively related to the implications 'sustainable food shopping behavior' ($\beta = 0.13$, $p = 0.04$) and 'sustainable food consumption and waste' ($\beta = 0.26$, $p < 0.01$); and (marginally) positively related to 'revised of values and norms' ($\beta = 0.10$, $p = 0.10$). To test the difference between significant coefficients, their corresponding 95% confidence intervals (CI) were estimated. If the confidence intervals overlap with <50%, the coefficients can be considered significantly different from each other ($p < 0.05$) (Cumming 2009). This criterion suggests that the relationship between 'consumer responsibility' and 'sustainable food shopping behavior' (95% CI [0.02, 0.24]) was not significantly different from the relationship between 'consumer responsibility' and 'sustainable food consumption and waste' (95% CI [0.13, 0.39]).

The results also suggest that the frame content 'values and social norms' had positive relationships with both 'sustainable food consumption and waste' ($\beta = 0.18$, $p < 0.01$) and 'revised social sustainability values and norms' ($\beta = 0.22$, $p < 0.01$). Calculations of CI suggest that the relationship between 'values and social norms' and 'sustainable food consumption and waste' (95% CI [0.05, 0.31]) was not significantly different from the relationship between 'values and social norms' and 'sustainable food consumption and waste' (95% CI [0.12, 0.32]).

In addition, the results indicate that the frame 'responsibility – other stakeholders' was positively related to 'sustainable production methods' ($\beta = 0.29$, $p < 0.01$) and that the frame 'consumer sustainability consciousness' was positively related to 'sustainability education and knowledge' ($\beta = 0.17$, $p < 0.01$).

4.4. Results pertaining to RQ2 and RQ3

Multiple-group path analysis with chi-square difference tests was used to investigate the moderating effects pertaining to year (2019 vs. 2020) and authorship (journalist vs. reader) (Table 4). Several significant moderating effects were detected.

