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Empirical testing of consumers' perceptions of differences in package and product version of seemingly identical branded food products

Results of an online experiment in ten European countries

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Abstract

Differences in composition of seemingly identically branded food products, also known as dual food quality, occur when a good is marketed as identical (i.e. under the same brand and with the same or similar package), but its composition differs substantially across Member States. In this context, what makes consumers perceive goods as identical based on their presentation and, in particular, front-of-pack design remains an open question. The present study addresses this knowledge gap by collecting data on consumers' perceptions of the front-of-pack designs of seemingly identical branded food products. The purpose is to understand how variation in the front-of-pack of a seemingly identical branded food product affects consumers' ability to perceive packages as different, whether this translates in believing that products are different, and their ability to take informed transactional decisions. The study uses primary data collected through an online survey to provide insights on two fronts. First, it gives information about whether, and under what circumstances, the front-of-pack presentation allows consumers to identify versions of products; second, it indicates whether these differences translate into consumers believing that the products are different. Overall, the results indicate the influence of front-of-pack design elements on the perception of package and product differences and on consumer choices; however, these differ between design elements and products, highlighting the need for a case-by-case assessment. This suggests that noticeable changes in some packaging elements do not convey differences in the product. Overall, claims about the origin of ingredients, changes in package colour and images and logos making a claim about the quality of the product show the largest impacts. The findings could provide authorities and interested stakeholders dealing with this topic with useful insights.

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Executive summary

The situation where food products are marketed as identical while having a substantially different composition or characteristics has gained public attention in recent years. Some stakeholders suggested that brand owners market different versions (i.e. with different compositions or characteristics) of the same products in different Member States using the same or similar packaging, referring to this as dual food quality (DFQ). Testing campaigns have confirmed that companies have in their portfolios seemingly identical products with different composition in different Member States (Nes et al., 2021). In this debate, the term 'DFQ' has been replaced with 'different composition of seemingly identical products' (DC-SIP), as there is no univocal relationship between differences in composition and quality.

The European Parliament¹ and the Council² have stressed the importance of tackling the issue of DC-SIP at European level. Since then, the European institutions have undertaken both policy and legislative actions to better understand DC-SIP practices and to clarify the applicable rules.

Notably, the Unfair Commercial Practices Directive 2005/29/EC (UCPD) was amended by Directive (EU) 2019/2161³ to clarify the rules and thus help competent authorities to assess, on a case-by-case basis, whether DC-SIP amounts to unfair commercial practices or not. To allow this assessment, it becomes crucial to understand how consumers perceive differences in packaging and how these differences affect their perceptions of the products and impacts on their transactional decisions. Beyond protecting the product, packaging provides consumers with extrinsic signals that can allow them to develop expectations about the product. However, we still do not fully understand what makes consumers perceive food products as identical or different, based on front-of-pack (FOP) design⁴. To fill this gap, this study presents the results of consumers' perceptions of different FOP designs for seemingly identical branded food products. The study uses primary data collected through an online survey to provide insights on two fronts. It shows, first, whether and under what circumstances the FOP design informs consumers about the different versions of the product. Second, it also shows which FOP elements would better inform consumers about DC-SIP, the differences in product characteristics (composition, taste, healthiness, etc.) signalled by these and their impact on purchase decisions.

Overall, the results indicate the influence of FOP elements on the perception of package and product differences and on consumer choices, although varying by FOP element and product type. The greater the number of elements changing together on the FOP, the greater the probability of consumers perceiving differences in packages and products. However, the impact is greater on perception of packaging than of product suggesting that some packaging elements, although perceived, do not convey differences in the product. In addition to multiple FOP elements changing simultaneously, a claim about origin of ingredients, different colours and a logo making a claim about the quality of the product are the elements that most increase the probability of consumers noticing differences. Another important finding is that changes in various FOP elements that convey specific differences in product characteristics or qualities (e.g. origin of ingredients, quality, taste), are the most effective in making consumers believe the products are different. It becomes, thus, essential to know what message each element conveys to consumers. For instance, the claim about origin of ingredients leads consumers to expect differences in the origin of the ingredients, the place of production, product composition, healthiness of the product and nutritional values. Finally, despite the impact of price, the study reveals that the FOP elements tested go beyond packaging and product perception and affect purchase decisions. This shows the importance of the packaging as a tool in tackling the DC-SIP issue and highlights the need to assess it on a case-by-case basis.

Policy context

The existence of products marketed as identical while having substantially different compositions gained widespread public attention at EU level in 2017. Interventions by the European Parliament⁵ and the Council of the EU⁶ stressed the importance of tackling the issue of DC-SIP, commonly referred to as "dual food quality", as this practice may be misleading for consumers. Since then, the European institutions have taken strong action on various fronts, including legislative proposals.

¹ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013IP0239&from=EN>

² <http://data.consilium.europa.eu/doc/document/ST-8754-2016-INIT/en/pdf>

³ <https://eur-lex.europa.eu/eli/dir/2019/2161/oj>

⁴ FOP design is one of the many aspects of product presentation. Other elements such as physical (additional signalling in the shopping outlet) and online (social media) marketing campaigns are not considered in this report.

⁵ <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013IP0239&from=EN>

⁶ <http://data.consilium.europa.eu/doc/document/ST-8754-2016-INIT/en/pdf>

In September 2017, the European Commission issued a set of guidelines on the application of EU food and consumer protection law to DC-SIP issues. On 11 April 2018, the Commission adopted a proposal to clarify the application of UCPD to the DC-SIP issue as part of its New Deal for Consumers initiative. On 27 November 2019, the European Parliament and the Council adopted the amendment to the UCPD as part of the Better Enforcement and Modernisation Directive (EU 2019/2161)⁷. Member States were required to transpose this directive into national law by 28 November 2021 and apply it from 28 May 2022. In December 2021, the Commission issued new guidance on the interpretation and application of the UCPD with a chapter dedicated to the “dual quality” matter replacing the earlier 2017 guidelines.⁸ Article 6(2)(c) UCPD clarifies now that marketing a good in one Member State as being identical to a good marketed in other Member States, while that good has significantly different composition or characteristics, is a prohibited commercial practice if it affects or it is likely to affect the transactional decision of a consumer *unless justified by legitimate and objective factors*. The assessment is carried out by the competent national authorities on a case-by-case basis. In this assessment, the question of whether a good can be considered marketed as identical to a good marketed in another Member State is key. For that reason, it is crucial to understand the role of packaging, particularly the FOP elements, in conveying differences in packages and products affecting consumers’ perceptions and choices.

Key conclusions

As a general conclusion, it is clear that FOP elements can allow consumers to identify product packages as different and infer that the product inside the package is different too. However, not all FOP elements or combinations thereof suffice for that purpose. The study reveals that the impact of the FOP elements tested goes beyond packaging and product perception and affect purchase decisions. This shows the importance of the packaging as a tool to tackle the DC-SIP issue. Importantly, the reported effect varies with each specific FOP element type, the FOP elements with which it appears and the product type in question.

Related and future Joint Research Centre work

The European Commission’s Joint Research Centre (JRC), in close collaboration with the other Commission services, experts from Member States’ competent authorities and stakeholders in the food supply chain, has developed a common methodology, with the objective of improving comparative testing of food products and obtaining results that are comparable across Member States⁹. Under the coordination of the JRC, this methodology was subsequently applied in an EU wide testing campaign in 2018/2019, to provide further evidence of whether the composition¹⁰ of various branded food products differs between Member States. The results of this original campaign (European Commission, 2019) showed that differences in composition with identical or similar FOP were found for 9 % and 22 % of the 1380 products evaluated respectively (128 unique products each present in up to 19 EU countries). In 2021 the Commission analysed the sensory properties of a subset of these 128 products to find out whether different recipes used for preparing a product lead to noticeable sensory differences (Ulberth, 2021). The results of this second analysis showed that, for 10 out of the 20 food products evaluated, differences in sensory properties between the national versions were noticeable. The bigger the difference in composition, the higher the probability of consumers detecting sensory differences.

Furthermore, the JRC, in collaboration with the Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, carried out an economic analysis of differences in the composition of seemingly identical branded goods between July 2018 and December 2019 in order to (i) explain the rationale for brand owners to offer different versions of identically or similarly branded food products in different markets, (ii) analyse the impact of DC-SIP on consumers’ choices and welfare and (iii) identify the main determinants of the occurrence of DC-SIP issues across Member States¹¹.

This study contributes to understanding the role of packaging in tackling the DC-SIP issue, in particular by identifying situations where consumers cannot identify differences in packaging based on differences in FOP design. It will also help understand whether differences in FOP design lead consumers to believe the products are also different. Readers of this report could identify particular FOP elements that individually or in

⁷ <https://eur-lex.europa.eu/eli/dir/2019/2161/oj>

⁸ [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021XC1229\(05\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021XC1229(05)&from=EN)

⁹ https://ec.europa.eu/knowledge4policy/sites/know4pol/files/eu_harmonised_testing_methodology_-_framework_for_selecting_and_testing_of_food_products_to_assess_quality_related_characteristics_0.pdf

¹⁰ We refer to composition and not quality, as the latter is a concept that combines objective and individual specific subjective factors. In most cases the quality rating of two versions of a product would vary from individual to individual.

¹¹ https://publications.jrc.ec.europa.eu/repository/bitstream/JRC120297/dc-sip_summary_report_1.pdf

combination with others result in a sufficiently high probability of identifying two packages as different. In addition, one can examine whether these differences also translate into perceptions about the characteristics of the product and if they affect purchasing decisions.

