Food Research International 150 (2021) 110752

Contents lists available at ScienceDirect

Food Research International

journal homepage: www.elsevier.com/locate/foodres

No lockdown in the kitchen: How the COVID-19 pandemic has affected food-related behaviours

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ARTICLE INFO

Keywords:
Consumer behaviour
Food choice
COVID-19
Habit disruption

ABSTRACT

The COVID-19 pandemic and especially the lockdowns coming with it have been a disruptive event also for food consumption. In order to study the impact of the pandemic on eating habits, self-reported changes in food-related behaviours were investigated in ten European countries by means of an online survey. A latent class cluster analysis distinguished five clusters and showed that different types of consumers can be distinguished based on how they react to the pandemic as regards their eating habits. While food-related behaviours were resilient for 60% of the sample, another 35% reported more enjoyment in cooking and eating, more time in the kitchen and more family meals. Among those, a slight majority also showed signs of more mindful eating, as indicated by more deliberate choices and increased consumption of healthy food, whereas a slight minority reported more consumption of indulgence food. Only 5% indicated less involvement with food. As the COVID-19 pandemic is a disruptive event, some of these changes may have habit-breaking properties and open up new opportunities and challenges for food policy and food industry.

1. Introduction

In 2020 the COVID-19 pandemic caused by a new type of virus affected the entire world's functioning, bringing about far-reaching changes affecting virtually every aspect of life, including food-related behaviours (Eftimov, Popovski, Petkovic, Seljak & Kocev, 2020). In an effort to limit the spread of the coronavirus, most countries introduced restrictions that have affected how people buy and consume food. Restaurants and venues have been closed, and many companies and institutions have switched from working in the office to working from home. Many people who used to eat out have had to start preparing meals at home or order ready-made food. It also became necessary to adjust eating times to fit own job requirements and children's schooling on an online system. Restrictions on movement and on the number of people who can be in stores at one time have changed shopping habits, such as buying food less frequently but in larger quantities (Davis, Downs & Gephart, 2021; Wang, Xu, Schwartz, Gosh & Chen, 2021).

Changes in consumer behaviour may be caused not only by external restrictions, but also by the perception of the pandemic situation (Kozlowski, Veldkamp & Venkateswaran, 2020; Moran et al., 2020). Reductions in the frequency of shopping or visiting restaurants are dictated not only by lockdown restrictions, but also by the fear of contagion (Goolsbee & Syverson, 2020). Concern about one's own health also contributes to some people trying to change their diet to

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https://doi.org/10.1016/j.foodres.2021.110752
Received 26 April 2021; Received in revised form 9 September 2021; Accepted 9 October 2021
Available online 13 October 2021

increase immunity by consuming more fruits, vegetables, or dietary supplements (Hamulka, Jeruszka-Bielak, Gornicka, Drywien & Zielinska-Pukos, 2020; Laguna, Fiszman, Puerta, Chaya & Tarrega, 2020; Murphy et al., 2021). On the other hand, the demands of sitting at home, limiting real-life interactions with other people, or struggling to maintain an income, can all promote a reduction in self-control and the occurrence or intensification of dysfunctional eating habits (increased alcohol or fast-food consumption, overeating, etc.; Huber, Steffen & Schlichtinger, 2020; Di et al., 2020).

Some changes in food-related behaviours during the pandemic may appear suddenly and fade quickly. In the beginning of the pandemic, considerable uncertainty about its implications was pervasive. With regard to food, people were uncertain about the security of the food supply, and this led to sudden but short-term panic buying and stockpiling behaviour (Barrett, 2020; Lehberger, Kleih & Sparke, 2021; Loxton et al., 2020). However, some behaviours can change more permanently, creating a new situation for policy makers wanting to promote healthy and sustainable diets and placing food companies in a situation where they will need to adapt to the new reality. Moreover, different consumers may change their behaviour in various ways in the face of a pandemic. This may be related to external conditions (e.g., different country restrictions), demographic variables (e.g., gender), or psychological characteristics (e.g., different emotions in the pandemic situation).

A number of studies have looked at how food-related consumer behaviour has changed during the pandemic, including some multi-country studies, although they are mostly based on convenience samples (De Backer et al., 2021; Molina-Montes et al., 2021; Murphy et al., 2021). They indicate that while for many consumers food-related behaviours have been unchanged, others have changed, and these changes can go into different directions, either towards more or less healthy and sustainable food choices. This suggests that there are different types of consumers reacting to the pandemic in different ways. In addition, these studies have also provided first evidence that the degree of changes is related to the severity of pandemic-induced measures and the way these have affected both objective and subjective well-being (De Backer et al., 2021; Janssen et al., 2021; Molina-Montes et al., 2021).

Our study extends this work by identifying consumer clusters that are distinguished by changes in self-reported behaviours along the meal provisioning chain. In other words, we cover all aspects of providing meals in the home. While the fact that it was not possible to eat out during the lockdown was most likely a major driver of changes in-home meal provisioning, we do not address changes in eating out to the extent that this remained possible during the pandemic.

We also investigated several groups of factors (demographics, emotional reactions to the pandemic, food-related goals) that may explain the likelihood of belonging to each cluster. Finally, we explored how consumption of various food products has changed in each of the clusters. The study was conducted in September 2020, i.e. after the first lockdown and before the onset of further lockdowns, in 10 European countries based on samples with quotas for age and gender.

2. Literature review and conceptual development

Many food-related behaviours are based on habits, and habits thrive in stable environments (Verplanken & Aarts, 1999). The COVID-19 pandemic is a disruptive event that has changed the environments in which food-related behaviours take place, affecting conditions for shopping, choice of sites and occasions to eat, preparation of meals in the home, and how and with whom to eat. Some people had more time for meal provisioning at home, others had less, for example because they had to entertain their children who otherwise would be at school. A number of studies have looked at changes in food-related behaviours during the pandemic, although none of them has explicitly invoked a habit change framework. Several studies have concluded that there has been a high degree of stability and resilience in consumers' food-related behaviours throughout the pandemic (Chenarides, Grebitus, Lusk & Printezis, 2020; Ellison et al., 2021; Janssen et al., 2021; Poelman, McFadden, Rickard & Wilson, 2021), whereas others have found changes, at least for some consumers. De Backer et al. (2021), in a study with data from 38 countries, found an increase in selecting and preparing healthy food, and Molina-Montes et al. (2021), in a study carried out in 16 European countries, found an increased adherence to the Mediterranean Diet, which is commonly used as an indicator of healthy eating. However, Robinson et al. (2021), in a UK study, found changes towards less healthy eating, and both Janssen et al. (2021) and Murphy et al. (2021), both based on multi-country data, found changes in both directions. Marty, Lauzun-Guillain, Labess and Nicklaus (2021), in a French study, found higher saliency of health-related food choice motives, but nevertheless a decline in adherence to French dietary guidelines, and also found changes in opposite directions.

The above results suggest that consumer reactions to the pandemic have been diverse, and also raise the question whether both the occurrence and the direction of changes are related to external factors, most notably the severity of the impact of the pandemic. Some evidence already points in that direction. De Backer et al. (2021) showed that changes towards selecting and preparing healthier foods were related to stay-at-home policies, and Molina-Montes et al. (2021) found a relationship between the increased adherence to the Mediterranean Diet and the stringency response index from the Oxford COVID-19 government response tracker (Hale et al., 2021), which combines data on the application of measures related to stay-at-home policies and restrictions at work places, in schools, for public gatherings, and in travelling. Other studies found changes to be linked to people's concerns about the pandemic, risk perception, negative affect and anxiousness (Chenarides et al., 2020; Janssen et al., 2021; McAtamney, Mantzios, Egan & Wallis, 2021; Robinson et al., 2021). We extend these studies by defining a range of change variables covering the whole meal provisioning chain, and defining both a range of potential factors facilitating or inhibiting change. Most importantly, we want to distinguish different groups of consumers depending on the degree and direction of change.

We interpret 'food-related behaviours' in a broad sense, covering all steps of the meal provisioning chain, i.e., shopping, choosing products, meal preparation, eating and waste handling. Also, we view the term 'behaviour' broadly and from the viewpoint of consumers, focussing on behaviour changes as perceived by consumers themselves.