Year (2019 vs. 2020). 'Responsibility - other stakeholders' had a

Table 2
CatPCA dimensions structure matrix.^a

	Dimension													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
RC1 (Responsibility – consumers)	0,152	–0,074	0,473	0,237	0,215	–0,064	0,108	–0,109	–0,018	0,430	0,161	0,029	0,912	0,139
RC2	0,167	0,020	0,131	–0,031	0,126	–0,023	0,353	–0,036	0,173	–0,047	0,137	0,084	0,927	0,018
RC3	0,101	–0,021	0,377	0,133	0,199	0,003	0,079	–0,029	–0,046	0,283	0,153	0,027	0,972	–0,016
RMA1 (Responsibility – other stakeholders)	–0,036	0,328	0,100	–0,031	0,154	0,047	–0,007	0,087	–0,055	–0,036	0,959	0,105	0,255	0,061
RMA2	–0,030	0,296	0,106	–0,031	0,157	0,093	–0,045	0,023	–0,050	–0,000	0,974	0,066	0,228	0,042
RMA3	–0,056	0,230	0,051	0,272	0,089	0,170	0,155	–0,060	0,159	0,221	0,889	0,020	0,066	–0,241
RMA4	–0,051	0,333	0,013	0,072	0,095	0,086	0,043	–0,044	–0,009	0,124	0,980	–0,019	0,018	–0,113
HI1 (Human interest factors)	0,254	0,064	0,089	0,049	0,985	0,040	0,180	0,089	0,099	0,115	0,215	–0,057	0,121	–0,040
HI2	0,246	–0,005	0,056	0,087	0,962	0,073	0,145	0,015	0,126	0,129	0,135	–0,029	0,171	0,045
HI3	0,263	–0,022	0,085	0,039	0,975	0,026	0,065	0,026	0,057	0,219	0,125	–0,034	0,173	0,006
HI4	0,290	–0,033	0,100	–0,019	0,960	–0,048	0,039	0,063	0,089	0,155	0,026	–0,074	0,142	0,070
ECON1 (Economic factors)	0,030	0,158	0,044	–0,053	–0,007	0,973	0,042	–0,027	0,022	–0,043	0,067	0,053	–0,033	–0,025
ECON2	0,056	0,111	0,015	0,013	0,061	0,964	0,062	–0,084	0,053	0,012	0,132	0,035	0,005	–0,006
ECON3	–0,007	0,069	0,036	0,049	0,002	0,974	–0,027	–0,035	–0,036	0,030	0,060	0,059	–0,066	–0,080
CSC1 (Consumer sust. consciousness)	0,254	–0,049	–0,010	0,065	0,150	0,051	0,116	0,175	0,976	0,154	–0,024	–0,072	0,024	0,075
CSC2	0,308	–0,065	0,105	0,333	0,039	0,020	0,111	–0,030	0,915	0,108	0,002	0,064	0,125	0,385
CSC3	0,138	0,134	–0,141	–0,023	0,110	–0,031	0,022	0,127	0,976	–0,050	0,043	0,024	–0,001	0,147
VSN1 (Values and social norms)	0,967	0,054	0,020	–0,074	0,234	0,006	–0,032	0,074	0,319	0,297	–0,048	0,066	0,035	0,171
VSN2	0,982	–0,001	0,211	–0,091	0,273	0,092	0,075	–0,002	0,220	0,268	–0,061	–0,121	0,162	0,095
VSN3	0,973	0,112	0,194	0,006	0,308	0,042	0,070	0,092	0,074	0,229	0,010	–0,080	0,159	–0,103
VSN4	0,944	0,006	0,368	0,137	0,311	–0,024	0,076	0,025	0,221	0,325	–0,048	–0,033	0,180	–0,070
SPM1 (Sust. production methods)	0,056	0,975	–0,083	–0,134	0,002	0,105	0,018	0,080	0,060	–0,044	0,250	–0,032	–0,046	–0,036
SPM2	0,068	0,973	–0,060	–0,106	0,015	0,091	0,013	0,059	–0,029	–0,098	0,332	–0,018	0,038	–0,018
SPM3	0,064	0,964	0,001	–0,107	0,020	0,130	0,034	0,095	0,052	–0,101	0,296	–0,077	–0,042	–0,058
SSM1 (Sust. selling methods)	0,073	0,106	–0,079	0,159	–0,022	–0,013	–0,029	0,980	0,024	–0,006	–0,008	0,009	–0,114	–0,011
SSM2	0,068	0,094	–0,115	0,095	0,074	–0,057	0,003	0,974	0,142	–0,013	0,035	–0,030	–0,056	–0,023
SSM3	0,018	0,032	–0,079	–0,018	0,090	–0,077	–0,006	0,953	0,131	–0,158	–0,007	–0,028	0,043	–0,008
SEK1 (Sust. education and knowledge)	0,000	–0,040	0,017	0,333	–0,025	–0,047	0,091	0,016	0,226	0,189	–0,015	0,226	0,065	0,957
SEK2	0,014	–0,085	–0,004	0,363	0,025	–0,024	0,051	–0,075	0,216	0,213	–0,063	0,093	0,059	0,954
SI1 (Sust. information)	0,002	–0,192	0,020	0,954	0,084	–0,017	0,098	0,137	0,180	–0,002	0,060	0,181	0,127	0,337
SI2	0,014	–0,132	0,142	0,958	0,095	–0,038	0,184	0,121	0,162	–0,028	0,062	0,188	0,090	0,353
SFS1 (Sust. food shopping behavior)	0,123	0,056	0,247	0,142	0,128	0,018	0,965	–0,039	0,089	–0,073	0,102	–0,038	0,095	0,028
SFS2	0,073	–0,005	0,294	0,248	0,154	0,056	0,969	0,035	0,033	0,001	–0,070	0,029	0,256	0,045
SFS3	0,005	–0,025	0,268	0,069	0,210	0,115	0,971	–0,074	0,086	0,124	0,008	0,072	0,240	0,041
SFS4	–0,050	0,086	0,144	0,135	–0,063	–0,111	0,878	0,025	0,149	0,119	0,049	0,398	0,194	–0,183
SFC1 (Sust. food consumption and waste)	–0,083	–0,058	0,746	0,371	–0,014	0,133	0,465	–0,110	–0,150	0,363	–0,014	–0,148	0,327	–0,328
SFC2	0,222	–0,025	0,968	0,075	0,107	0,032	0,223	–0,105	–0,002	0,179	0,082	0,122	0,284	–0,019
SFC3	0,205	–0,045	0,979	0,091	0,089	0,029	0,236	–0,097	–0,012	0,195	0,068	0,141	0,315	–0,003
SVN1 (Revised values and norms)	0,390	–0,066	0,280	0,047	0,207	0,004	0,036	–0,080	0,068	0,969	0,100	0,015	0,300	0,146
SVN2	0,360	–0,070	0,243	0,057	0,252	0,019	0,006	–0,084	0,028	0,975	0,000	0,061	0,206	0,125
SVN3	0,313	–0,184	0,097	–0,252	0,248	–0,060	–0,009	–0,024	0,252	0,857	0,159	–0,070	0,103	0,308
ST1 (Food taxes/restrictions)	–0,012	–0,036	0,138	0,119	–0,040	0,146	0,136	–0,056	–0,034	0,041	0,014	0,952	0,004	0,086
ST2	–0,067	–0,083	0,115	0,177	–0,041	0,000	0,042	–0,019	0,006	0,013	0,074	0,968	0,132	0,145
Var (%)	13.50	9.10	7.86	7.05	6.23	5.82	5.67	4.77	3.76	3.46	3.13	3.07	2.77	2.13
Var cum.	13.50	22.10	30.46	37.51	43.74	49.56	55.23	60.00	63.76	67.22	70.35	73.22	76.19	78.32

^a Rotation Method: Oblimin with Kaiser Normalization.

Table 3
Descriptive statistics and correlations between CatPCA dimensions.