Limitations

Our results are based on the specific implementation of different FOP attributes in hypothetical products (i.e. not found in the market, even when replicating common designs). Therefore, predictions regarding the probability of consumers detecting differences in packaging, inferring differences in the product inside the package, and having varying beliefs regarding product characteristics should not be taken as definitive. The findings do not offer a final response to the issue of what constitutes a seemingly identical product, and should be further corroborated by repeating the same or a similar analysis for the specific FOP element design and changes that need evaluation.

Quick guide

Section 1 provides the introduction to the study. Section 2 summarises the theoretical framework and hypotheses. Section 3 describes the data collection and the methodology for analysis. Section 4 presents the analyses and results. Section 5 includes conclusions.

1 Introduction

The situation where food products are marketed as identical while having a substantially different composition or characteristics has gained public attention in recent years. Some stakeholders suggested that brand owners market different versions (i.e. with different compositions or characteristics) of the same products in different Member States using the same or similar packaging, referring to this as dual food quality (DFQ). Testing campaigns have confirmed that companies have in their portfolios seemingly identical products with different composition in different Member States (Nes et al., 2021). In this debate, the term 'DFQ' has been replaced with 'different composition of seemingly identical products' (DC-SIP), as there is no univocal relationship between differences in composition and quality.

The European Parliament¹² and the Council¹³ have stressed the importance of tackling the issue of DC-SIP at European level. Since then, the European institutions have undertaken both policy and legislative actions to better understand DC-SIP practices and to clarify the applicable rules.

In September 2017, the European Commission issued a set of guidelines on the application of EU food and consumer protection law to DC-SIP issues. On 11 April 2018, the Commission adopted a proposal to clarify the application of UCPD to the DC-SIP issue as part of its New Deal for Consumers initiative. On 27 November 2019, the European Parliament and the Council adopted the amendment to the UCPD as part of the Better Enforcement and Modernisation Directive (EU 2019/2161)¹⁴. Member States were required to transpose this directive into national law by 28 November 2021 and apply it from 28 May 2022. In December 2021, the Commission issued new guidance on the interpretation and application of the UCPD with a chapter dedicated to the "dual quality" matter replacing the earlier 2017 guidelines.¹⁵ Article 6(2)(c) UCPD clarifies now that marketing a good in one Member State as being identical to a good marketed in other Member States, while that good has significantly different composition or characteristics, is a prohibited commercial practice if it affects or it is likely to affect the transactional decision of a consumer *unless justified by legitimate and objective factors*. The assessment is carried out by the competent national authorities on a case-by-case basis. In this assessment, the question of whether a good can be considered marketed as identical to a good marketed in another Member State is key. For that reason, it is crucial to understand the role of packaging, particularly the FOP elements, in conveying differences in packages and products affecting consumers' perceptions and choices

In order to make this assessment, it becomes crucial to understand how consumers perceive differences in packaging and how these differences affect their perceptions of the products and impacts on their transactional decisions. Beyond protecting the product, packaging provides consumers with extrinsic signals that can allow them to develop expectations about the product. However, the literature is inconclusive on what makes consumers perceive food products as being identical or different, based on their presentation and, in particular, the front-of-pack (FOP) design. To fill this gap, this report presents findings about consumers' perceptions for different FOP designs of identical branded food products.

Using an experimental method implemented in an online survey, we addressed the policy questions related to consumers' perception of the FOP design of seemingly identical branded food products and their transactional decisions. The results of this experiment provide insights into consumers' perception of different FOP designs. The study also shows which FOP elements seem to inform consumers better about DC-SIP and what differences in product characteristics (composition, taste, healthiness, etc.) are signalled by these FOP elements.

The experiment was carried out in 10 EU Countries by using visualizations of the FOP design of hypothetical branded food products (i.e. not found in the market, even when replicating common designs found in them) to evaluate consumers' perceptions and whether differences in certain FOP elements lead consumers to believe that the package and products are the same or different. In particular, we provide insights into the following policy questions.

1. What differences in the FOP designs of branded food products lead the consumer to perceive products as identical or different?
2. If consumers perceive products as different, what do they expect to be different between the products?

¹² <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013IP0239&from=EN>

¹³ <http://data.consilium.europa.eu/doc/document/ST-8754-2016-INIT/en/pdf>

¹⁴ <https://eur-lex.europa.eu/eli/dir/2019/2161/oj>

¹⁵ [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021XC1229\(05\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021XC1229(05)&from=EN)

3. Do perceived differences in FOP design between food products allow consumers to take an informed transactional decision?

The analysis of the data collected provides insights that can inform the authorities and stakeholders dealing with DC-SIP. In particular, it can support the implementation of the Unfair Commercial Practices Directive (UCPD) by providing guidance on differences in FOP elements that lead consumers to perceive packages and products as being significantly different.

2 Theoretical framework and hypotheses

When making purchasing decisions about frequently consumed products such as food, consumers have been found to rely primarily on extrinsic product cues, such as brand, place of origin, price, and packaging (Colen et al., 2020; Richardson et al., 1994). Consumers use these extrinsic cues to develop expectations about the product. Our study focuses on understanding how consumers perceive differences in packaging and infer differences about the product. In this study we focus on the FOP dimension of packaging, that is, design elements, logos or claims that a consumer can see when looking at a product without needing to turn it around. FOP is one of the many aspects of product presentation. Other elements such as marketing campaigns, both physical (additional signalling in the shopping outlet) and online (social media), are not considered in this report. We also do not consider the impact of elements that appear in the back of the pack or have to be accessed using digital means (e.g. scanning a QR code or checking a website address provided in the front or back of the package). A package can include in its FOP design elements that act as both implicit and explicit cues. For instance, brand, claims or other printed information, act as explicit cues; while colour, shape, material and pictures function as design signals cues, which are not recognised by the consumer and may not be consciously perceived as signals that persuasively communicate brand or product characteristics (van Ooijen et al., 2017).

There is some controversy over which type of packaging elements and combinations thereof have the most significant influence on consumers' perceptions. It appears that visual or design cues attract consumers' attention more easily and generate expectations about the product more quickly than text (Colen et al., 2020; Underwood and Klein, 2002), particularly when consumers are time constrained. Moreover, consumers prefer label information to be simple (Silayoi & Speece, 2004). The use of cues when evaluating a product requires making inferences about products from the configuration of multiple available cues, which becomes more complex when the number of cues increases (Burnkrant, 1978). According to cue consistency theory, if cues are consistent they translate into a more intense perception of the product. Therefore, design packaging elements affect product inferences more when there is a consistent alignment of these with explicit signals such as price or brand. But even when packaging design attributes are not aligned with explicit signals packaging elements affected product inferences demonstrating that consumers may use packaging design more than they use price or brand in product purchase consideration (van Ooijen et al., 2017).

Our **policy questions** are about understanding when consumers are capable of perceiving that different package versions of a food product contain different products, or when consumers are inclined to consider different versions of the food product to be the same because of the similarities in the FOP presentation. Drawing on previous research, our experiment aims to understand how consumers process differences in the combination of package design elements that are presented in the FOP (e.g. visible without the need to turn the product) and directly accessible to the consumer (i.e. without needing to access an external website either by scanning a QR code or by typing an address into a browser) of food products. We refer to the different combinations of such elements as FOP design. Consumers' processing the different FOP designs lead to two different assessments: (i) of the packaging itself; and (ii) of the product inside the packaging. In addition, we also evaluate how these assessments influence consumers' purchase behaviour. Purchase behaviour is understood as their ability to make informed decisions based on packaging cues. Building on the insights of Burnkrant (1978), our analysis considers each FOP design elements both alone and in combination with others when trying to explain the inferences consumers make about the three aspects mentioned above. We, therefore, pose the following research questions.

1. What elements of the FOP design of branded food products impact on consumers' perception of differences in:
 - (a) the product package;
 - (b) the product inside the package?
2. What food product characteristics (e.g. composition, nutritional aspects, taste, healthiness, naturalness, sustainability) do consumers expect (believe) to differ between products that have been identified as different based on the FOP design?
3. Do perceived differences in (combinations of) FOP attributes between branded food products affect transactional decisions?

The answer to the first and second research questions will reveal the elements that would clearly indicate to consumers that the food products are different or the same (Table 1) and what are the perceived differences in product characteristics, if any, that they convey.

Table 1. A typology of impact of FOP elements on consumer perceptions of package and products

		Consumer declares that two <u>packages</u> are:	
		perceived as the same	perceived as different
Consumer declares that <u>product characteristics</u> inside the two packages are:	perceived as the same	Case 1: FOP elements do <u>not signal</u> differences in package or in products	Case 2: FOP elements <u>signal</u> differences in package but <u>do not signal</u> differences in products
	perceived as the different	Case 3: FOP elements do <u>not signal</u> differences in package but <u>signal</u> differences in products	Case 4: FOP elements <u>signal</u> differences in package and in products

Source: Authors' own elaboration

This typology is of relevance from a policy perspective. Understanding which changes in FOP elements are sufficient for consumers to perceive that products are different can indicate how to make sure that different compositions of food products are not present in the market with seemingly identical packaging. Moreover, based on the responses provided we can put together a predictive model that can forecast the probability of consumers identifying two products as the same or different based on the differences in FOP package designs.