In addition to the changes themselves, we look at four groups of factors that may be related to the extent and type of changes (see Fig. 1). First, demographics as age, gender and education are known to be related to food-related behaviours (Lusk, 2017). In addition, country can have an impact on food-related behaviour, not only because of differences in food culture, but also because of differences in the extent to which the COVID-19 pandemic has affected different countries and in the way the authorities and the health system have handled it, as documented in the Oxford COVID-19 government response tracker (Hale et al., 2021). Second, at the household level, there are differences in the extent to which the COVID-19 pandemic has resulted in more general effects on people's lives, and we look both at objective changes (loss of income, changes in number of children at home) and negative emotional reactions. Third, people are known to differ in their food-related goals and resources (Dean, Grunert, Raats, Nielsen & Lumbers, 2008), and this may affect both their possibilities to change food-related behaviours and the perceived desirability or undesirability of such changes. Finally, we believe that changes in food-related behaviours may be linked to trust in food chain actors. The lack of trust in food chain actors may lead to perceptions of food insecurity and therefore encourage behaviours like stockpiling, while a high level of trust may reduce the likelihood that people changed their behaviours to mitigate the crisis. In a similar way, high levels of general social trust may imply confidence in the way society can cope with the pandemic and lead to less changes, whereas low levels of general social trust may induce people to make more efforts to cope with the crisis (Macready et al.,

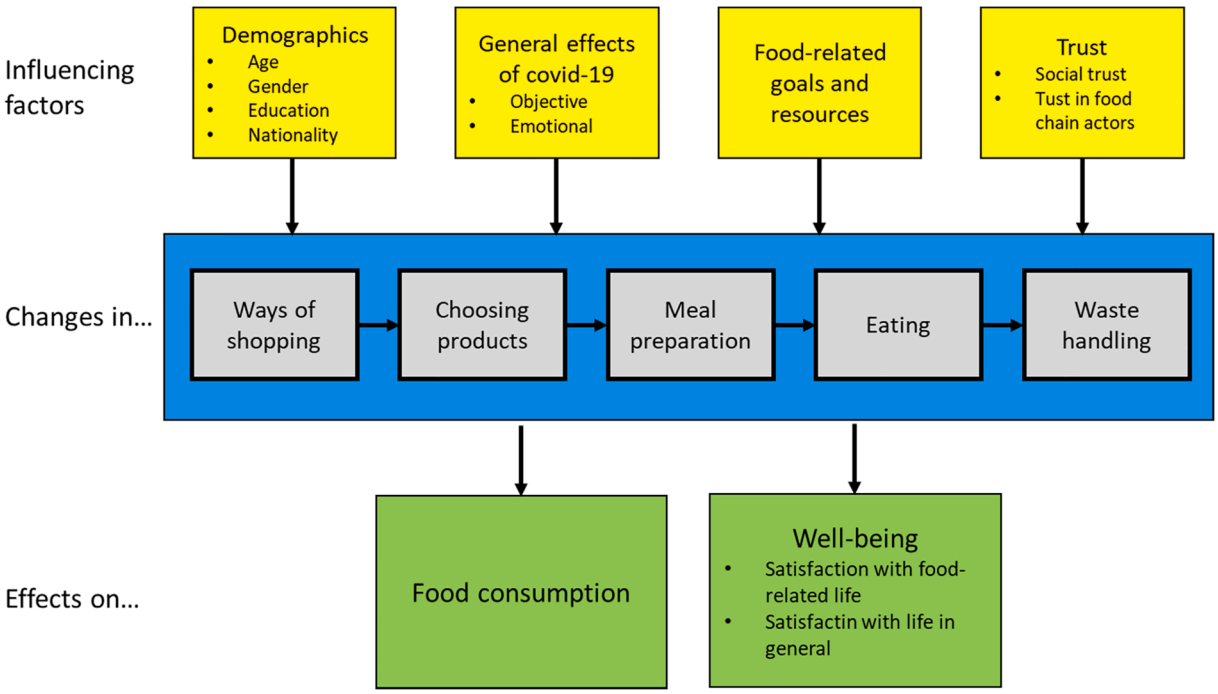

Fig. 1. Conceptual model on changes in food-related behaviours, their determinants and effects.

2020).

We also look at two types of possible outcomes of those changes. Naturally, the changes can be expected to be related to the type of food that is consumed, as manifested in the consumption of different types of food products. In addition, changes in food-related behaviours can be expected to be related to consumers' satisfaction with their food-related life, and, as food is an essential part of everyone's life, their overall life satisfaction (Diener, Emmons, Larsen & Griffin, 1985; Grunert, Dean, Raats, Nielsen & Lumbers, 2007). Our overall conceptual model can be seen in Fig. 1.

3. Methods

3.1. Choice of countries

The study was carried out in ten countries: Finland, France, Germany, Greece, Italy, Poland, Romania, Spain, Sweden and UK. The countries were selected to have good geographical spread within Europe and to have diversity in terms of both food culture and how strongly they have been affected by measures mitigating the COVID-19 pandemic. Spread in terms of food culture is evidenced by the fact that 7 of our 10 countries map into 7 different food clusters in the analysis of food cultures by Askegaard and Madsen (1998; their analysis did not include the 3 remaining countries). In order to map differences in the extent to which countries were affected by the COVID-19 pandemic, we draw on

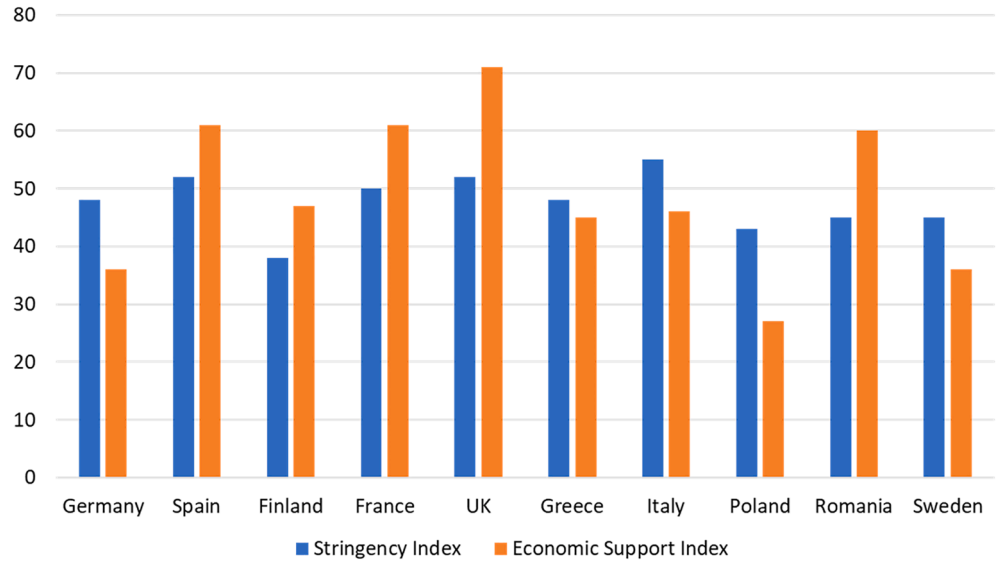

Fig. 2. COVID-19 response in the 10 countries. Based on data from the Oxford COVID-19 Government Response Tracker. Index values are averaged over the period from the beginning of 2020 until the end of the data collection. For details on how the indices are computed see Hale et al. (2021).

the Oxford COVID-19 government response tracker (Hale et al., 2021) and more specifically on those two indices that are most likely to map factors that have an impact on consumer behaviour: The stringency index and the economic support index. The stringency index measures the severity of restrictions concerning access to work and school, limitations in socializing, mobility and public gatherings, and stay-at-home orders. The economic support index measures government help in terms of income, tax relief and debt relief (for details see Hale et al., 2021). Fig. 2 shows the mean of these two indices for the 10 countries in the study across the whole time period from January 2020 until the end of the data collection period.

3.2. Data collection

The questionnaire was developed in English and translated into the other nine languages. The translations were checked by native speakers of our research group before data collection. The questionnaire was pretested before the actual field work and no problems with the measures were encountered. It was then programmed and data collected using Compusense Cloud software (Compusense Inc. Guelph, Canada). Data collection was conducted in 10 European countries (Spain, Sweden, Germany, UK, Poland, Italy, France, Greece, Finland, Romania). The main data collection period was September 17–25, 2020. Consumers were recruited via Cint, which is a service platform for consumer panels used in market research (www.cint.com). The target was to reach 500 consumers in each country (N = 5000 total). It is difficult to do power analysis for multilevel latent class analyses (Park & Yu, 2018), but our sample size is in line with similar applications of multilevel latent class analysis in consumer behaviour (e.g., Thøgersen, 2017).