Dimension	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 Values & norms	76													
2 Prod. methods	0,04	99												
3 Sust. consump.	0,15 ^a	−0,04	81											
4 Sust. Information	−0,03	−0,10	0,14	46										
5 Human int. factors	−0,26 ^a	−0,01	−0,08	−0,02	29									
6 Econ. factors	0,02	0,10	0,05	0,02	0,02	47								
7 Food shopping	0,02	0,03	0,21 ^a	0,14 ^b	−0,09	0,03	26							
8 Selling methods	0,05	0,07	−0,09	0,07	0,05	−0,06	−0,02	34						
9 Sust. conscious.	0,20 ^a	0,01	−0,06	0,08	0,08	0,01	0,09	0,09	124					
10 Rev. val & norms	0,23 ^a	−0,09	0,20 ^a	0,05	0,14 ^b	−0,01	0,03	0,07	−0,06	55				
11 Resp. oth stakeh	−0,04	0,27 ^a	0,04	0,04	0,12	0,08	0,02	0,01	0,02	0,06	87			
12 Taxes/restriction	−0,04	−0,03	0,05	0,10	−0,06	0,02	0,07	−0,01	0,02	0,01	0,04	17		
13 Consumer resp.	0,11	−0,02	0,28 ^a	0,08	−0,15 ^b	−0,03	0,16 ^b	−0,04	0,02	0,14 ^b	0,12	0,05	97	
14 Sust. education	0,05	−0,07	−0,05	0,15 ^a	−0,03	−0,04	−0,04	−0,01	0,17 ^a	−0,08	−0,03	0,11 ^b	0,04	48

Numbers on the diagonal represent the number of times (averaged across items) a particular frame was coded 1 in the analysis.

Numbers below the diagonal represent correlations among CatPCA dimensions. N = 271.

^a Significant at the 1% level.

^b Significant at the 5% level.

negative relationship with ‘sustainability information’ ($\beta = -0.24$, $p = 0.01$) and a marginal negative relationship with ‘sustainable food shopping behavior’ ($\beta = -0.16$, $p = 0.10$) for 2019, while both these relationships were non-significant for 2020 ($\beta = 0.05$, $p = 0.63$; $\beta = 0.01$, $p = 0.92$, respectively), even though ‘responsibility – other stakeholders’ was mentioned in the media to a significantly larger degree in 2020 than in 2019 (Table 3). Chi-square difference tests suggested that the difference between the pairwise coefficients was significant in both incidents ($\Delta\chi^2 = 4.21$, $\Delta df = 1$, $p = 0.04$; $\Delta\chi^2 = 3.92$, $\Delta df = 1$, $p = 0.05$, respectively).

For 2020, the results showed a positive relationship between ‘human interest factors’ and ‘sustainable selling methods’ ($\beta = 0.20$, $p = 0.03$), while this relationship was non-significant for 2019 ($\beta = -0.06$, $p = 0.55$; $\Delta\chi^2 = 3.96$, $\Delta df = 1$, $p = 0.05$). Also, the relationship between ‘human interest factors’ and ‘sustainability information’ was negative for 2019 ($\beta = -0.20$, $p = 0.04$) and non-significant for 2020 ($\beta = 0.12$, $p = 0.24$; $\Delta\chi^2 = 3.93$, $\Delta df = 1$, $p = 0.05$). Finally, the relationship between ‘consumer sustainability consciousness’ and ‘sustainable production methods’ was marginal positive for 2019 ($\beta = 0.15$, $p = 0.09$) and non-significant for 2020 ($\beta = -0.11$, $p = 0.23$; $\Delta\chi^2 = 3.91$, $\Delta df = 1$, $p = 0.05$).

Article authorship (journalist vs. reader). The frame ‘responsibility – other stakeholders’ was differently related to ‘food taxes/restrictions’ for articles written by journalists versus readers. The relationship was non-significant for ‘journalist’ ($\beta = 0.11$, $p = 0.14$) and negative for ‘reader’ ($\beta = -0.25$, $p = 0.04$; $\Delta\chi^2 = 4.61$, $\Delta df = 1$, $p = 0.03$). The results also indicated a positive relationship between ‘human interest factors’ and ‘sustainable consumption and waste’ for ‘reader’ ($\beta = 0.29$, $p = 0.02$), while this relationship was non-significant for ‘journalist’ ($\beta = -0.11$, $p = 0.14$; $\Delta\chi^2 = 5.41$, $\Delta df = 1$, $p = 0.02$).

The relationship between ‘values and social norms’ and ‘sustainable production methods’ was non-significant for ‘journalist’ ($\beta = -0.01$, $p = 0.98$) and positive for ‘reader’ ($\beta = 0.41$, $p < 0.01$; $\Delta\chi^2 = 3.94$, $\Delta df = 1$, $p = 0.05$). The relationship between ‘values and social norms’ was also non-significant for ‘journalist’ ($\beta = -0.11$, $p = 0.14$) and positive for ‘reader’ ($\beta = 0.47$, $p < 0.01$; $\Delta\chi^2 = 6.44$, $\Delta df = 1$, $p = 0.01$).

Several marginal differences between coefficients were also detected. ‘Consumer responsibility’ was positively related to ‘sustainable food consumption and waste’ ($\beta = 0.32$, $p < 0.01$) for ‘journalist’ while this relationship was non-significant for ‘reader’ ($\beta = 0.02$, $p = 0.86$; $\Delta\chi^2 = 3.61$, $\Delta df = 1$, $p = 0.06$). The results also suggested that the relationship between ‘economic factors’ and ‘sustainable food shopping behavior’ was positive for ‘reader’ ($\beta = 0.29$, $p = 0.04$) and non-significant for ‘journalist’ ($\beta = -0.09$, $p = 0.22$; $\Delta\chi^2 = 3.04$, $\Delta df = 1$, $p = 0.08$). Finally, the relationship between ‘values and social norms’ and ‘revised values and social norms’ was positive for journalist ($\beta = 0.32$, $p < 0.01$) and

non-significant for ‘reader’ ($\beta = -0.02$, $p = 0.91$; $\Delta\chi^2 = 2.98$, $\Delta df = 1$, $p = 0.08$).