Finally, the answer to the third question will allow us to understand whether differences perceived by consumers on the FOP design affect their preferences and choices and thus enable them to make informed decisions.

To structure the analysis, which will provide responses to these research questions, we put forward the following hypotheses which are summarised in **Figure 1**. As FOP elements act as a cue for food package and can act as a cue of product perceptions, we formulate the following hypotheses:

H1. The higher the number of elements that change in the FOP, the higher the probability that individuals:

- (a) declare the packages are different.*
- (b) declare they believe the products inside the packages are different.*

H2. Differences in each specific type of FOP elements (e.g. claim/label, logo, colour, image) influence differently the probability that individuals:

- (a) declare the packages are different.*
- (b) declare they believe the products inside the packages are different.*

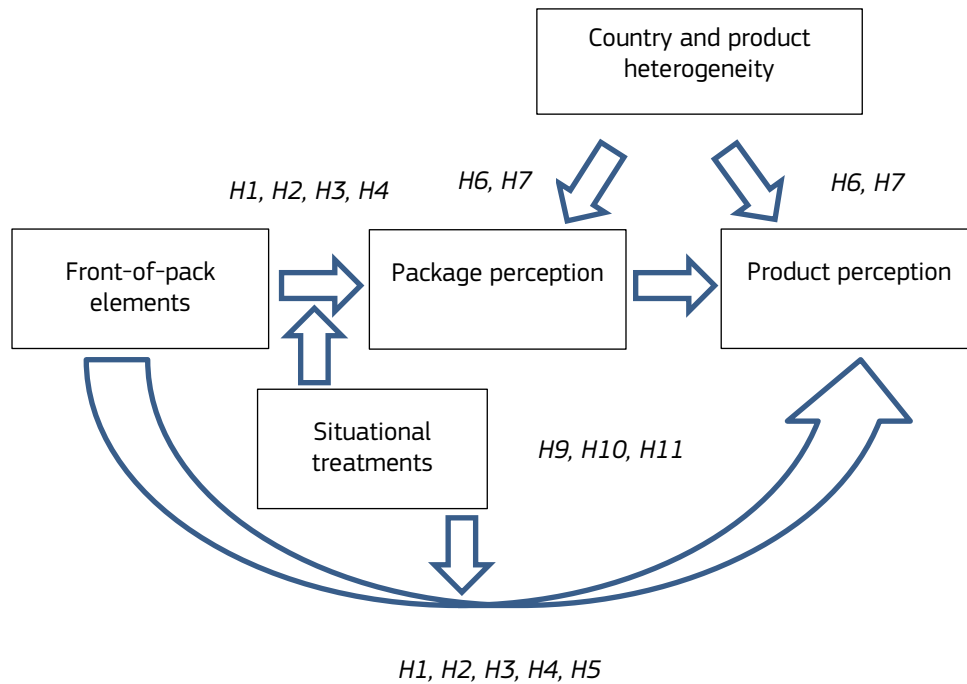
H3. The number of individual FOP elements changing simultaneously with each specific FOP element affects the probability that individuals:

- (a) declare the packages are different.*
- (b) declare they believe the products inside the packages are different.*

H4. The combinations of individual types of FOP elements changing simultaneously affect the probability that individuals:

- (a) declare the packages are different.*
- (b) declare they believe the products inside the packages are different.*

Figure 1. Simplified diagram of the packaging and product perception model



Source: Authors' own elaboration based on the Theory of Planned behaviour (Ajzen, 1991).

The literature suggests that it is important to understand the ‘meaning’ that consumers attach in their minds to the packaging elements in order to explain consumer perceptions (Ng et al., 2013). Specifically, for this study, it appears important to understand whether a difference in a specific FOP element conveys differences in product characteristics relevant to the DC-SIP debate such as ingredients, composition and origin of ingredients. For this, we formulate the additional hypothesis.

H5. The individual types of FOP elements (e.g. claim/label, logo, colour, image) affect differently the expectations about differences in specific product characteristics.

Taking advantage of the rich data set collected we can add additional hypothesis regarding heterogeneity in our main hypothesis from product and country perspectives. Therefore, we add two additional hypotheses as follows.

H6. Impacts of specific packaging elements on packaging and product perceptions differ by EU country.

H7. Impacts of specific packaging elements on packaging and product perceptions differ by product.

In addition to impacts on packaging and product perception we also test whether differences declared translate into effects on purchase decisions, with the following hypothesis.

H8. Different FOP elements influence buying behaviour.

Last, besides the specific impacts of packaging elements mentioned above, the study included different experimental conditions implemented as between-subject treatments to investigate whether the way in which choices are presented to consumers and product awareness factors impact the results. Based on existing literature we identify two choice architecture factors that can be key when assessing the impacts: time available to inspect the packages (Silayoi & Speece, 2004) and whether the packages are seen simultaneously or independently (Peri, 2006). These two factors are relevant to the DC SIP debate because, first, consumers do not normally see the two versions of the product simultaneously and, second, in normal shopping conditions very limited time is allocated to product choice, particularly the products are bought frequently¹⁶.

¹⁶ There are no hard statistics on time spent choosing a product, however media reports that time spent choosing a product in a shelf ranges from three to five seconds (Calasuonno, 2018) to 13 seconds (ICSID, no date).

As the study uses fictional brands, this could affect our results. Brands are supposed to act as cues to product quality as consumers are familiar and experienced with them (Burnkrant, 1978). When fictional brands are used, this role is missing. As an attempt to overcome this limitation we prime part of the sample, asking them to consider our fictional brands to be those they usually purchase. Based on the analysis of these between subject treatments we put forward the following hypotheses.

H9. Time available to inspect product packages moderates the influence of differences in FOP elements on package and product perceptions.

H10. The simultaneous seeing of both packages moderates the influence of differences in FOP elements on package and product perceptions.

H11. Product familiarity moderates the influence of differences in FOP elements on package and product perceptions.

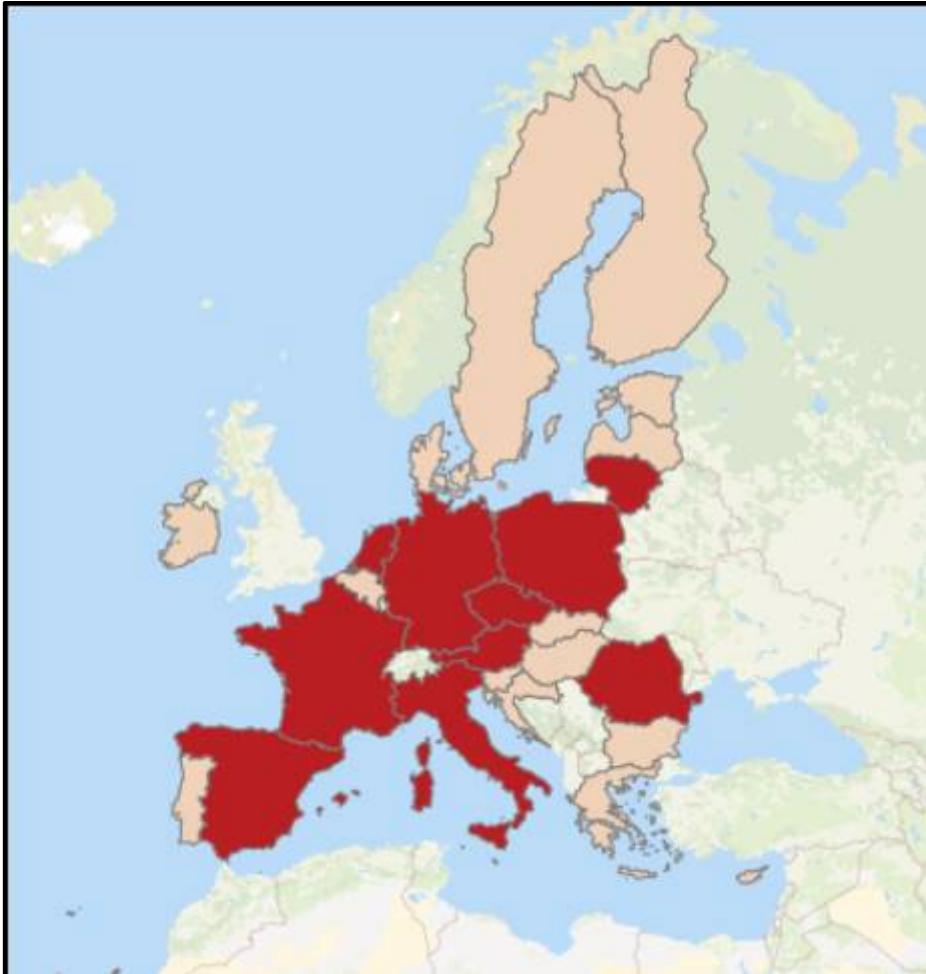
As depicted in **Figure 1**, hypotheses 1, 2, 3 and 4 relate to how individual FOP design element affect package and product perceptions considered in four dimensions: as number of differences (H1), when standing alone (H2); when changing simultaneously with others (H3); and in specific combinations (H4). Hypothesis 5 expands the analysis to investigate which product characteristics consumers believe vary between products when they consider the products to be different. The heterogeneity of impacts between EU countries and between products is considered in hypotheses 6 and 7. Last, we consider the potential impact of changing experimental conditions on our results for time available to make decisions (H9), how consumers see the two packages (H10) and whether consumers are made aware of the hypothetical brands used or not (H11). In addition, we use the same product designs to investigate whether differences also affect purchases decisions (H8).