Eligibility criteria for the online survey were: Adults, 18 + years old and responsible/co-responsible for grocery shopping. In each country equal quotas were set for gender and for the age groups 18–40, 41–60 and 61–100. The total number of completed responses in each country varied between 543 and 580 and the final total sample size was 5618. The average response time to complete the survey was 28.5 min (median 22 min). The Aarhus University Committee on Research Ethics approved the study protocol and all participants agreed to an informed consent statement in the beginning of the questionnaire. The demographic profile of the sample can be seen in Table 1.

3.3. Measures

Perceived changes in food-related behaviours along the meal provisioning chain were measured using 24 items selected from the modular food-related lifestyle instrument (Brunsø et al., 2021). Each item is a statement about a particular activity in one of the steps in the meal provisioning chain, and the items can be seen in Fig. 4. For the purposes of this study, which is interested in change, respondents were asked to indicate to which extent they have been performing this particular behaviour more or less during the COVID-19 pandemic using a 7-point scale with labels 1-much less than before, 4-unchanged, 7-much more than before.

Trust in food chain actors was measured using four single-item measures of trust in farmers, food manufacturers, retailers and authorities, adapted from Macready et al. (2020), to be answered on a 7-point scale anchored 1-I trust them much less than before and 7-I trust them much more than before. Social trust was measured using 3 items from Gefen and Straub (2004).

Food-related goals and resources were measured using the items from Dean et al. (2008). These measure the importance of 11 food-related goals (e.g., 'eat a healthy diet', 'choose food products and dishes that you enjoy eating' on a scale from 1-low importance to 7-high importance) and perceived possession of 12 food-related resources (formulated as statements indicating possession of the resource, for example 'I have good cooking skills' or 'I have access to food at reasonable prices'), to be rated on a 7-point scale (1-totally disagree and 7-totally agree).

Emotional reactions to the COVID-19 pandemic were measured by 7 items on a 7-point frequency scale (never/very rarely/rarely/sometimes/frequently/very frequently/all the time): feeling hopeless, feeling restless or fidgety, feeling that everything requires more effort, feeling worthless, feeling nervous, feeling so depressed that nothing can cheer me up, feeling of struggling financially. The first six items are from the K6 scale of psychological distress (Kessler et al., 2002), the last item was added for this study. In addition, respondents were asked how worried they were to get COVID-19 (one item, 7-point scale 1-very little, 7-very strong).

Demographics were ascertained by standard measures for gender, age, education, country of residence and nationality. In addition, respondents were asked whether they had a (partial) loss of income due to the COVID-19 pandemic and whether the number of children under 18 living in the household had changed. Respondents were also asked how many lockdown episodes they had been living under.

Food consumption changes were measured using 21 items each corresponding to a different food group that can be seen in .Fig. 7 Respondents had to reply on a 5-point scale with labels 1-significant decrease in consumption, 3-no change in consumption, 5-significant increase in consumption, supplemented by the options 'not sure' and 'not applicable'.

Satisfaction with food-related life was measured using the 5-item scale developed by Grunert Dean, Raats, Nielsen and Lumbers (2007). Overall satisfaction with life was measured using the 5-item scale from

Table 1
Socio-demographic composition of the sample (%).

		Spain N = 552	Sweden N = 581	Germany N = 548	UK N = 578	Poland N = 550	Italy N = 544	France N = 568	Greece N = 553	Finland N = 581	Romania N = 563	Total N = 5618
Gender	Female	49.8	51.1	50.7	52.1	49.5	50.6	51.2	50.5	50.4	50.4	50.6
	Male	50.2	48.9	49.3	47.8	50.5	49.4	48.6	49.5	49.4	49.4	49.3
Age	*Mean age in years*	*48.5*	*50.4*	*49.9*	*49.9*	*47.9*	*47.4*	*49.8*	*46.1*	*49.4*	*47.0*	*48.6*
	18–40 years of age	33.3	33.6	32.3	32.4	34.4	37.1	32.9	38.3	32.4	35.2	34.2
	41–60 years of age	37.1	33.2	35.9	34.6	35.6	36.6	34.2	38.2	32.9	35.2	35.3
	61–100 years of age	29.5	33.3	31.8	33.0	30.0	26.3	32.9	23.5	34.8	29.7	30.5
Education	Primary school	1.6	11.7	8.2	0.7	2.0	1.8	25	1.1	7.2	0.2	3.7
	Secondary school	19.7	39.4	27.6	31.3	41.3	19.5	32.4	22.4	45.3	7.1	28.7
	Higher education (not university)	27.2	17.6	34.3	27.3	10.5	40.1	27.8	18.6	24.1	29.0	25.6
	University (first degree, Bachelor's degree)	32.4	21.9	16.4	31.0	14.0	17.3	25.4	36.5	8.4	44.8	24.8
	University (higher degree, Master's degree, PhD)	19.0	9.5	13.5	9.7	32.2	21.3	12.0	21.4	15.0	19.0	17.1
Reponsibility for food shopping	All or most of it	79.5	73.8	74.6	83.6	76.5	81.4	79.0	79.9	73.1	76.7	77.8
	Part of it	20.5	26.2	25.4	16.4	23.5	18.6	21.9	20.1	26.9	23.3	22.2

Diener, Emmons, Larsen and Griffin (1985).

3.4. Analysis

Items measuring perceived changes along the meal provisioning chain were recoded into three categories, less/no change/more, for subsequent analysis.

Measures with multi-item scales (social trust, emotional reactions to the COVID-19 pandemic, satisfaction with food-related life, satisfaction with life) were transformed into mean scores. Cronbach's alpha was computed for these scales both for the overall sample and per country; all values were >0.85.

The four items measuring trust in the four food chain actors were transformed to a formative index of overall trust by summing them up. Likewise, items measuring possession of food-related resources were transformed into a formative index of overall command of food-related resources by summing them up.

A multilevel latent class analysis was performed on the 24 recoded items measuring perceived changes in food related behaviours along the meal provisioning chain. Latent class analysis estimates respondents' probability of belonging to one of a set of latent classes that are defined by similar patterns of responses to the variables forming the basis for the clustering. Multi-level latent class clustering is used when respondents differ, not only in terms of their individual responses to the items forming the basis for the clustering, but are additionally grouped into units that are expected to have an impact on their pattern of responses (Vermunt, 2003, 2008). Here, where respondents come from 10 different countries, country of residence is used as the second level of units.

Latent class solutions were estimated for 1 to 7 clusters of respondents and for 1 to 3 groups of countries. Selection of the cluster solution is normally based on a combination of a fit criterion, most commonly the Bayesian Information Criterion (BIC), and interpretability of the cluster solution (Vermunt & Magdison, 2002). As a rule of thumb the model with the lowest BIC should be selected, however, with large samples (like here), BIC has a tendency to continue declining as the number of clusters increases (Paas, 2014), and this happened also here. In this case, a cluster solution is chosen when the decrease of BIC when increasing the number of clusters is marginal. Here, a 5 cluster solution was chosen, which seemed the best compromise between fit and interpretability, as further increases in the number of clusters resulted in decreases of BIC of <1%. In addition, for each cluster solution, the fit was investigated for 1 to 3 groups of countries. In all cases, the fit was best for 2 country groups. Thus, the final solution chosen involved 5 groups of respondents and 2 groups of countries.

A multinomial logit model was used to profile the identified clusters. The biggest cluster (*resilient*) was used as base level. The model assesses which factors affect the likelihood to belong to another cluster relative to the baseline cluster. As explanatory variables, the model includes demographics, lockdown conditions and psychographic characteristics. Socio-demographic variables included age, gender, country of residence, level of education and number of household members below 18. Variables on lockdown conditions included respondents' worry to get COVID-19, number of times in lockdown, income loss suffered due to COVID-19, an aggregated measure for the emotional reactions due to COVID-19 and an aggregated measure on food related resources. The psychographic variables included trust in actors, social trust, food related goals and food related resources.