5. Policy implications

In light of Rogers’ (1983) protection motivation theory, people are inspired to alter their behavior and/or those of others when confronted by hostile, albeit remediable, challenges. In line herewith, the current study established that ‘consumer responsibility’ was positively related to both ‘sustainable shopping behavior’ and ‘sustainable consumption and waste’. These results encourage food policy makers and authorities to focus on increasing consumers’ feelings of responsibility for contributing to sustainable societal developments. However, food policy makers and authorities should also be aware that simply focusing on increasing consumers’ responsibility may backfire as it may result in increased stress levels; if not accompanied by initiatives that strengthen consumers’ perceived self-efficacy (Hansen and Thomsen 2021). Such initiatives may include exposing consumers to successful task experiences, providing vicarious experiences of watching successful others and encouraging or persuading individuals that they are up to the sustainability tasks (Pajares and Schunk 2001).

We found a positive relationship between ‘consumer sustainability consciousness’ and ‘sustainable education and knowledge’; thereby encouraging food policy makers and authorities to also focus on increasing consumers’ sustainability consciousness. This is important as previous research suggests a positive link between sustainability education and knowledge and sustainable behavior (Peschel et al. 2016). Our finding is also in line with previous environmental and sustainable research suggesting a positive relationship between consumer ‘consciousness’ and demand for improved ‘education and knowledge’ (e.g., Barber et al. 2009) and also with the ‘motivation-ability’ framework, which holds the classic basic premise that consumer learning is influenced by motivational factors – for example, involvement or consciousness (Alba and Hutchinson 2000). Furthermore, the relationship between ‘consumer sustainable consciousness’ and ‘sustainable production methods’ was (marginally) positive for 2019 but non-significant for 2020. The findings align with previous research (Eshuis et al. 2014), which found that major occurrences might affect political and other dialogues between interested parties.

The relationship between ‘consumer responsibility’ and ‘sustainable consumption and waste’ was (marginally) additionally described by ‘article authorship’, given its significance only of journalist-written articles. We also found that when a third party (i.e., ‘other stakeholders’) is assigned ‘responsibility’, this could be accompanied by a call for action – for instance, the use of sustainable production methods. In addition,

Table 4
Estimated standardized coefficients.