Section 3 provides details on how the different treatments are implemented, data collected and hypotheses tested.

3 Materials and methods

The data used in this study were collected through an online experiment with consumers in 10 EU countries (Czechia, Germany, Spain, France, Italy, Lithuania, the Netherlands, Austria, Poland and Romania) as depicted in **Figure 2**. The experiment was informed by discussions held in focus groups prior to the launching of the field work. The focus groups provided qualitative evidence to identify the most relevant FOP elements to be included in the online experiment and the product range. From an initial long-list of 15 products and 18 FOP elements discussed in the focus groups, a subsample of six products and eight elements was selected for the online experiment. The online experiment consisted of an online survey with three tasks to respond to the different research questions: evaluation of package differences, evaluation of product differences and purchase decisions.

Figure 2. EU countries in which the field work was implemented



Note: Dark red, EU countries where the experiment was implemented; light orange, other EU countries.

Table 2 summarises the characteristics of the focus groups and the online experiment.. Next, the following subsections give some methodological details about the focus groups (including the selection of elements and products) and the online experiment.

Table 2. Products, FOP elements and scope in the different phases of the methodological approach

		Focus Group	Online experiment	
Products		Carbonated soft drink	X	
		Tea	X	
		Instant coffee	X	X
		Yoghurt	X	X
		Fish fingers	X	X
		Mayonnaise	X	
		Cornflakes	X	
		Baby food	X	X
		Chocolate	X	X
		Natural juice	X	
		Drinking milk	X	
		Cream cheese	X	
		Frozen pizza	X	
		Crisps	X	X
		Sweet jelly beans	X	
FOP elements	<i>Claim (text)</i>	Origin of ingredients	X	X
		Naturalness	X	
		Nutrition and health	X	
		Organic production	X	
		Novelty	X	
		Recipe	X	X
		Taste	X	X
	<i>Logo</i>	Origin of ingredients	X	
		Quality	X	X
		Nutritional facts panel	X	
		Promotion	X	
		Brand	X	
	<i>Design features</i>	Background colour	X	X
		Picture / image	X	X
		Position of picture / image	X	X
Product description		X	X	
Colour of drawing		X		
		Number of languages	X	
Number of countries		10	10	
Number of participants		5 or 6 per group	Minimum 2000	

Note: shaded rows highlight products/elements used in the online experiment

Source: Authors' own elaboration

3.1 Focus groups

This section summarises the methodology for the focus group discussions and the decisions made based on them¹⁷. Notably, the focus groups were designed to provide a structured discussion on:

- consumers' awareness of differences and similarities in FOP elements (or patterns);
- how consumers' expectations about products are affected by differences or similarities in FOP elements;
- how consumers' transactional purchase decisions are affected by their perceptions and expectations of differences or similarities in FOP elements.

¹⁷ The discussion guide used in the focus groups can be found in Annex I. The discussion guide was translated to the official languages of the 10 countries where these were carried out.

In each of the 10 countries where the focus groups were held, at least five participants were invited to an online discussion. Countries were selected to maximize geographical representation across the EU, different socioeconomic contexts, and different attitudes towards food. During the focus groups 15 products and 18 FOP elements were discussed. The selection of the products and FOP attributes tested was informed by the results of the 2018-2019 JRC EU-wide label comparison (European Commission, 2019).

3.1.1 Selection of products and front-of-pack attributes

The selection of products for the focus groups was agreed after discussions between the JRC, the Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs and the Directorate-General for Justice and Consumers.

Box 1. Selection of products used in the focus groups.

Crisps; Sweets (jelly beans); Carbonated soft drink; Natural juice; Tea; Drinking milk; Instant coffee; Cream cheese; Yoghurt; Frozen pizza; Fish fingers; Baby food; Mayonnaise; Chocolate; Cornflakes

The previous comparison exercise also yielded a list of pre-selected FOP elements to be considered in the focus groups. The attributes were classified into three categories:

- **claims:** elements providing information about the product in text form;
- **logos:** elements providing information about the product in a visual form;
- **'Tweaks':** elements whose implementation require a more fundamental change in the package design, such as a change in colour or picture.

Based on the frequency with which FOP elements occurred among the selected products, and the suitability of the attributes for both the focus groups and the online experiment, the 18 FOP attributes in Table 3 were selected for analysis in the focus groups.

Table 3. Selection of FOP elements used in the focus groups

Claims	Logos	Tweaks
Claim on origin of ingredients (text version)	Nutritional information	Brand logo
Claim on naturalness	Claim on quality	Background colour
Nutrition and health claim	Claim on origin of ingredients (logo version)	Picture/image
Claim on organic production	Promotion	Position of picture/image
Claim on novelty		Product description
Claim on recipe		Colour of drawings
Claim on taste		Number of languages

Source: Authors' own elaboration

Since not all FOP elements could reasonably be included for all products in the focus groups, attributes were mapped to specific products. This mapping ensured that all attributes were discussed in the focus groups while maintaining a reasonable number of attributes per product. To ensure that each attribute was discussed across a range of products, each attribute was allocated to at least four products (Table 4).

Table 4. Mapping of FOP elements to products used in the focus groups

	Claims						Logos						Tweaks				
	Origin of ingredients	Naturalness	Nutrition and health	Organic production	Novelty	Recipe	Taste	Nutritional information	Quality	Origin of ingredients	Promotion	Brand	Background colour	Picture / image	Position of image	Product description	Colour of drawings
Crisps						✓	✓	✓			✓		✓		✓		✓
Carbonated soft drink			✓		✓	✓				✓			✓	✓			
Tea		✓							✓		✓						✓
Instant coffee		✓			✓								✓		✓		
Yoghurt	✓		✓					✓					✓	✓			
Fish fingers	✓								✓		✓					✓	
Mayonnaise			✓			✓									✓	✓	
Cornflakes					✓		✓			✓	✓			✓			✓
Baby food	✓			✓	✓				✓		✓			✓			✓
Chocolate									✓	✓	✓		✓				
Sweets (jelly beans)			✓					✓		✓			✓				
Natural juice	✓	✓		✓			✓							✓			
Drinking milk		✓		✓					✓								✓
Cream cheese				✓			✓	✓	✓						✓	✓	
Frozen pizza						✓		✓	✓					✓			

Source: Authors' own elaboration

As only a limited number of products could be discussed in each focus group, different products were included in each of the countries. In each country, five products were discussed allowing that each product was covered in at least three countries to cover the diversity of the EU (Table 5).

Table 5. Mapping of products to countries used in the focus groups

Country	Crisps	carbonated soft drink	Tea	Instant coffee	Yoghurt	Fish fingers	Mayonnaise	Cornflakes	Baby food	Chocolate	Sweets (jelly beans)	Natural juice	Drinking milk	Cream cheese	Frozen pizza
Czechia				✓		✓	✓					✓			✓
Germany		✓	✓		✓									✓	✓
Spain	✓								✓	✓	✓		✓		
France				✓			✓	✓			✓	✓			
Italy				✓		✓		✓				✓	✓		
Lithuania	✓								✓	✓	✓		✓		
Netherlands						✓	✓	✓				✓		✓	
Austria	✓								✓	✓	✓		✓		
Poland		✓	✓		✓									✓	✓
Romania		✓	✓		✓									✓	✓

Source: Authors' own elaboration

3.1.2 Design of packages used in the focus groups

To facilitate the focus groups, a professional designer developed 30 hypothetical product visualizations combining the 18 FOP elements and the 15 products. Drafts in English were agreed between the JRC and its partner directorates general in this project, and the agreed versions were translated to the official languages of the 10 countries where the focus groups took place. Figure 3 shows a selection of the sketches used to agree on the final combinations of product and FOP elements used in the focus groups. The agreed versions were then translated into realistic coloured designs, which were used in the focus groups.

Figure 3. Example of pairs of product sketches designed for the focus groups (from left to right and from top to bottom: chocolate, yoghurt, instant coffee, frozen pizza and natural juice)



Source: LE Europe

3.1.3 Products and attributes shortlisted for the online experiment

Based on the focus groups results, a classification framework for both the products and attributes tested was developed. Products were classified based on the following three overarching criteria:

- frequency of consumption;
- importance or attention to the packaging of a product for consumers' transactional decisions;
- product category¹⁸.

FOP attributes were classified based on the following three overarching criteria:

- importance for consumers' perceptions;
- importance for consumers' expectations about food products; and,
- importance for consumers' purchase decisions.

Based on this classification framework and discussions between the JRC, the Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs and the Directorate-General for Justice and Consumers, the claims on organic production and on nutrition and health were excluded because these were subject to

¹⁸ The following categories were considered: hot beverages, cold beverages, meals (or parts thereof), snacks and confectionary, and products not otherwise categorised.

specific regulations. The final selection of six products and eight attributes for the online experiment is presented in Table 6. In each country five products were tested. Due to the limitation on the number of package designs that could be developed, four products were tested in 10 countries while chocolate and yoghurt were tested in only five countries each¹⁹. In principle all of the FOP elements used in the experiment would be allowed under current legislation on food labelling.

Table 6. Final selection of products and FOP elements for the online experiment (all FOP elements were applied to all products)

Products	FOP Elements
Instant coffee	Background colour
Crisps	Picture/image
Baby food	Positioning of the picture/image
Fish fingers	Product description
Chocolate ^[a]	Claim on the origin of ingredients
Yoghurt ^[a]	Claim on taste
	Claim on recipe
	Quality logo

[a] Tested in five EU countries only see footnote 19

Source: Authors' own elaboration

3.2 Online experiment

This section provides a summary of the design process followed for the various elements of the experiment, while the implementation of the experiment is summarised in Annex 4.