Multinomial logit models were also used to analyse the impact of cluster membership on whether consumption of the different food categories had increased, decreased or stayed the same. Differences between the clusters in terms of satisfaction with life and with food-related life were analysed by ANOVA with Scheffe's test for posthoc contrasts.

The latent class clustering analysis was done in LatentGold 6.0 (Statistical Innovations, Arlington, MA). All other analyses were done either in SPSS 27 (IBM) or in STATA (StataCorp, College Station, TX).

4. Results

4.1. Clusters of change

We analysed differences in self-reported changes in food-related behaviours by means of multi-level latent class analysis, opting for a solution with 5 clusters of consumers and two groups of countries. Results are visualized in Fig. 3 and the size of the clusters and the share of respondents in each cluster reporting to do more or less of the various types of behaviours can be seen in Fig. 4.

Cluster 1, *resilient,* is the biggest one, accounting for 60% of the sample. Its main characteristic is that the people in this cluster report few changes in their food-related behaviours due to COVID-19. The remaining clusters, 40% of the sample, report changes in their food-related behaviours due to the pandemic. Cluster 2*, more mindful eating*, Cluster 3, *more convenient enjoyment* and Cluster 4, *more food involvement*, altogether 35% of the sample, all report enjoying more time in the kitchen, experimenting more when cooking and having more meals together. All three clusters also report being more aware of prices and use-by-dates, packaging, and the presence of additives and preservatives in the food, although these changes are smaller in cluster 3 than in the other clusters. Cluster 2, *more mindful eating* (17% of the sample)*,* in addition reports making less unplanned purchases, making more product comparisons, and using less frozen foods, less ready-to-eat foods, and less snacks. Cluster 3, *more convenient enjoyment* (12% of the sample)*,* has an opposite tendency; they report using more frozen food, more indulgence by treats and delicacies, more ready-to-eat meals and more snacking. Respondents in Cluster 4 (6% of the sample), *more food involvement,* report engaging more in most of the behaviours assessed. In addition, there is Cluster 5, *less food involvement,* accounting 5% of the sample, the only one in which food involvement decreased and which reports doing less of most of the behaviours assessed.

The country grouping variable results in two groups of countries, a North-Western group consisting of Finland, France, Germany, Sweden and the UK, and a South-Eastern group consisting of Greece, Italy, Poland, Romania and Spain. The main difference is that cluster 1 had the highest share of respondents in the North-Western group, significantly different from all other clusters but cluster 5. Cluster 2 had the lowest share of respondents in the North-Western group, significantly different from all other clusters except cluster 4 (pairwise comparisons with a Scheffe correction for multiple comparisons, $p < .05$). Thus, there have been more changes in food-related consumer behaviour in the South-Eastern than in the North-Western countries, as illustrated in Fig. 5.

Fig. 6 shows the development in the stringency index and the economic support index from the Oxford COVID-19 government response tracker for the period from January 2020 until the end of the data collection in September for the two country groups. The data clearly show that in the critical period during the first lockdown, the South-Eastern group of countries had more severe restriction measures in place and less economic support than the countries in the North-Western group.

4.2. Cluster profiling

In the following, all change clusters are profiled in comparison to the *resilient* cluster (Cluster 1). The results described are based on a multinomial logit regression analysis which can be seen in Table 2. In the following, differences between clusters are reported only when they are significant at the 0.05 level or less.

All *more enjoyment* clusters report having more trust in food chain actors (farmers, processors, retailers, authorities) than consumers in the *resilient* cluster, while the *less food involvement cluster* reported less trust in those actors.

Respondents in the *more mindful eating* cluster (Cluster 2) were more likely to be male and more likely to be from the South-Eastern group of countries compared to Cluster 1. They were more worried to be infected

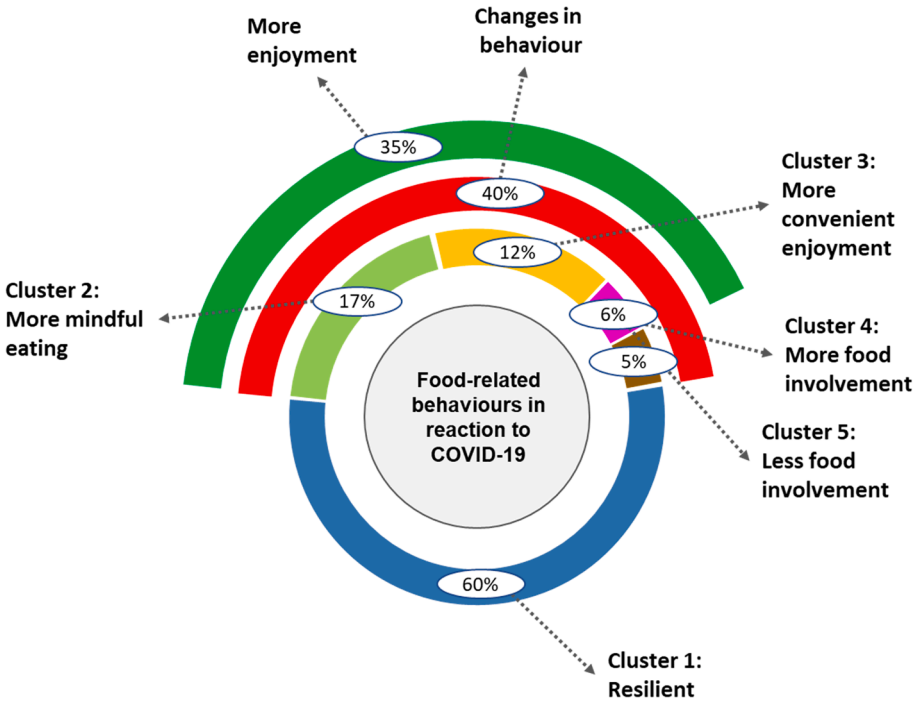

Fig. 3. Clusters of change.

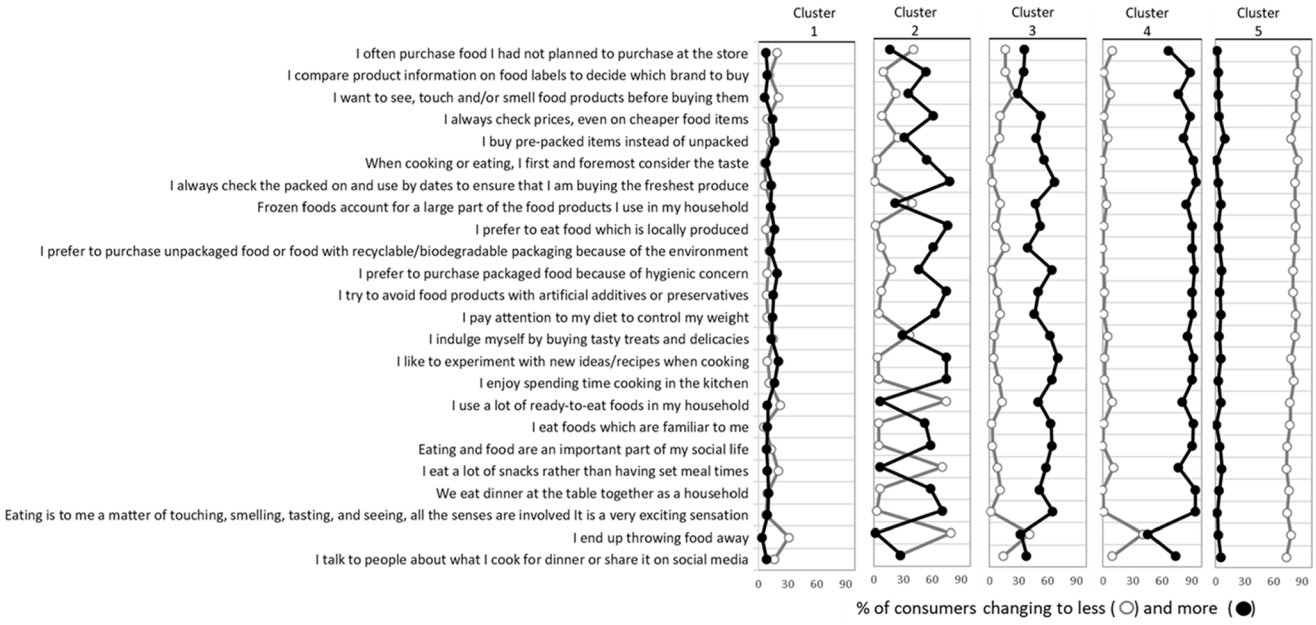

Fig. 4. Share of respondents increasing or decreasing behaviours in the clusters.

with the COVID-19 virus, were more likely to suffer from income loss due to the pandemic and experienced more negative emotions since the pandemic. In terms of their food related goals, they have a higher focus on healthy eating, varying menus, weight management and attach less importance to lowering food expenditures. Maintaining food related traditions, cooking for other people and having time to cook are important for these respondents.