Relationship	Model effects $\beta(\text{SE})$ <i>t</i> -Value	Moderating effects			
		Article appearance		Article authorship	
		2019 $\beta(\text{SE})$ <i>t</i> -Value	2020 $\beta(\text{SE})$ <i>t</i> -Value	Journalist $\beta(\text{SE})$ <i>t</i> -Value	Reader $\beta(\text{SE})$ <i>t</i> -Value
Cons. Resp. →	−0.05	−0.12	0.04	−0.03	−0.19
Sust. Production	(0.07)	(0.09)	(0.10)	(0.08)	(0.15)
Methods	−0.83	−1.39	0.44	−0.40	−1.30
Cons. Resp. →	−0.06	−0.01	−0.11	−0.02	−0.29
Sust. Selling	(0.07)	(0.09)	(0.09)	(0.07)	(0.15)
Methods	−0.90	−0.13	−1.24	−0.26	2.02 ^b
Cons. Resp. →	0.03	0.05	−0.01	0.09(0.07)	−0.10
Sust. Edu. and	(0.06)	(0.10)	(0.09)	1.15	(0.17)
Knowledge	0.48	0.54	−0.03	−0.69	
Cons. Resp. →	0.05	0.16	−0.01	0.12(0.07)	0.03
Sust.	(0.06)	(0.08)	(0.09)	1.60	(0.10)
Information	0.80	1.69 ^c	−0.09	0.16	
Cons. Resp. →	0.13	0.07	0.23	0.18(0.07)	0.03
Sust. Shopping	(0.06)	(0.07)	(0.08)	2.28 ^b	(0.10)
Behavior	2.05 ^b	0.70	2.50 ^b	0.16	
Cons. Resp. →	0.26	0.40	0.19	0.32(0.08)	0.02
Sust.	(0.07)	(0.09)	(0.09)	4.19 ^a	(0.14)
Consumption	4.17 ^a	4.16 ^a	2.15 ^b	0.18	
and Waste					
Cons. Resp. →	0.10	0.17	0.03	0.12(0.06)	0.17
Rev. Values and	(0.06)	(0.10)	(0.07)	1.60	(0.18)
Norms	1.65 ^c	1.92 ^c	0.34	1.14	
Cons. Resp. →	0.05	0.16	0.01	−0.02	0.26
Food Taxes/	(0.06)	(0.08)	(0.08)	(0.07)	(0.11)
Restrictions	0.76	1.70 ^c	0.14	−0.27	1.98 ^a
Resp. (other	0.29	0.35	0.24	0.28(0.08)	0.36
stakeh.) → Sust.	(0.06)	(0.10)	(0.09)	3.79 ^a	(0.11)
Prod. Methods	4.71 ^a	3.84 ^a	2.58 ^a	2.73 ^a	
Resp. (other	0.01	−0.03	−0.02	0.02(0.08)	−0.05
stakeh.) → Sust.	(0.06)	(0.10)	(0.09)	0.25	(0.11)
Selling Methods	0.23	−0.30	−0.17	−0.37	
Resp. (other	−0.02	0.03	−0.02	−0.02	−0.04
stakeh.) → Sust.	(0.06)	(0.11)	(0.08)	(0.07)	(0.13)
Edu. and Knowl.	−0.37	0.34	−0.25	−0.26	−0.31
Resp. (other	−0.01	−0.24	0.05	0.02(0.07)	−0.07
stakeh.) → Sust.	(0.06)	(0.09)	(0.09)	0.26	(0.12)
Information	−0.06	2.49 ^b	0.49	−0.47	
Resp. (other	−0.04	−0.16	0.01	−0.02	−0.18
stakeh.) → Sust.	(0.06)	(0.07)	(0.08)	(0.07)	(0.08)
Shopping Beh.	−0.09	1.66 ^c	0.10	−0.29	−1.30
Resp. (other	0.02	−0.04	0.07	0.02(0.08)	0.02
stakeh.) → Sust.	(0.06)	(0.11)	(0.09)	0.27	(0.10)
Consump. and	0.26	−0.42	0.77	0.13	
Waste					
Resp. (other	0.01	0.16	−0.01	−0.02	0.08
stakeh.) → Rev	(0.06)	(0.11)	(0.07)	(0.07)	(0.12)
Values and	0.09	1.71 ^c	−0.03	−0.23	0.60
Norms					
Resp. (other	0.02	−0.14	0.09	0.11(0.07)	−0.25
stakeh.) → Food	(0.06)	(0.09)	(0.08)	1.47	(0.08)
Taxes/Restrict.	0.30	−1.46	0.99	2.03 ^b	
Human Int.	−0.05	0.08	0.13	−0.01	−0.21
Factors → Sust.	(0.06)	(0.08)	(0.10)	(0.08)	0.03
Prod. Methods	−0.85	0.83	1.33	1.52	
Human Int.	0.07	−0.06	0.20	−0.06	0.08
Factors → Sust.	(0.06)	(0.08)	(0.10)	(0.08)	(0.11)
Selling Methods	0.98	−0.61	2.17 ^b	−0.75	0.59
Human Int.	−0.03	0.03	−0.07	−0.10	0.09
Factors → Sust.	(0.06)	(0.09)	(0.09)	(0.07)	1.22
Edu. and Knowl.	−0.44	0.25	−0.68	0.71	
Human Int.	−0.01	−0.20	0.12	−0.03	0.04
Factors → Sust.	(0.06)	(0.07)	(0.10)	(0.07)	0.37
Information	−0.20	2.10 ^b	1.17	0.27	
Human Int.	−0.02	−0.07	0.12	−0.09	0.24
Factors → Sust.	(0.05)	(0.06)	(0.09)	(0.07)	1.18
Shopping Beh.	−0.33	−0.66	1.30	1.60	
Human Int.					
Factors → Sust.					

Table 4 (continued)