3.2.1 Design of the survey and experiment document

The survey and experiment were scripted by Ipsos in its proprietary survey platform. Following a pre-test the final survey and experiment were adjusted. The final script of the survey and experiment design consisted of four parts:

- **Part 0:** Introduction, general demographic information and screening questions.
- **Part 1:** Questions on purchase behaviour.
- **Part 2:** Questions on perceptions of food packaging and product differences.
- **Part 3:** Questions on product preferences (discrete choice experiment (DCE)).
- **Part 4:** Follow-up questions

In order to test whether the way consumers make choices (the choice architecture) and product awareness factors influenced the results, individuals were randomly allocated to one of three sets of treatments:

- variation in the time that images were shown to respondents in Part 2 of the survey (short (four seconds) versus long (six seconds)),
- variation in whether images in Part 2 were shown to respondents side by side (simultaneous) or one after the other (sequential),
- variation in whether the brand logos of the products used during the survey were shown to respondents beforehand (priming) or not.

In Part 2 of the experiment, individuals were asked to declare whether pairs of packages were perceived as different or the same and again whether the products inside those packages were perceived as different or the same. Those respondents who declared that they perceived the packages as different were subsequently asked to rate the degree of difference using a Likert scale with five levels from slightly different to very different. Moreover, pairs of images were shown for a limited time to mimic the fact that consumers take relatively quick decisions when buying individual food items, as observed in the focus group discussions.

¹⁹ Chocolate was tested in Czechia, France, Italy, Austria, and Romania; yoghurt in Germany, Spain, Lithuania, the Netherlands and Poland.

Then the first experimental treatment changed the time for which individuals could see the product designs. Half of the sample saw the images for four seconds simulating a shopping environment where individuals are in a hurry assuming a system 1 thinking process, while the other half saw the images for six seconds to relax this condition allowing a system 2 thinking process (Kahneman, 2011)²⁰. The number of seconds for each treatment was decided based on the results of the pre-. The second experimental treatment changed whether individuals saw each pair of products simultaneously or sequentially. The second treatment simulates the fact that consumers would normally not find differing packages for the same food product, as sold in different EU countries, side by side in the shop. Lastly, the research used fictitious brands of food products. To test the impact of familiarity with brands on decision-making, half of the respondents were primed on the fictitious brands to be used in the experiment. The priming text used was the following:

'In this survey you will see five products from five fictitious brands. In the remaining part of the survey, please act as if the product we present were the one you normally purchase or are familiar with. Only for convenience, we use fictitious brands.'

Following the text, a table with the names of the brands for each of the products was shown.

The complexity of the product image (i.e. how many attributes are contained in the FOP design) was also considered as potential treatment, but ultimately not included. This treatment would have been methodologically problematic since it would have required ad hoc decisions on which attributes would be retained for simpler designs.

The final survey questionnaire is provided in Annex 3.

3.2.2 Design of the images

In order for the experiment to mimic as closely as possible real choices by consumers, the alternatives presented were designed as images and not as tables (He and Gao, 2015). A professional graphic designer developed the hypothetical product visualizations, resulting from the combinations of the selected FOP attributes and levels (see section 3.2.3) and the selected products that the respondents would evaluate in choice cards.

The designs were mainly based on the package images created for the focus group discussions and refined based on the feedback received during the focus groups. This ensured that the basic elements of each product had been previously tested with our target population. Based on the design brief, the designers created English-language master versions of all images. Then the information on the packages was translated into the local languages and the translations were implemented by the designers.

In Figure 4, we can see examples of the 24 product visualisations created for the experiment for each country, and in Figure 5 we can see an example highlighting the differences in FOP attributes.

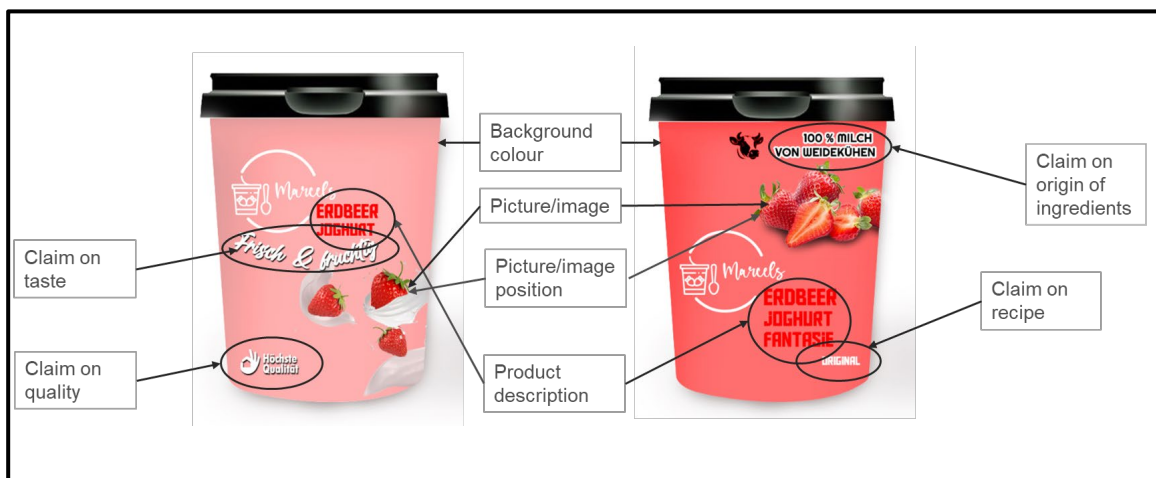
²⁰ System 1 thinking can be described as fast and automatic decision-making while system 2 thinking relates to slow and more analytic decision-making. System 1 would apply to routine purchases not involving a very high price (e.g. a litre of milk) while system 2 would apply to purchases that are made only once in a long time and involve a significant disbursement (e.g. a car).

Figure 4. Example of pairs of product versions designed for the online experiment (version used in Spain)



Source: LE Europe

Figure 5. Example identifying the differences in the front-of-pack elements of a pair of product versions (yoghurt used in Germany and Austria)



Source: LE Europe

Consumers saw only these images without any actual information about the product or its composition (except for price and weight in the DCE). Therefore, all differences that consumers report are driven exclusively by what is shown (or not) on the package, and not by any additional information about product content.

3.2.3 Design of the choice set

To implement the elicitation of perceived differences in packages and products (Part 2) and the purchase decisions (Part 3), the survey showed images of packages with different FOP elements. To ensure that the comparison between different images in the survey was methodologically sound, sets of choice cards including two different package designs were constructed. Choice sets define *choice situations* between, in this experiment, two options per situation. The options in each situation are defined by the FOP elements included in each image being compared. Due to the divergent methodological needs of the three tasks in

question, two different choice sets were designed: one for Part 2 (declaring whether package and product were the same or different) and one for Part 3 (purchase decision) of the survey.

For both choice sets, each of the eight FOP elements could take one of two values. For FOP elements classified as claims or logos, these were either present or not in a specific product version. For FOP elements classified as tweaks, one or other option was present in a specific product version (e.g. one or another background colour). In addition, in the design for the purchase decision choice in Part 3, prices were added with four product- and country-specific price levels. For a description of the selection of the price levels, see section 3.2.6 below.

The two choice sets were checked for balance and correlation between the attributes. The sets ensured that each level of each attribute was equally distributed across all possible choices (balance) and, that there was no systematic relationship between two or more attributes (correlation). Choice sets with balanced and uncorrelated attributes yield data with less variability and therefore allow for more precise estimates.

3.2.4 Choice set for the purchase decision

The analysis of purchase decisions is made using a DCE approach (see section 3.3). The choice set for the DCE was based on the principles of efficient design. To ensure an efficient design when using attributes (the DCE terminology applied to each of the FOP elements used in this report) with two values, for any given choice situation the two options presented to respondents should differ in most – if not all – elements. For example, if in option 1, a claim on taste was included, it was most likely not included in option 2.

The efficient design was manually adjusted to ensure that for two choice situations, the number of attributes that differed between the two options was low (only three attributes were different for these situations). For the other choice situations, all eight attributes differed between the options presented. In total the efficient design results in 12 choice situations. Taking into account that each choice card had two options, this yielded 24 different images being used per product to construct the DCE efficient design. As consumers faced choices for five products, to avoid survey fatigue, the 12 choice cards were blocked into six sub-groups of two cards each.

Table 7 and Table 8 provide the choice set used for the DCE in terms of the FOP elements included in each image for each of the options in each of the choice cards and how each FOP element was implemented for the different products.