Respondents in the *more convenient enjoyment* cluster (Cluster 3) were more likely to be younger, male and from Greece and Poland compared to Cluster 1. Like the *more mindful eating* cluster they are more worried to be infected by COVID-19, have a higher probability to have lost income and have more negative feelings since the pandemic. On top of that, they went more often in lockdown and had more children under 18 in their household during these lockdowns. They have more access to food-related resources and were characterized by the more pleasurable food related goals: a stronger focus on enjoyment of food, eating in nice surroundings and food products and dishes that are quick and easy to prepare.

The *more food involvement* cluster (Cluster 4) was more likely to include younger males and to come from countries in SouthEastern Europe than Cluster 1. They were more worried to be infected and have experienced more negative emotions during the pandemic, even though they were not more likely to have lost income. People in this cluster also went more in lockdown and had more children below 18 at home during

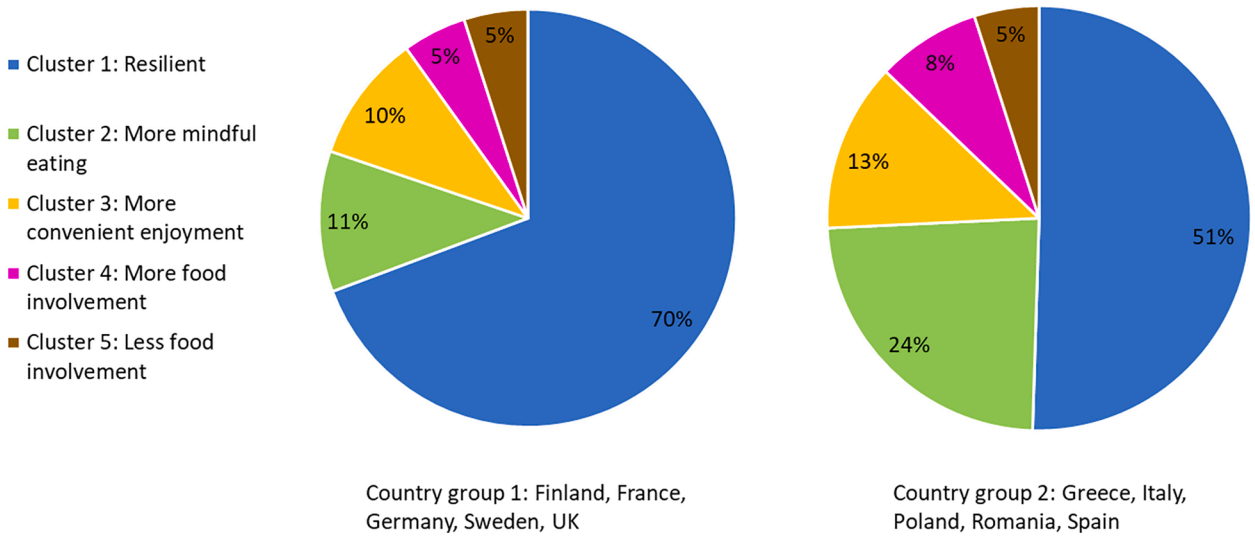

Fig. 5. Country groups.

the lockdown. They have more access to food-related resources and attach more importance to maintaining food traditions, to cooking for others and choosing quick and ready meals.

The *less food involvement* cluster (Cluster 5) is also characterized by younger people who are more likely to be based in Poland, Greece, Finland and Romania. They form a group of lower educated respondents that went more often in lockdown and were more likely to have suffered income loss than Cluster 1. Furthermore, their trust in food chain actors was lower. Choosing food products to enjoy is relatively less important to this group.

Table 3 provides additional information on how the clusters differ with regard to how the COVID-19 pandemic has affected respondents' job situation. It can be seen that respondents in the *resilient* cluster were lease likely to have experienced changes in their work-situation because of the pandemic.

4.3. Effects on food consumption

In the whole sample, the demand for inexpensive food increased and the demand for expensive food decreased. Moreover, the demand for private label branded products increased (Fig. 7). Also, online buying and use of takeaway food increased. Overall, the consumption of food items had either increased or stayed more or less the same. The biggest increases were reported in the consumption of fruits, vegetables and legumes, nuts and flours. At the same time, increases in consumption of chocolate and sweets as well as in crisps and snacks were also reported. Among the animal-based foods, biggest increases were reported in the consumption of dairy products and poultry.

As above, differences between the clusters will be described by looking at how the change clusters differ from the *resilient* cluster. Again, only differences significant at the 0.05 level of less will be reported.

In the *more mindful eating* cluster, there was a higher reported consumption of fruits, vegetables, nuts, dairy products and poultry, and a lower consumption of red meat and alcohol compared to the *resilient* cluster. In the *more convenient enjoyment* cluster, consumption of fruits, and vegetables and of dairy products likewise increased together with foods that are often used as treats, such as crisps and snacks, whereas the consumption of alcohol, fish and berries decreased, compared to the *resilient* cluster. The *more food involvement* cluster reported increased consumption of fruits, nuts and dairy products compared to the *resilient* cluster. The *less food involvement* clusters did not differ significantly in its reported consumption changes from the *resilient* cluster.

4.4. Effects on well-being

ANOVAs were carried out to evaluate to what extent these different responses in food behaviour were reflected in consumers' well-being (Table 4). When considering people's food-related life, only the *less food involvement cluster* reported lower levels of satisfaction than the *resilient* reference. Compared to the *resilient* cluster, all other clusters reported higher levels of satisfaction in an upward trend from *more convenient enjoyment* over *more mindful eating* to the *more food involvement cluster,* where the highest level of well-being was observed. In terms of general life satisfaction, the *more food involvement* cluster reported higher levels of life satisfaction than the other clusters.

5. Discussion and conclusion

5.1. Theoretical implications

The results revealed that despite the pandemic and lock down restrictions, the majority of consumers (60%) engaged in similar food-related behaviours to what they normally do, which is in line with previous results on food-related behaviours during the pandemic (Chenarides et al., 2020; Ellison et al., 2021; Janssen et al., 2021; Marty et al., 2021; Poelman et al., 2021). This confirms that for most consumers, food-related behaviours are habitual and enduring. On the other hand, the finding that 40% did report changes shows that for many consumers the pandemic has been a catalyst for behavioural change. Our results also show that the severity with which the pandemic has affected people, both in terms of objective factors, like loss of income, and in terms of emotional stress, is related to the likelihood of behaviour change. This is in line with other studies showing that negative affect due to the pandemic is associated with a higher likelihood of change (McAtamney et al., 2021; Robinson et al., 2021).

Except for a small group of respondents located mostly in South-Eastern Europe and heavily affected by the pandemic in terms of lockdown and loss of income, most respondents reported changes in the direction of enjoying more time in the kitchen, experimenting more in cooking and having more family meals. Apart from that, the direction of changes differed with the largest subgroup generally engaging in more healthy and mindful behaviours, and a smaller subgroup engaging in more indulgence. By distinguishing different clusters of consumers, we have been able to provide more structure to the diverse findings on different directions of change during the pandemic that have been observed in other studies (Janssen et al., 2021; Marty et al., 2021; Murphy et al., 2020).