Relationship	Model effects $\beta(\text{SE})$ <i>t</i> -Value	Moderating effects			
		Article appearance		Article authorship	
		2019 $\beta(\text{SE})$ <i>t</i> -Value	2020 $\beta(\text{SE})$ <i>t</i> -Value	Journalist $\beta(\text{SE})$ <i>t</i> -Value	Reader $\beta(\text{SE})$ <i>t</i> -Value
Consump. and	−0.02	−0.06	0.09	−0.11	0.29
Waste	(0.06)	(0.08)	(0.10)	(0.08)	(0.10)
	−0.24	−0.67	1.00	1.47	2.34 ^b
Human Int.	0.05	0.07	0.05	0.08(0.07)	0.01
Factors → Rev.	(0.06)	(0.09)	(0.07)	1.06	(0.13)
Values and	0.80	0.74	0.59		0.03
Norms					
Human Int.	−0.09	−0.04	−0.17	−0.11	−0.05
Factors → Food	(0.06)	(0.07)	(0.09)	(0.07)	1.46
Taxes/Restrict.	−1.31	−0.38	1.73 ^c	−0.36	
Economic Factors	0.08	0.10	0.03	0.09(0.07)	0.04
→ Sust. Prod.	(0.06)	(0.10)	(0.08)	1.33	(0.11)
Methods	1.26	1.16	0.37		0.28
Economic Factors	−0.07	−0.05	−0.10	−0.06	−0.11
→ Sust. Selling	(0.06)	(0.11)	(0.08)	(0.07)	(0.11)
Methods	−1.07	−0.47	−1.13	−0.75	−0.81
Economic Factors	−0.07	−0.07	−0.04	−0.05	−0.16
→ Sust. Edu.	(0.05)	(0.12)	(0.07)	(0.07)	(0.12)
and Knowl.	−1.05	−0.71	−0.47	−0.68	−1.23
Economic Factors	−0.03	−0.05	−0.09	−0.01	−0.18
→ Sust.	(0.06)	(0.10)	(0.07)	(0.07)	−0.11
Information	−0.51	−0.59	−0.92	0.17	−1.19
Economic Factors	−0.01	0.11	−0.10	−0.09	0.29
→ Sust.	(0.05)	(0.08)	(0.07)	(0.06)	(0.07)
Shopping Beh.	−0.05	1.12	−1.15	−1.22	2.02 ^b
Economic Factors	0.03	0.01	0.02	0.01(0.07)	0.01
→ Sust.	(0.06)	(0.11)	(0.07)	0.11	(0.10)
Consump. and	0.40	0.12	0.19		0.05
Waste					
Economic Factors	−0.02	−0.08	−0.01	−0.01	−0.08
→ Rev. Values	(0.06)	(0.12)	(0.06)	(0.06)	(0.12)
and Norms	−0.31	−0.91	−0.06	−0.12	−0.60
Economic Factors	−0.03	0.07	−0.07	−0.01	0.05
→ Food Taxes/	(0.05)	(0.09)	(0.07)	(0.07)	(0.08)
Restrict.	−0.46	0.71	−0.74	−0.18	0.37
Cons. Sust. Cons.	0.01	0.15	−0.11	−0.01	−0.05
→ Sust. Prod.	(0.07)	(0.09)	(0.09)	(0.08)	−0.13
Methods	0.17	1.72 ^c	−1.20	0.14	−0.34
Cons. Sust. Cons.	0.07	0.15	0.02	0.09(0.07)	−0.17
→ Sust. Selling	(0.06)	(0.09)	(0.09)	1.25	(0.13)
Methods	1.17	1.56	0.20		−1.19
Cons. Sust. Cons.	0.17	0.22	0.18	0.15(0.07)	0.21
→ Sust. Edu.	(0.06)	(0.10)	(0.08)	1.93 ^c	(0.15)
and Knowl.	2.68 ^a	2.19 ^b	2.94 ^b	1.45	
Cons. Sust. Cons.	0.09	0.01	0.11	0.04(0.07)	0.20
→ Sust.	(0.06)	(0.09)	(0.09)	0.59	(0.14)
Information	1.45	0.08	1.20		1.24
Cons. Sust. Cons.	0.09	−0.04	0.12	0.06(0.07)	0.12
→ Sust.	(0.06)	(0.07)	(0.08)	0.78	(0.09)
Shopping Beh.	1.34	−0.42	1.41		0.76
Cons. Sust. Cons.	−0.10	−0.14	−0.07	−0.10	−0.16
→ Sust.	(0.07)	(0.10)	(0.09)	(0.08)	(0.12)
Consump. and	1.58	−1.55	−0.76	−1.38	−1.16
Waste					
Cons. Sust. Cons.	−0.01	−0.01	−0.06	−0.04	0.20
→ Rev. Values	(0.06)	(0.11)	(0.07)	(0.06)	(0.15)
and Norms	−0.07	−0.04	−0.66	−0.55	1.33
Cons. Sust. Cons.	0.03	−0.10	0.08	0.04(0.07)	−0.01
→ Food Taxes/	(0.06)	(0.08)	(0.08)	0.48	(0.09)
Restrict.	0.40	−1.01	0.88		−0.03
Values and Norms	0.08	−0.09	0.13	−0.01	0.41
→ Sust. Prod.	(0.07)	(0.09)	(0.09)	(0.08)	(0.13)
Methods	1.31	−0.89	1.42	−0.03	2.77 ^a
Values and Norms	0.01	−0.11	0.02	−0.11	0.47
→ Sust. Selling	(0.07)	(0.10)	(0.09)	(0.08)	(0.13)
Methods	0.11	−1.03	0.20	−1.48	3.19 ^a
Values and Norms	0.02	−0.09	0.11	−0.04	0.12
→ Sust. Edu.	(0.06)	(0.11)	(0.08)	(0.07)	(0.15)
and Knowl.	0.26	−0.86	1.19	−0.47	0.83

(continued on next page)

Table 4 (continued)

Relationship	Model effects β (SE) t-Value	Moderating effects			
		Article appearance		Article authorship	
		2019	2020	Journalist	Reader
Values and Norms	−0.03	0.06	−0.09	−0.05	−0.03
→ Sust.	(0.06)	(0.09)	(0.09)	(0.07)	(0.14)
Information	−0.49	0.61	−0.91	−0.62	−0.17
Values and Norms	0.04	0.09	0.01	0.05(0.07)	0.05
→ Sust.	(0.06)	(0.07)	(0.08)	0.29	(0.09)
Shopping Beh.	0.58	0.88	0.02		0.31
Values and Norms	0.18	0.18	0.19	0.22(0.08)	0.10
→ Sust.	(0.07)	(0.10)	(0.09)	2.83 ^a	(0.12)
Consump.	2.71 ^a	1.86 ^c	2.10 ^b		0.74
Waste					
Values and Norms	0.22	0.23	0.29	0.32(0.07)	−0.02
→ Rev. Values	(0.06)	(0.11)	(0.07)	3.94 ^a	(0.15)
Norms	3.39 ^a	2.40 ^b	3.31 ^a		−0.12
Values and Norms	−0.03	0.06	−0.09	−0.02	−0.06
→ Food Taxes/	(0.06)	(0.09)	(0.08)	(0.07)	(0.09)
Restric.	−0.51	0.61	−0.98	−0.25	−0.42

Coefficients in bold are statistically different ($p < 0.05$), coefficients in italics are marginal statistically different ($p < 0.10$); only differences in which at least one coefficient was significant (or marginal significant) were inspected. Sample size n. groups: 2019 = 126, 2020 = 142; journalist = 195, reader = 73. N = 268; in the SEM analysis three articles were detected as outliers based on Mahalanobis distance (D) (Kline, 2010) and removed from further data analysis.