Table 7. Values used for the different attributes in the two options presented in the different choice cards of the experimental design for the DCE

Choice	Option 1									Option 2								
	Claim on recipe	Background colour	Position of the picture/image	Claim on the origin of ingredients	Claim on taste	Quality logo	Picture/image	Product description	Price (level)	Claim on recipe	Background colour	Positioning of the picture/image	Claim on the origin of ingredients	Claim on taste	Quality logo	Picture/image	Product description	Price (level)
1	Yes	V2	V2	Yes	No	No	V2	V2	3	No	V1	V1	No	Yes	Yes	V1	V1	2
2	No	V1	V2	Yes	No	Yes	V1	V1	1	Yes	V2	V1	No	Yes	No	V2	V2	4
3	No	V2	V1	Yes	Yes	Yes	V2	V1	4	No	V2	V2	No	Yes	No	V2	V1	2
4	Yes	V1	V1	Yes	No	Yes	V1	V2	3	Yes	V1	V2	No	No	No	V1	V2	1
5	No	V2	V2	No	No	Yes	V2	V2	3	Yes	V1	V1	Yes	Yes	No	V1	V1	2
6	Yes	V2	V1	No	No	Yes	V1	V2	2	No	V1	V2	Yes	Yes	No	V2	V1	3
7	Yes	V1	V2	No	Yes	Yes	V2	V1	4	No	V2	V1	Yes	No	No	V1	V2	1
8	No	V1	V2	No	Yes	No	V1	V2	2	Yes	V2	V1	Yes	No	Yes	V2	V1	3
9	Yes	V2	V2	Yes	Yes	No	V1	V1	4	No	V1	V1	No	No	Yes	V2	V2	1
10	No	V1	V1	Yes	Yes	No	V2	V2	2	Yes	V2	V2	No	No	Yes	V1	V1	3
11	Yes	V1	V1	No	No	No	V2	V1	1	No	V2	V2	Yes	Yes	Yes	V1	V2	4
12	No	V2	V1	No	Yes	No	V1	V1	1	Yes	V1	V2	Yes	No	Yes	V2	V2	4

Note: the specific value for each of the price levels of the different products can be found in Table 11.

Source: Authors' own elaboration

Table 8. Description of the implementation of the values of the attributes used in the construction of the experimental design for the DCE for each of the six products

Attribute	Instant coffee	Crisps	Baby food	Fish fingers	Chocolate	Yoghurt
Claim on recipe	Original					
Background colour (v1)	Black	Red	Light grey	Light blue	Blue/purple	Light red
Background colour (v2)	Grey	Yellow brown	Dark grey	Dark blue	Dark brown	Dark red
Position (v1)	Bottom of package	Bottom of banner	Image on the left	Image on the left	Image on the right	Bottom of package
Position (v2)	Top of package	Top of banner	Image on the right	Image on the right	Image on the left	Top of the package
Claim on the origin of ingredients	Authentic African coffee beans	Made from potatoes grown in Europe	Made from fruit grown in Europe	Made from North Sea cod	Made with Alpine milk chocolate	100% free range dairy
Claim on taste	Pure aroma	Packed with flavour	Your baby's first tastes	Taste of the sea	Perfectly silky	Fresh & Fruity
Quality logo	Premium quality					
Picture (v1)	Coffee cup	Handful of crisps	Couple of apples and pears	Pirate in blue	Chocolate	Strawberries falling through milk
Picture (v2)	Coffee beans	Crisps slices from potato	One apple and one pear	Pirate in red	Cow in meadow	Strawberries bunched together
Product description (v1)	Gold	Salted	Apple & Pear	15 fish fingers	Milk Chocolate	Strawberry yoghurt
Product description (v2)	Noir	Salt flavoured	Pear & Apple	15 bread crumbed fish fingers	Smooth chocolate	Strawberry yoghurt fantasy

Source: Authors' own elaboration

3.2.5 Choice set for the elicitation of perceived differences in package and product in the survey

Using the DCE choice set described above for the elicitation of perceived differences in package and product faced several problems. As mentioned above, the DCE choice set is constructed maximizing the differences in attributes value between the two alternatives in the choice set. This approach would not work for the purpose of identifying which FOP elements signal differences the most to consumers. The DCE choice set, even when we modified it to include two options with differences across products in three FOP elements, failed to provide sufficient variability in the number of differences in FOP elements across products in the choice cards. In most cases the number of differences was the maximum (eight). Using such a choice set would have resulted in most individuals detecting the differences in packages and would have made it impossible to detect which attribute affected the perception of package and product as different or the same.

If one wants to estimate models explaining which attributes lead consumers to perceive a package and product as the same or different, the number of attributes that differ between options within each choice situation should vary across choice situations. For this, we would need to have additional product pairs designed with varying number of differences in FOP elements. However, the degrees of freedom in designing new products for this choice set were restricted by budgetary constraints, as the total number of product designs that the contractor could deliver had already been exhausted with the product designs used for the DCE choice set. Therefore, the products used in this new choice set design had to be based on the 24 images already designed for the DCE choice set, excluding the price attribute.

With this restriction in mind, it was not possible to generate a choice set using an efficient design generation process which took into account the requirement of varying the number of differences in FOP elements between the two products in the choice cards. Therefore, the choice set for the elicitation of perceived differences in packages and products was created manually using the product designs already used in the DCE choice set. When manually creating this choice set, **we ensured that the set was balanced and that attributes were largely uncorrelated**. The 12 new choices created in this choice set included:

- three choice cards on which all FOP elements differed between alternatives (i.e. eight),
- three choice cards on which six FOP elements differed between alternatives, while two attributes were the same,
- three choice cards on which four FOP elements differed between alternatives, while the other four were the same,
- three choice cards on which two FOP elements differed between alternatives, while six attributes were the same.

Table 9 provides the choice set used for this part of the survey. The definition of the different values of attributes is the as same presented in Table 8. Again, as consumers faced choices for five products, to avoid survey fatigue, the 12 choice cards were blocked into six sub-groups of two cards each.

Table 9. Values used in the different choice cards of the experimental design for eliciting perceptions of packages and product versions as the same or different

Choice	Option 1								Option 2							
	Claim on recipe	Background colour	Positioning of the picture/image	Claim on the origin of ingredients	Claim on taste	Quality logo	Picture/image	Product description	Claim on recipe	Background colour	Positioning of the picture/image	Claim on the origin of ingredients	Claim on taste	Quality logo	Picture/image	Product description
1	Yes	V2	V2	Yes	No	No	V2	V2	No	V1	V1	No	Yes	Yes	V1	V1
2	No	V2	V1	Yes	Yes	Yes	V2	V1	No	V1	V2	No	Yes	No	V1	V2
3	Yes	V1	V2	No	Yes	Yes	V2	V1	Yes	V2	V1	Yes	No	Yes	V2	V1
4	No	V1	V1	Yes	Yes	No	V2	V2	No	V1	V2	Yes	Yes	No	V2	V1
5	No	V2	V2	No	No	Yes	V2	V2	Yes	V1	V1	Yes	Yes	No	V1	V1
6	No	V2	V2	No	No	Yes	V2	V2	Yes	V2	V2	Yes	Yes	No	V1	V1
7	Yes	V2	V1	No	Yes	No	V2	V2	Yes	V2	V1	Yes	No	Yes	V2	V1
8	No	V2	V1	No	Yes	No	V1	V1	No	V1	V1	No	Yes	Yes	V1	V1
9	No	V1	V1	Yes	Yes	No	V2	V2	Yes	V2	V2	No	No	Yes	V1	V1
10	Yes	V1	V1	Yes	No	Yes	V1	V2	No	V1	V2	Yes	Yes	No	V2	V1
11	Yes	V2	V1	No	No	Yes	V1	V2	Yes	V1	V2	Yes	No	Yes	V2	V2
12	Yes	V1	V1	Yes	No	Yes	V1	V2	Yes	V2	V1	No	No	Yes	V1	V2

Source: Authors' own elaboration

3.2.6 Product prices used in the discrete choice experiment

An important aspect of any DCE is the selection of the levels for the price attribute shown to respondents. Prices have to be realistic to ensure that the analysis yields realistic willingness to pay (WTP) estimates and minimizes hypothetical bias (Glenk et al. 2019). The prices for the DCE were selected following a three-step process.

In the first step, data was collected from Statista on the value in million euro and volume in million kg of sales in 2020 of product groups relevant to each of the six products in the experiment. By assuming a standard weight for each product based on the typical weight of products reported in JRC (2019), volume was converted into units sold. An implicit unit price for each product was then calculated by dividing total value by total units sold. This was done separately for each country.

Table 10 provides the Statista product categories and the assumed standard unit weight for each of the experiment products.

Table 10. Product category and assumed unit weight for each experiment product

Experiment product	Statista product category	Assumed unit weight (g)
Instant coffee	Instant coffee	200
Crisps	Snack food	175
Baby food	Baby food	160
Fish fingers	Fresh fish	300
Chocolate	Confectionary	100
Yoghurt	Yoghurt	450

Source: Authors' own elaboration based on Statista.com and JRC (2019)

Since Statista records value in euro, the implicit unit prices were converted to local currencies for countries outside the euro area using the average exchange rate in 2020 as published by Eurostat²¹.

In the second step, prices were collected for each experimental product in each of the countries where the experiment was implemented. Prices were collected by visiting the website of the larger online supermarkets (in terms of sales) in each country. The prices of the comparison products were used to evaluate whether the implicit unit prices calculated in the first step were reasonable, and if not adjustments were made. The product price obtained following adjustments in the second step formed a baseline price for the DCE prices.

In the third step, the baseline price obtained in the second step was converted into four price levels as defined by the choice set for DCE (see section 3.2.4). This mapping was done as follows:

- **Level 1:** 85% of the baseline price
- **Level 2:** 95% of the baseline price
- **Level 3:** 105% of the baseline price
- **Level 4:** 115% of the baseline price

This approach ensured that the relative variation in price was the same across products and countries irrespective of the underlying prices or currencies. Table 11 shows all price levels for all products and countries as used in the DCE.