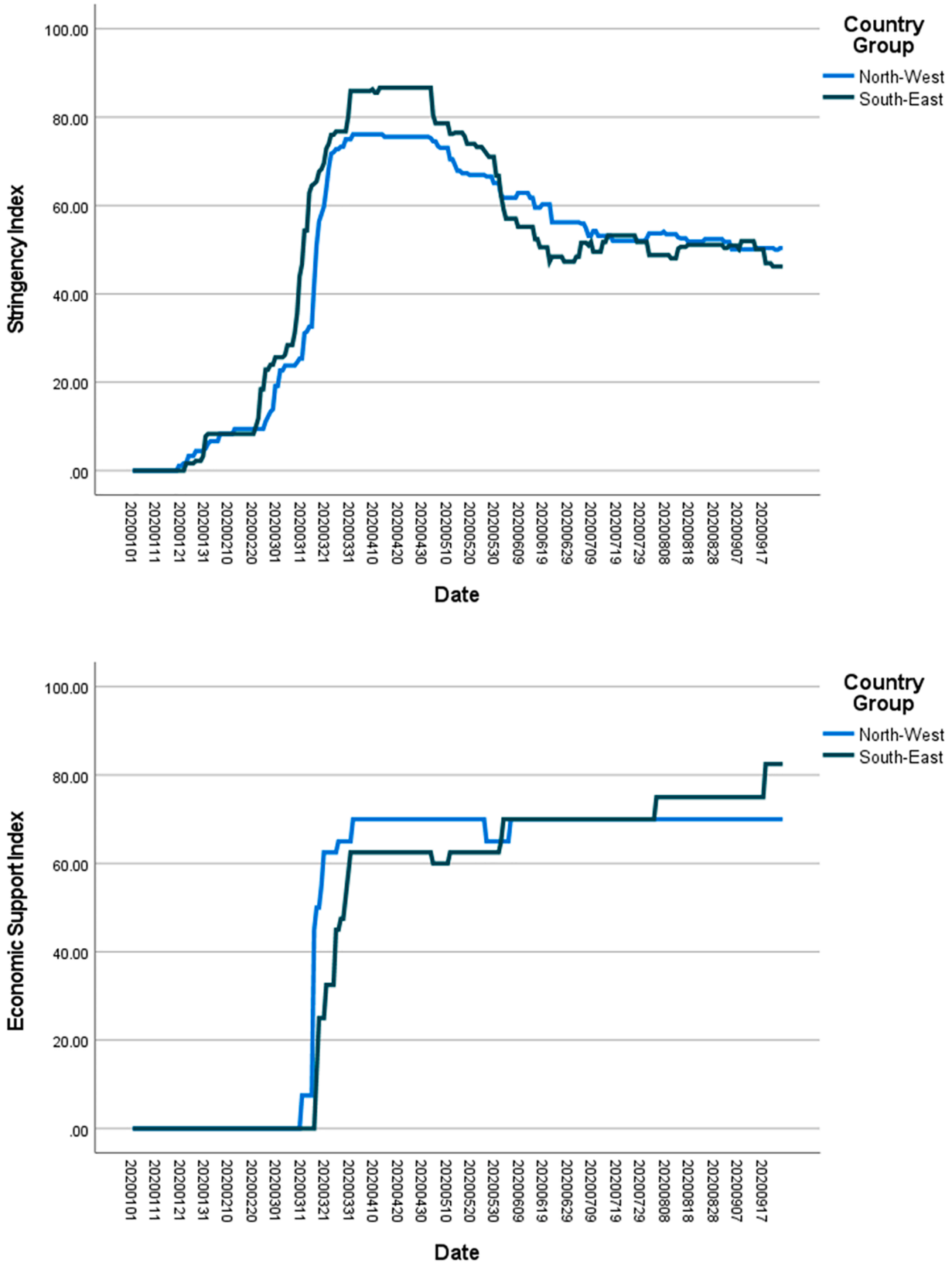

Fig. 6. Development in government response to COVID-19 crisis in the two country groups. Based on data from the Oxford COVID-19 Government Response Tracker. Index values are averaged over the period from the beginning of 2020 until the end of the data collection. For details on how the indices are computed see Hale et al. (2021).

Table 2
Multinomial logit regression explaining cluster membership by demographics, country, COVID-19 impact and food-related goals and resources. Cluster 1 is reference group, i.e., all coefficients indicate deviations from cluster 1 – resilient. Figures in bold indicate significant effects, $p < .05$.

		Cluster 2: More mindful eating (17%)			Cluster 3: More convenient enjoyment (11%)			Cluster 4: More food involvement (6%)			Cluster 5: Less food involvement (5%)		
		Coef	Std. Err.	p	Coef	Std. Err.	p	Coef	Std. Err.	p	Coef	Std. Err.	p
Demographics	**Age**	0.001	0.003	0.750	−0.026	0.003	**0.000**	−0.033	0.005	**0.000**	−0.016	0.005	**0.001**
	Gender: female	−0.254	0.083	**0.002**	−0.302	0.093	**0.001**	−0.414	0.141	**0.003**	+0.018	0.138	0.898
	Education (Ref Primary school)												
	Secondary school	0.040	0.265	0.880	−0.331	0.277	0.232	−0.690	0.396	0.082	−0.395	0.298	0.185
	Higher education (not university)	0.165	0.267	0.537	−0.213	0.280	0.447	−0.747	0.403	0.064	−0.724	0.314	**0.021**
	Bachelor (University)	0.333	0.269	0.215	−0.112	0.282	0.691	−0.496	0.404	0.219	−0.893	0.326	**0.006**
	Master (University)	0.249	0.273	0.362	−0.101	0.288	0.725	−0.538	0.410	0.190	−0.893	0.340	**0.009**
Country	**Country (Ref Spain)**												
	Sweden	−1.090	0.201	**0.000**	−0.323	0.223	0.148	−0.856	0.327	**0.009**	0.698	0.372	0.061
	Germany	−0.688	0.181	**0.000**	−0.323	0.225	0.152	−0.718	0.351	**0.041**	0.056	0.420	0.894
	UK	−0.845	0.189	**0.000**	0.267	0.200	0.182	−0.037	0.267	0.889	0.066	0.420	0.875
	Poland	0.386	0.167	**0.021**	0.410	0.212	0.054	−0.048	0.296	0.872	0.860	0.377	**0.023**
	Italy	0.006	0.165	0.969	−0.141	0.216	0.513	0.103	0.256	0.688	0.605	0.385	0.116
	France	−0.832	0.178	**0.000**	0.034	0.205	0.868	−0.347	0.272	0.202	0.376	0.387	0.332
	Greece	0.129	0.167	0.442	0.419	0.202	**0.038**	0.021	0.276	0.940	0.905	0.377	**0.017**
	Finland	−0.817	0.195	**0.000**	0.062	0.214	0.771	−1.248	0.367	**0.001**	1.075	0.369	**0.004**
	Romania	−0.082	0.166	0.621	0.316	0.200	0.114	−0.473	0.291	0.104	1.089	0.374	**0.004**
COVID-19 impact	**Worried to get COVID**	0.065	0.026	**0.014**	0.076	0.030	**0.011**	0.208	0.048	**0.000**	0.068	0.045	0.134
	Times in lockdown	0.085	0.048	0.078	0.137	0.053	**0.010**	0.171	0.076	**0.025**	0.124	0.071	**0.082**
	Income loss due to COVID	0.337	0.089	**0.000**	0.198	0.098	**0.044**	0.085	0.147	0.561	0.315	0.147	**0.032**
	Household members < 18	0.033	0.045	0.467	0.112	0.043	**0.009**	0.288	0.056	**0.000**	−0.012	0.062	0.845
	Negative emotions since COVID	0.180	0.040	**0.000**	0.293	0.046	**0.000**	0.437	0.069	**0.000**	0.052	0.068	0.438
Trust	**Trust in actors**	0.306	0.043	**0.000**	0.457	0.051	**0.000**	0.932	0.075	**0.000**	−0.665	0.070	**0.000**
	Social trust	−0.030	0.030	0.323	−0.017	0.035	0.637	0.186	0.054	**0.001**	0.086	0.056	0.122
Food-related goals and resources	**Total food related resources**	0.010	0.006	0.058	0.012	0.006	**0.047**	0.039	0.010	**0.000**	−0.004	0.009	0.625
	Food related goals												
	Choose food to enjoy	0.048	0.046	0.297	0.104	0.049	**0.033**	−0.063	0.080	0.435	−0.241	0.060	**0.000**
	Eat healthy	0.316	0.046	**0.000**	−0.056	0.046	0.226	0.028	0.078	0.715	−0.079	0.066	0.229
	Vary menu	0.117	0.049	**0.017**	0.000	0.050	0.998	−0.027	0.084	0.750	−0.046	0.070	0.512
	Eat in nice surroundings	0.006	0.045	0.897	0.100	0.049	**0.041**	−0.098	0.081	0.225	0.058	0.068	0.392
	Low expenditures	−0.058	0.027	**0.035**	−0.033	0.033	0.322	0.083	0.054	0.125	−0.072	0.050	0.149
	Maintain food traditions	0.109	0.030	**0.000**	0.061	0.035	0.079	0.195	0.062	**0.002**	0.046	0.051	0.367
	Manage weight	0.086	0.034	**0.010**	0.022	0.038	0.570	0.110	0.067	0.101	0.069	0.057	0.221
	Be able to cook for others	0.115	0.033	**0.000**	0.038	0.037	0.308	0.169	0.065	**0.010**	0.035	0.054	0.517
	Quick and easy products	−0.217	0.031	**0.000**	0.078	0.039	**0.047**	0.174	0.068	**0.010**	−0.040	0.056	0.474
	Have time to cook meals	0.086	0.041	**0.037**	0.026	0.045	0.564	−0.062	0.078	0.424	−0.049	0.063	0.439
	Constant	−7.631	0.501	0.000	−6.593	0.539	0.000	−13.370	0.780	0.000	1.549	0.701	0.027