^a Significant at the 1% level.

^b Significant at the 5% level.

^c Marginal significant at the 10% level.

while the relationship between ‘responsibility – other stakeholders’ and ‘sustainable information’ was negative for 2019, there was no significance for the 2020 relationship. Similarly, the relationship between ‘responsibility – other stakeholders’ and ‘sustainable food shopping behavior’ was (marginally) negative for 2019 and non-significant for 2020. Ultimately, the results indicate that during the COVID-19 crisis ‘other stakeholders’ are at least no longer ‘excused’ from engaging in societal issues such as sustainable information and shopping behavior. This result brings new arguments to food policy makers seeking to convince food companies that it is in their interest to develop sustainable business practices; as they may otherwise not be in line with public opinion.

Moreover, the results suggest that food policy makers should distinguish between public opinion as reflected in journalist-written vs. reader-written articles. Specifically, readers-written articles are more likely to call for ‘hard’ action (such as ‘sustainable production methods’ and ‘sustainable selling methods’) based on ‘values and norms’ as compared to those written by journalists. One of the possible reasons for these results may lie in the idea that journalists regard themselves as the ‘fourth power’ and as a ‘societal authority’, which may lead them to avoid implications that ultimately could reduce economic growth or market well-functioning. Instead, the results indicate that journalists (vs. readers) are more in favor of implications that relate more to ‘soft’ actions, such as ‘revision of values and social norms’.

Pace et al. (2014) and Pandve et al. (2011) argue that individuals who are personally or emotionally invested are more concerned with the immediate environment and work to shield them from apparent external threats. In line with this suggestion, we found that ‘values and norms’ were positively related to both ‘sustainable consumption and waste’ and ‘revised values and norms’. This notion is also reflected in our findings when the relationship-moderating implications of ‘article appearance’ and ‘article authorship’, respectively, are taken into account. When food sustainability is framed from a personal and emotional perspective (i.e., ‘human interest factors’), the preferred implication during COVID-19 is ‘sustainable selling methods’ while this effect was non-significant for

2019. In addition, the relationship between ‘human interest factors’ and ‘sustainability information’ was negative for 2019 but non-significant during COVID-19. Furthermore, the relationship present between ‘human interest factors’ and ‘sustainable consumption and waste’ was positive for articles written by readers and non-significant for those written by journalists. These results bring opportunities for food policy makers and authorities to promote possible connections between consumer values and human interest factors and food sustainability issues. First, during the COVID-19 crisis food policy makers may focus on supporting food companies who wish to revise their selling methods from being mostly product-centered towards approaches that allow for sustainable selling methods, such as sustainable packaging, investments in technological developments that facilitate package free products or stores, among others. Second, it may be stressed that improved selling methods are beneficial to consumers as they better allow for purchasing food products without experiencing feelings of guilt or shamefulness. Third, food policy makers and companies may seek to take advantage of the findings that consumers during the COVID-19 crisis have become less reluctant to sustainability information. This is especially relevant since many consumers may hesitate from receiving sustainability information because they believe that such information is not relevant to them (e.g., Reisch et al. 2021). In that sense, the COVID-19 crisis seems to offer a window of opportunities for carrying out information campaigns concerning food sustainability issues.

6. Limitations and future research

Like other studies, this research encountered several challenges and limitations, whose identification could guide future research into this topic. First, while the quantitative approach employed in this research enhanced the identification and quantification of important relationships, it did not incorporate the qualitative aspects of the variables affecting these relationships. Consequently, the incorporation of a mixed methodology approach – quantitative and qualitative – could improve the effectiveness of the analysis and provide greater insight into framing, particularly in regard to food sustainability issues, and help to further refine the background data. Besides, the integration of a qualitative approach to data collection and analysis might better inform the reasoning for the observed trends in this data, culminating in a why- or how-approach to interpretation.

Second, this research only centered on written forms of communication – newspapers, in particular. This focus excluded a variety of other forms of communication, including social media, digital outlets, and televised media, which may be similarly relevant for the framing and implication of issues pertaining to food sustainability. As such, expanding into these news outlets would provide a wider database and even increase the accuracy and conclusiveness of the results.

Third, this research sought to evaluate the potential implications of the COVID-19 pandemic. Though it is unfeasible to rule out the influence of other occurrences on the framing of food sustainability issues, it is evident that no other events received as much attention as the pandemic in 2020. Besides, the likelihood that variations in the results emanate from inconsistencies in measurements between samples is eliminated by the utilization of identical coding items in both the analyzed periods (i. e., 2019 vs. 2020). Finally, this research focused its analysis on news articles sourced from a single society/culture. Although the studied framing contents and implications apply to most cultures, this may impact the generalizability of results across cultures (Sebri and Zaccour 2017).