²¹ Database code: ert_bil_eur_a

Table 11. Levels used for the price attribute in the discrete choice experiment for the different products in the different countries

	AT	FR	RO	CZ	IT	DE	NL	LT	PL	ES
Level	(EUR)	(EUR)	Lei(RO)	(CZK)	(EUR)	(EUR)	(EUR)	(EUR)	(PLN)	(EUR)
Instant coffee										
1	11.09	6.29	22.57	72.03	7.33	5.33	7.70	3.32	14.09	3.71
2	12.40	7.03	25.22	80.50	8.19	5.95	8.61	3.71	15.75	4.15
3	13.70	7.77	27.88	88.97	9.05	6.58	9.52	4.10	17.40	4.58
4	15.01	8.51	30.53	97.45	9.92	7.21	10.42	4.49	19.06	5.02
Crisps										
1	1.69	1.05	5.65	42.33	1.27	0.84	1.27	1.27	5.52	1.19
2	1.89	1.17	6.32	47.31	1.42	0.94	1.42	1.42	6.17	1.33
3	2.09	1.29	6.98	52.29	1.56	1.04	1.56	1.56	6.81	1.47
4	2.29	1.41	7.65	57.27	1.71	1.14	1.71	1.71	7.46	1.61
Baby food										
1	1.56	0.96	2.99	13.63	1.39	0.83	1.24	0.99	2.23	0.87
2	1.74	1.08	3.34	15.24	1.56	0.93	1.39	1.10	2.50	0.98
3	1.93	1.19	3.69	16.84	1.72	1.03	1.53	1.22	2.76	1.08
4	2.11	1.30	4.04	18.45	1.88	1.13	1.68	1.33	3.02	1.18
Fish fingers										
1	2.96	2.32	8.52	50.98	2.25	2.18	3.10	1.36	6.71	1.87
2	3.31	2.59	9.53	56.97	2.51	2.43	3.46	1.52	7.50	2.09
3	3.65	2.87	10.53	62.97	2.77	2.69	3.83	1.68	8.29	2.31
4	4.00	3.14	11.53	68.97	3.04	2.95	4.19	1.84	9.08	2.53
Chocolate										
1	0.98	1.05	3.85	16.93	1.12	N/A	N/A	N/A	N/A	N/A
2	1.09	1.17	4.30	18.92	1.25	N/A	N/A	N/A	N/A	N/A
3	1.21	1.30	4.76	20.91	1.38	N/A	N/A	N/A	N/A	N/A
4	1.32	1.42	5.21	22.90	1.51	N/A	N/A	N/A	N/A	N/A
Yoghurt										
1	N/A	N/A	N/A	N/A	N/A	1.70	1.70	1.70	7.55	1.70
2	N/A	N/A	N/A	N/A	N/A	1.90	1.90	1.90	8.44	1.90
3	N/A	N/A	N/A	N/A	N/A	2.10	2.10	2.10	9.33	2.10
4	N/A	N/A	N/A	N/A	N/A	2.30	2.30	2.30	10.22	2.30

Source: Authors' own elaboration based on Statista.com

3.2.7 Example of how the online experiment was run

In this section we present how the online survey was implemented in practice. Following a set of screening questions, consumers would see two mock FOP images of the package, containing the identical product²². Depending on the treatment, consumers would see these images either simultaneously or consecutively and for longer or shorter time. The consumers would then be asked to declare whether they believed the packages and products inside were the same or different. If they declared that the products were different, they would be asked which product characteristics they believe to differ between the two products (Figure 6). Consumers faced these questions twice per product for the five products (10 questions in total). The sub-group of choice cards presented, the order of types of products, and the order (in case of the sequential treatment) or position (in the case of the simultaneous treatment) of each pair of products were randomized between individuals. After this, the consumers were presented with the DCE. In the DCE the product versions were shown side-by-side and also included the different prices. Consumers would then be asked to choose which version they would purchase, including a no-buy option. Again, the block of the choice set, the order of products and the position

²² As mentioned in section 3.2.2, consumers saw only the images of the packages without any actual information about the product or its composition (except for price and weight in the DCE). Therefore, all differences that consumers report are driven exclusively by what is shown (or not) on the package not by any additional information about product content.

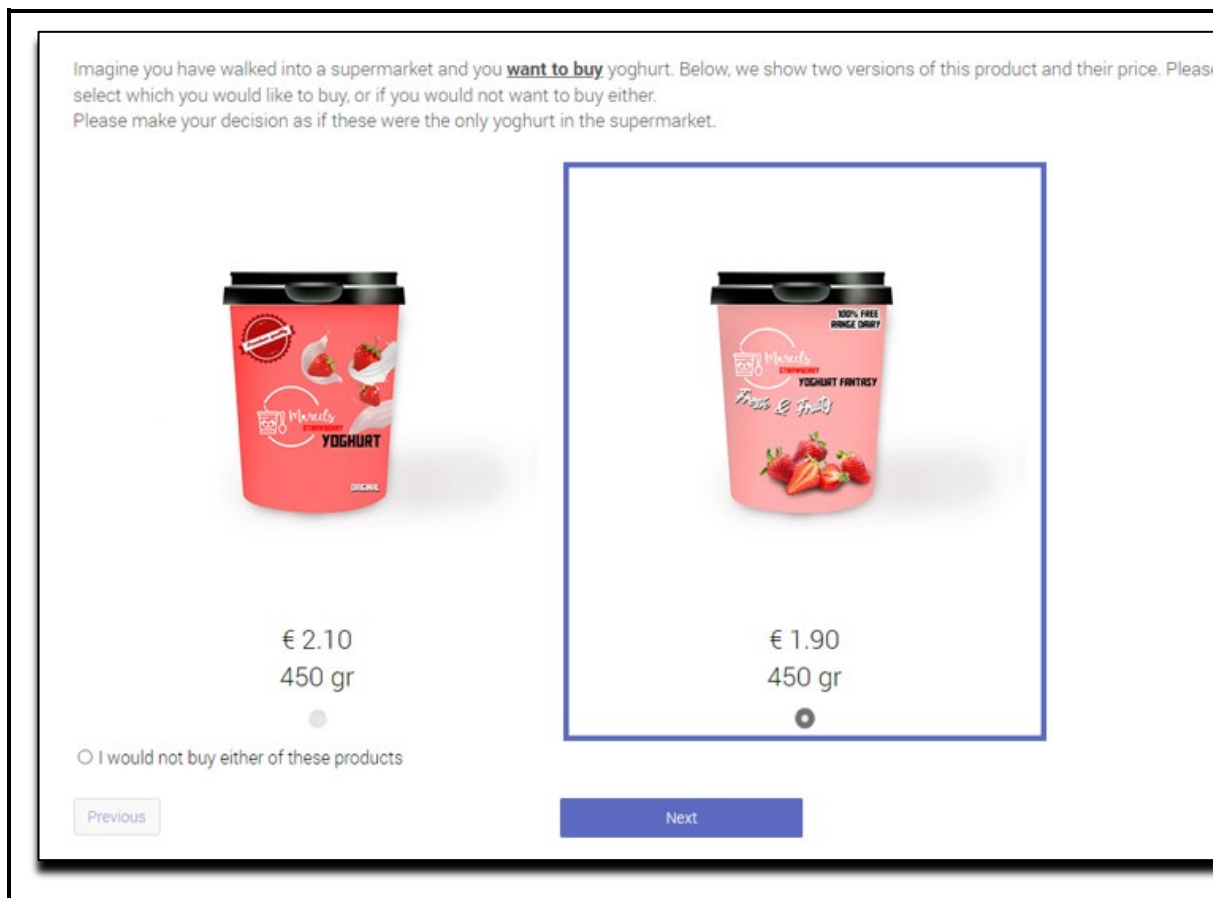
of the product versions were randomized. The consumer would face ten choice cards, two for each of the five products (Figure 7). At the end, the consumer responded to some follow up questions.

Figure 6. Visualisation of the questions in Part 2 of the online experiment on consumer perceptions

The figure displays three sequential screenshots of an online experiment interface. Each screenshot is contained within a light gray rounded rectangle with a thin black border. The first screenshot shows a question: "In your opinion, the two packages of yoghurt that you have just seen are:". Below the question are two radio button options: "DIFFERENT" (which is selected) and "THE SAME". At the bottom of the screenshot are two buttons: "Previous" on the left and "Next" on the right. The second screenshot shows a follow-up question: "You have answered that the packages you just saw were DIFFERENT. Would you expect the yoghurt to be:". Below this are two radio button options: "DIFFERENT" and "THE SAME" (which is selected). It also features "Previous" and "Next" buttons at the bottom. The third screenshot asks: "In which of the following characteristics do you expect the yoghurt to be different? Please note that in this question we are interested in the product properties, not in the characteristics of packaging. Multiple answers are possible." Below the question is a list of nine characteristics, each with an unchecked checkbox and a small blue information icon: "Origin of ingredients", "Quality", "Nutritional composition", "Taste", "Ingredients", "Healthiness", "Sustainability", "Place of production", and "Other". There is also a "Don't know" option at the bottom of the list. "Previous" and "Next" buttons are located at the bottom of the screenshot.