Table 3
How COVID-19 affected work and income in the 5 clusters (%).

	Cluster 1: Resilient (60%)	Cluster 2: More mindful eating (17%)	Cluster 3: More convenient enjoyment (11%)	Cluster 4: More food involvement (6%)	Cluster 5: Less food involvement (5%)
Underwent changes in work/study situation since COVID 19	25.3	30.4	37.0	43.4	39.9
Had to work part- or full-time from home since COVID 19	31.7	37.6	45.1	64.3	44.8
Suffered income loss since COVID 19	28.1	40.4	41.8	47.3	42.5
Continued working but no longer full time since COVID 19	5.2	6.1	8.1	7.1	3.7
Did not work since COVID 19 *but did before*	3.2	4.4	3.5	1.2	3.4
Did not work since COVID 19	6.2	8.2	7.1	6.5	8.2

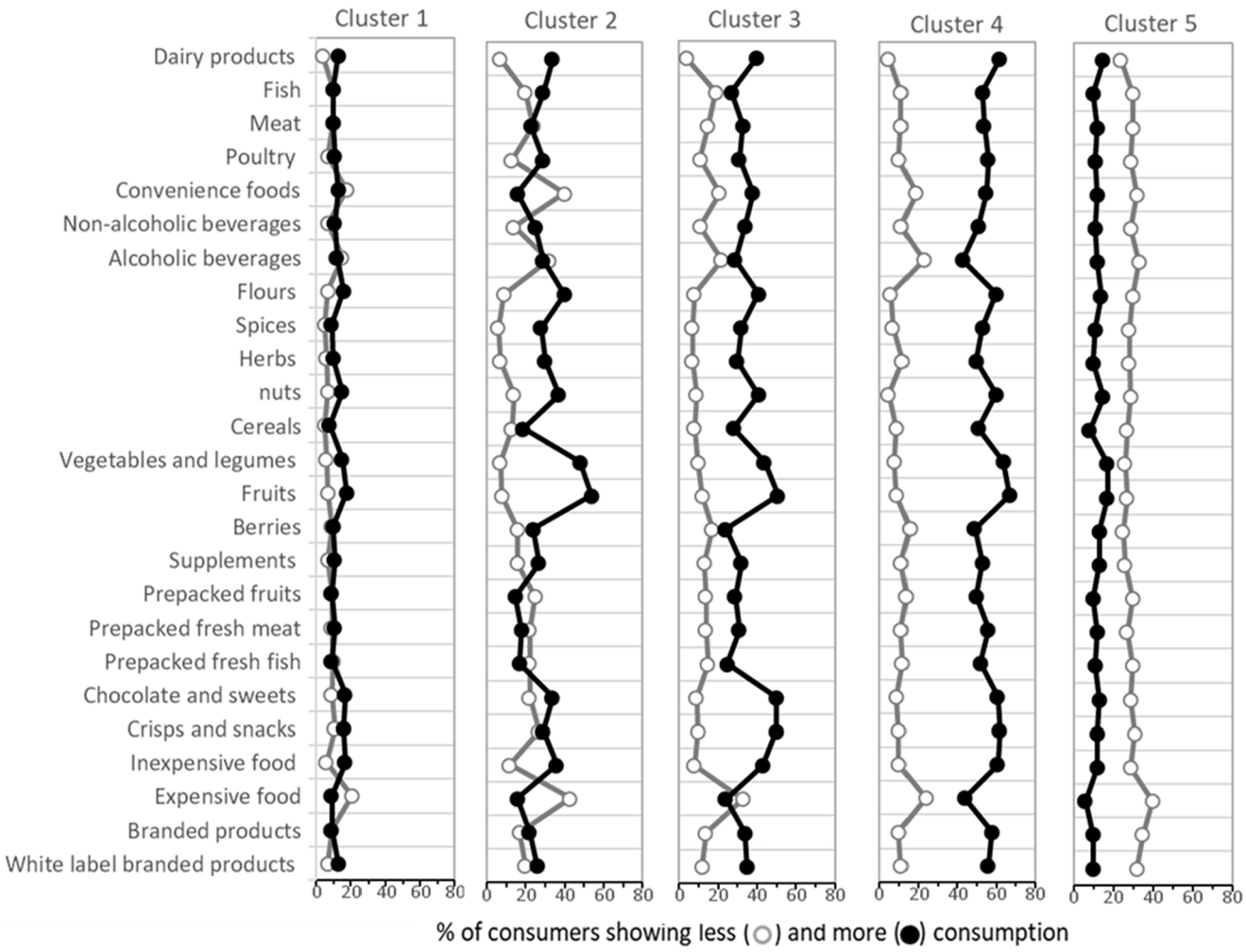

Fig. 7. Decrease and increase in self-reported consumption of foods in the five clusters.

Table 4
Average satisfaction with food-related life satisfaction and satisfaction with life per cluster. Cluster means without superscript in common are significantly different (Scheffe test, $p < 0.05$).

	Cluster 1: Resilient (60%)	Cluster 2: More mindful eating (17%)	Cluster 3: More convenient enjoyment (11%)	Cluster 4: More food involvement (6%)	Cluster 5: Less food involvement (5%)
Satisfaction with food-related life	4.78 (1.19)[a]	5.26 (1.05)[b]	5.04 (1.06)[c]	5.68 (0.87)[d]	4.47 (1.44)[e]
Satisfaction with life	4.17 (1.39)[a]	4.36 (1.38)[a]	4.37 (1.36)[a]	5.33 (1.16)[b]	4.16 (1.53)[a]

We found that the extent and direction of change differs between countries. This may be related to differences in how countries were affected by the pandemic, how they dealt with it, and general cultural differences. For example, evening meals cooked at home are the default in Northern and Central Europe, where eating out in the evening is more linked to special occasions (Lund, Kjærnes & Holm, 2017), whereas eating out is much more common in Southern Europe. North Europeans may therefore have found it easier to adapt to lockdown restrictions of eating out compared to South Europeans.

People's food-related behaviours are governed by their food-related goals and their access to food-related resources (Dean et al., 2008). The change clusters differed in their goal priorities and access to resources. For example, goal priorities of consumers in the *more mindful eating* cluster were linked to health, diversity of food, weight management, cooking for others and spending time cooking. This congruence of pre-pandemic goals and behavioural changes shows that the direction of changes induced by the pandemic was influenced by the more enduring food-related goals that people already had. The fact that this cluster reacted to the pandemic by eating more healthily (more fruits, vegetables, legumes, nuts and poultry and less red meat and alcohol) compared to the *resilient* cluster also supports that the food-related goals affected the direction of change. Likewise, the changes reported by the *more convenient enjoyment* cluster are in line with the goals prioritized more by this cluster, namely food enjoyment and eating in a nice atmosphere. Overall the results therefore support the notion that the disruption caused by the pandemic may have helped some people to align their behaviour better with their food-related goals. The mechanisms governing such an alignment are an interesting topic for further research, not least because the occurrence of such an alignment may also be linked to people's coping strategies in a stressful and disruptive situation (Coulthard, Sharps, Cunliffe & van den Tol, 2021).