7. Conclusion

Consumer food sustainability studies often use interviews, surveys or experiments to identify and classify sustainability issues. The present study differs from these studies in that we are (a) looking at consumer food sustainability through the eyes of the media and (b) introducing a

rather new method of quantitative content analysis to the consumer food sustainability literature. The quantitative content analysis of the relationships between frame contents and their implications contributes to the understanding of how public opinion regarding consumer food sustainability develops. Based on their framing contents, issues pertaining to food sustainability may have varied effects on the public. In this light, the insights provided by this research are of importance to food policy makers and authorities, largely due to the unintended responses that communications of food sustainability might elicit among the public if they are based on deleterious framing contents. The food sustainability literature has proposed relationships between consumer sustainability responsibility, competences, dispositional barriers and sustainable food consumption and shopping, among others. In that respect, this research contributes to the food policy and consumer sustainability literature by suggesting that external 'shocks', or moderators, from other domains should be taking into account when modeling and theorizing about relationships between consumer food sustainability issues, antecedents and consequences.

CRedit authorship contribution statement

Torben Hansen: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Validation, Visualization, Writing – original draft, 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.

Appendix

Frame contents

- Consumer responsibility
 - o RC1. Does the story suggest that consumers have the ability to alleviate identified issues/problems?
 - o RC2. Does the story suggest that consumers are responsible for identified issues/problems?
 - o RC3. Does the story suggest an issue that requires urgent action by consumer?
- Responsibility – other stakeholders
 - o RMA1. Does the story suggest that some level of government, food producers, retailers, or others, have the ability to alleviate identified issues/problems?
 - o RMA2. Does the story suggest that some level of the government, food producers, retailers, or others, is responsible for identified issues/problems?
 - o RMA3. Does the story suggest that an individual (or group of people in society) is responsible for identified issues/problems?
 - o RMA4. Does the story suggest an issue that requires urgent action by government, food producers, or others?
- Human interest factors
 - o HI1. Does the story provide a human example or 'human face' on sustainability issues?
 - o HI2. Does the story employ adjectives or personal vignettes that generate feelings of guilt, sadness, fear, empathy/caring, sympathy, or compassion?
 - o HI3. Does the story emphasize how individuals and groups are affected by sustainability issues/problems?
 - o HI4. Does the story go into the private or personal lives of the actors?
- Economic factors

- o ECON1. Is there a mention of financial losses now or in the future?
- o ECON2. Is there a mention of the degree of prosperity involved?
- o ECON3. Is there a reference to economic consequences of sustainability issues?
- Consumer sustainability consciousness
 - o CSC1. Is there a mention of consumer sustainability motivation?
 - o CSC2. Is there a mention of consumer sustainability knowledge?
 - o CSC3. Does the story make reference to consumer sustainability expectations or demand?
- Values and social norms
 - o VSN1. Does the story discuss values relating to sustainability issues?
 - o VSN2. Does the story discuss social norms relating to sustainability issues?
 - o VSN3. Does the story provide an example of values or social norms relating to sustainability issues?
 - o VSN4. Does the story offer specific social prescriptions about how to behave in a sustainable way?

Frame implications

- Sustainable production methods
 - o SPM1. Does the story suggest that raw materials should be sustainable?
 - o SPM2. Does the story suggest that climate-friendly production methods should be used?
 - o SPM3. Does the story suggest that food producers should reduce their waste?
- Sustainable selling methods
 - o SSM1. Does the story suggest that food suppliers (producers/retailers) should reduce their food waste?
 - o SSM2. Does the story suggest that food supplies (producers/retailers) should increase their focus on sustainable brands/products?
 - o SSM3. Does the story suggest that food suppliers (producers/retailers) should increase their focus on sustainable packaging?
- Sustainability education and knowledge
 - o SEK1. Does the story suggest that there is a need for educating consumers about sustainability issues?
 - o SEK2. Does the story suggest that consumers' understanding of sustainability issues needs to be improved?
- Sustainability information
 - o SI1. Does the story suggest that more sustainability information is needed?
 - o SI2. Does the story suggest an increased use of environmental food labels?
- Sustainable food shopping behavior
 - o SFS1. Does the story suggest that consumers' should shop for food locally?
 - o SFS2. Does the story suggest that consumers should shop for food items that are in season?
 - o SFS3. Does the story suggest that consumers should plan ahead/use shopping lists?
 - o SFS4. Does the story suggest that consumers should weigh sustainability at the expense of lower price?
- Sustainable food consumption and waste
 - o SFC1. Does the story suggest that consumers should reduce their food waste?
 - o SFC2. Does the story suggest that consumers should reduce their meat consumption?
 - o SFC3. Does the story suggest that consumers should increase their consumption of vegetarian food?
- Revised consumer values and norms
 - o SVN1. Does the story suggest that consumer values should be changed/revised?

- o SVN2. Does the story suggest that consumer social norms should be changed/revised?
- o SVN3. Does the story suggest that 'sustainability shaming' should be stopped/reduced?
- Food taxes/restrictions
 - o ST1. Does the story suggest that taxes should be imposed on 'non-sustainable' food items?
 - o ST2. Does the story suggest that food rationing/restrictions should be imposed on 'non-sustainable' food items?

Moderators

- M1. Article appearance: before (i.e., 2019) vs. March – December 2020
- M2. Journalist vs. reader written article

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