5.2. Implications for public policy

Among those people who indicated changes in behaviour, a majority claims changes beneficial in terms of sustainable and health-promoting food behaviours. For example, they favour more local production, choose more often unpacked or recyclable/biodegradable packed foods, and pay attention to their weight. From the public policy perspective, this might provide an opportunity to accelerate the on-going transition towards a more sustainable and health-promoting food system. The disruption caused by the pandemic forced them to break their food consumption routines, and to translate some of the already existing food related goals into actual behaviours. This is also in line with other studies reporting reductions in food waste during the pandemic (Rodgers et al., 2021; Vidal-Mones, Barco, Diaz-Ruiz & Fernandez-Zamado, 2021). Understanding the mechanisms that allow people to break habits and realign their behaviour with their goals could help further such behavioural changes. Even in situations where environmental changes are less disruptive than they have been during the pandemic such insights could provide a good basis for the development of evidence-based behavioural change strategies (Ammermann, Lindquist, Lohr & Hersey, 2002).

Less beneficial changes in consumer behaviour, which call for scrutiny from the public policy perspectives, also emerged. The study results showed that many consumers have lost income and favoured less expensive food products than before the COVID-19. In case the loss of income is prolonged after the acute pandemic situation, the tendency to consume inexpensive foods could lead to negative health-related consequences in the future.

Among the identified consumer groups, the cluster *more mindful eating* seems to change their food behaviour in directions aligned with the green transition (EC, 2020) of the food sector, like more consumption of fruits and vegetables, lower consumption of red meat and more attention to packaging. A deeper understanding of the *more mindful eating* cluster's coping strategies and adaptation patterns during the pandemic might provide building blocks in the development of strategies to prepare for future disruptive events.

5.3. Implications for industry

The results obtained revealed three main changes in food consumption behaviour with implications for the agri-food sector.

The overall increases observed for both inexpensive and branded products and the differences among consumer clusters indicate a polarization of the market into premium and discount products. This trend creates growth opportunities for food industries producing unbranded products and retailers with discount or everyday-low-price strategies. Furthermore, price is expected to have an important role in food purchasing decisions due to the economic recession experienced in most countries as a result of COVID-19 restrictions. However, there are also growth opportunities for those producing and selling premium food products for those consumers that are now more willing to put extra money on tasty treats and delicacies.

A sizable share of consumers reported to be more concerned about healthiness and sustainability of food products than before the pandemic. Although this was an already existing trend in recent years, the COVID-19 lockdown seems to have served as an accelerator of this trend. This is an opportunity but also a challenge for the food industry, which needs to move to more sustainable systems of production and distribution of healthy foods (Bisoffi et al., 2021). Consumers are paying more attention to these aspects of food that make them feel doing something good for themselves, the environment, or the society. They also look for products from companies or producers who are committed to sustainability and consider social impact of their activities.

Finally, during the COVID-19 lockdown people report significant rises in shopping online and ordering take-away food (Cavallo, Sacchi & Carfora, 2020; Chenarides et al., 2020). Shopping groceries online for home delivery can be seen as a way of decreasing risks of infection by avoiding contact with other people when shopping. Ordering take-away food can be both a way of alleviating the burden of home-cooking and an alternative to eating out, which was not possible during the lockdown. The increasing relevance of these new channels of distribution is an opportunity for small suppliers and producers to bring their products to the market, as the development of e-commerce platforms will allow their products to be visible for an increasing number of consumers that search for and buy food products online.

5.4. Limitations

The findings of this study are based on self-reported measures that are vulnerable to biases of under-reporting undesirable behaviours and over-reporting those that are socially desirable. Furthermore, behaviour change was measured as the perceived change of increasing or decreasing behaviours in relation to before the COVID-19 pandemic restrictions. Thus, the change lacks a baseline and does not tell about the degree of change in any objective terms. This was, however, a conscious choice of method in order to explore perceived changes in food-related behaviour. Because we have cross-country data with multi-cultural food habits, absolute changes may reflect different levels of experienced change. Although our results suggest that reported relative changes have an impact on the nutritional quality of the diet and thereby healthy eating, we cannot estimate the size of these changes. Instead, we can reflect on how perceived changes may promote learning of new food-related routines and how they are associated to aspects of life quality and well-being.

Data were collected during late summer and early fall when many participating countries were in a period between first and second wave of COVID-19 with still some of the restrictions in force, but not lockdown conditions as in the spring of 2020. However, the conditions in the ten target countries differed in what restrictions and lockdown conditions had been imposed during spring and what restrictions were still in force at the time of the survey. These may have influenced responses and contributed to some of the perceived country-wise differences.

Our data provide insights into how consumers perceived changes in their food-related behaviours at a particular point in time when people were well-acquainted with the pandemic and its implications. The data do not allow us to make predictions about the extent to which these changes will persist after the pandemic is over. Still, there is room for informed speculation. Our results show that many of the changes observed are in line with food-related goals that people had already pre-pandemic, meaning that during the pandemic people changed some of their behaviours in a way which aligns them better with their goals. As argued above, we believe that this is in line with an interpretation of the pandemic as a disruptive event that facilitates the change of established habits, which may have run counter to people's own goals. Such changes of behaviour therefore are likely to persist also after the pandemic.

5.5. Future studies

Future research could focus on three areas. The first one is to repeat the study one year after the first study, more than 1.5 years after the beginning of the pandemic. This could provide information on the extent to which the changes in food behaviour observed in the study described above continue and are permanent, or whether they were merely a short-term consumer response to a new situation. Additionally, such a study could provide information on whether new behaviours have emerged due to, for example, adaptive processes resulting from a prolonged pandemic.

A second area of investigation could be research that deepens the individual motives underlying changes in eating behaviour. In this case, it would be worthwhile to conduct a series of qualitative studies (e.g., in-depth individual interviews or ethnographic research) to go beyond the consumers' declarations and self-report measures and gain a deeper

understanding of the processes observed in the quantitative study. Such studies should also try to achieve a better understanding of why people use different coping strategies in a situation like the COVID-19 pandemic. This could include aspects of family dynamics, notably family composition and changes in children present during the day, not least in households where parents were essential workers and hence not at home.

Finally, it would be worthwhile to compare the results of this study with insights from other parts of the world. While Europe is diverse both in terms of food-related behaviours and ways of handling the pandemic, there is considerably more spread in terms of food culture and food-related behaviours in different regions of the world, which would be interesting to analyse from a COVID-19 handling perspective.

5.6. Conclusion

While 60% of respondents reported no major changes in their food-related behaviours due to the COVID-19 pandemic, the remaining 40% did acknowledge changes in their food-related behaviours in our ten-country study. Changes were more frequently observed in the South-Eastern than in North-Western parts of Europe. For most of those who reported changes, the changes resulted in more enjoyment with food, and most changes were in line with the food-related goals that respondents had pre-pandemic. This suggests that the disruptions caused by the pandemic have facilitated for some consumers to change behavior in a way such that the behavior is more aligned with their goals. There was a higher likelihood for change when people were more affected by the pandemic, and changes towards more food-based enjoyment were found even for respondents that suffered loss of income and experienced negative emotions due to the pandemic.

CRediT authorship contribution statement

Klaus G. Grunert: Conceptualization, Methodology, Writing – original draft, Supervision. **Michiel De Bauw:** Conceptualization, Methodology, Writing – original draft. **Moira Dean:** Conceptualization, Methodology, Writing – original draft. **Liisa Lähteenmäki:** Conceptualization, Methodology, Writing – original draft. **Dominika Maison:** Conceptualization, Methodology, Writing – original draft. **Kyösti Pennanen:** Conceptualization, Methodology, Writing – original draft. **Mari A. Sandell:** Conceptualization, Methodology, Writing – original draft. **Katarzyna Stasiuk:** Conceptualization, Methodology, Writing – original draft. **Lisa Stickel:** Conceptualization, Methodology, Writing – original draft. **Amparo Tarrega:** Conceptualization, Methodology, Writing – original draft. **Annukka Vainio:** Conceptualization, Methodology, Writing – original draft. **Liesbet Vranken:** Conceptualization, Methodology, Writing – original draft.

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.

Acknowledgements

This project has received funding from EIT Food, the European Knowledge and Innovation Community (KIC) on Food, under KAVA 20423.

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