Source: NV Ipsos Platform

Figure 7. Visualisation of the questions in Part 3 of the online experiment on consumer choices



Source: NV Ipsos platform

3.3 Econometric analyses

Logistic regression models were used to analyse the responses regarding difference between packages and products. These models make it possible to identify the effect of differences in the FOP elements of seemingly identical branded food products on consumers' perceptions, controlling for demographic characteristics such as age, gender, income level, country, lifestyle variables, shopping priorities and experimental treatments. We have three dependent variables:

- whether consumers declare they see / perceive packages as different,
- whether consumers believe the products are different versions of the same product,
- if they declare they believe that these two versions of the same product are different, for which specific characteristics (composition, healthiness, etc.) consumers expect the product versions to differ.

We specified logistic regression models in which the dependent variable Y_i is a binary variable that takes the value of 1 or 0. When analysing package perceptions, it takes the value of 1 if respondent i declares the packages to be different and 0 if the respondent declares the packages to be the same. When analysing product perceptions, it takes the value of 1 if respondent i declares the same product in different packages to be different and 0 if the respondent declares they are the same. Finally, when analysing expectations about product characteristics, it takes the value of 1 if respondent i declares that the versions of the products differ in the specific product characteristic (e.g. ingredient composition) and 0 if the respondent declares the versions of the product to be the same in that characteristic.

$$\log\left(\frac{P(Y_i)}{1 - P(Y_i)}\right) = \beta_{0,i} + \beta_{1,i} \text{Attributes} + \beta_{2,i} \text{Product} + \beta_{3,i} \text{Primed} + \beta_{4,i} \text{Simultaneous} + \beta_{5,i} \text{Longer - time} + \beta_{k,i} X_k \quad [1]$$

where P is the probability that an observation of the variable Y is 1 (also called the 'success probability;'). The independent variables are *Attributes*, representing the alternative variables used to capture the differences in packaging elements between pairs of product versions (see Annex 6 for details on variables and models), *Product* is the product type, and *Primed*, *Simultaneous* and *Longer - time*, are the situational treatments, taking the value of 1 if the treatment is applied or 0 otherwise. Finally, $X_{k,i}$ is the set of continuous and categorical control variables, including dummy countries, respondents' socio-demographic and lifestyle characteristics, and their buying priorities. Solving the probability equation [1] results in:

$$P = \frac{1}{1 + e^{-(\beta_{0,i} + \beta_{1,i} \text{Attributes} + \beta_{2,i} \text{Product} + \beta_{3,i} \text{Primed} + \beta_{4,i} \text{Simultaneous} + \beta_{5,i} \text{Longer-time} + \beta_{k,i} X_k)}} \quad [2]$$

Margin or marginal effects are statistics calculated from predictions of a previously fitted model at fixed values of some covariates and averaging or otherwise integrating over the remaining covariates. We can calculate the predictive margin or probability of $Y_i = 1$ for each level of *Attributes*. In addition, we can calculate the predictive margin for each value of *Attributes* when the rest of variables are set to specific values (e.g. country = 1, *Number of FOP differences* = 2).

Responses to the follow-up question on degree of difference together with the binary variable of perceiving the package as equal or different are modelled using an ordered logistic regression model.

$$\log(P(Y_i \leq j)) = \beta_{0,i} + \beta_{1,i} \text{Attributes} + \beta_{2,i} \text{Product} + \beta_{3,i} \text{Primed} + \beta_{4,i} \text{Simultaneous} + \beta_{5,i} \text{Longer - time} + \beta_{k,i} X_k \quad [3]$$

where j ($= 1 \text{ to } J$) is the value of our ordered dependent variable. The variable is constructed merging the binary and ordered responses. For respondents declaring they perceive the packages as the same it takes a value of 0, and for those declaring that they perceived them as different it takes values one to five capturing the degree to which differences in packaging are perceived with one being slightly different and five very different.

For the DCE data, we used a conditional logit (CL) model. In the current study a respondent r from country $s \in S$, in any of the 12 choice situations $t \in T$ for product $p \in P$, chooses his/her preferred alternative in the presence or absence of a specific element $l \in L$ among two possible alternatives. Thus, the respondent's utility from alternative $l \in L$ can be written as:

$$U_{r,t,l}^{s,p} = \beta_l^{s,p} X_l^{s,p} + \alpha^{s,p} p_l^{s,p} + \varepsilon_{r,t,l}^{s,p} \quad [4]$$

where X represents a product with a product-specific list of attributes (FOP elements and price). P to the price vector. β_l are the coefficients to be estimated and $\varepsilon_{r,s,l}^{s,i,p}$ are the unobserved error term assumed to be Gumbel-distributed.

Using the estimated parameters average WTP for each attribute is given by the ratio of the attribute coefficient, $\beta_l^{s,p}$, and the price coefficient $\alpha^{s,p}$ following equation [5].

$$WTP^{s,p} = \beta_l^{s,p} / \alpha^{s,p} \quad [5]$$

The WTP measures in [5] represent the average price premium (or price discount if the WTP is negative) that consumers are willing to pay for the presence of a specific attribute in the package²³.

Table 12 summarises the dependent and independent variables of our analysis (see Annex 6 for definition of variables definition and details of the model specifications).

Table 12. Dependent and independent variables

Dependent variables	Independent variables	Controls
Package different? Product versions different?	<ul style="list-style-type: none"> — Number of FOP differences — Individual FOP elements (e.g. origin claim) — Combinations of FOP elements 	Country, age, gender, income, lifestyle, purchase priorities, products
If product versions different, in what? (ingredients, origin, etc.)	<ul style="list-style-type: none"> — Number of FOP differences — Individual FOP elements (e.g. origin claim) — Combinations of FOP elements 	Country, age, gender, income, lifestyle, purchase priorities, products
Which product version would you buy?	<ul style="list-style-type: none"> — Individual FOP elements (e.g. origin claim) — Price 	None

Source: Authors' own elaboration

²³ WTP is the answer to the following question: 'If we add/change an attribute, by how much do we need to increase the price of the underlying product to make someone equally likely to buy it (compared with a situation without the change)?'

4 Results

In this section we present the results of the analysis of the data collected in the online experiment. First, we report estimates of the impact of FOP elements on consumer perception of differences between product versions. This analysis allows us to identify which differences in FOP elements (or combinations thereof) lead consumers to perceive packages, and the product versions inside the package as the same or different, and how consumers' socio-demographic and lifestyle characteristics and product awareness may affect the results. We also test whether the changes to the choice architecture in the experiment affected results (see Section 3.2.1). Second, this section analyses the relationship between consumer expectations about specific product characteristics and the differences in the individual FOP elements or combinations thereof. Finally, the section analyses the impact of FOP attributes on consumer preferences and choices related to differences between seemingly identical food products.

4.1 Sample description

A total of 20,133 respondents answered the online survey, with an even distribution across EU countries as planned in the data collection design (Table 13). The overall sample was relatively balanced concerning gender and age. The Polish and French samples comprised slightly more females than the rest, while the Austrian, Romanian and the Spanish samples were slightly skewed towards more male respondents. Moreover, the very high income bracket is the most represented in all countries, especially in Romania, and the low or very low income brackets are the least represented, again especially in Romania. Most households have two adults, with percentages ranging from 52.6% in Italy to 62.4% in France, and a vast majority of households do not have any children. The differences between countries are significant for all characteristics presented in Table 13.

In general, a majority of participants in all countries have not lived abroad. Czechia and the Netherlands stand out as the countries where participants have lived in another country the least. However, Czechia, the Netherlands, Romania and Austria, stand out as having the most participants who have visited other countries, along with Austria (Table 14).

Table 13. Sample socio-demographic characteristics

	CZ	DE	ES	FR	IT	LT	NL	AT	PL	RO	Total
Total sample	2,032	2,007	2,008	2,005	2,004	2,022	2,008	2,008	2,019	2,020	20,133
Gender***											
Female (%)	50.1	52.4	48.0	54.2	52.3	54.0	52.8	47.4	54.3	48.7	51.4
Male (%)	50.0	47.6	52.0	45.8	47.8	46.0	47.2	52.6	45.7	51.3	48.6
Age group (years)***											
18-34 (%)	22.2	21.7	23.3	24.6	21.1	30.7	24.1	27.5	26.8	26.7	24.9
35-54 (%)	38.0	32.4	40.8	33.5	35.5	38.6	33.2	37.2	36.0	43.1	36.8
55-65 (%)	17.1	20.1	18.4	18.3	19.0	21.4	19.1	20.1	18.8	18.1	19.1
>65 (%)	22.7	25.7	17.5	23.5	24.4	9.3	23.7	15.2	18.5	12.1	19.3
Income group***											
Very low income (%)	7.5	13.1	5.8	10.3	4.7	6.1	10.8	18.1	3.9	2.1	8.2
Low income (%)	6.9	9.8	7.2	9.2	11.9	8.5	8.8	11.9	4.4	2.5	8.1
Medium income (%)	7.6	11.5	17.0	12.5	16.7	10.4	13.4	14.3	7.5	3.9	11.5
High income (%)	14.8	16.6	16.8	17.6	18.7	19.2	14.2	16.8	14.8	11.5	16.1
Very high income (%)	55.6	40.6	44.7	41.6	35.4	44.3	33.3	27.3	59.7	74.1	45.7
Prefer not to answer (%)	6.1	7.3	6.3	7.0	9.9	9.8	15.1	9.7	7.0	4.1	8.2
Don't know (%)	1.5	1.3	2.1	1.9	2.7	1.7	4.5	1.9	2.8	1.8	2.2
Household's number of adults (age 18+)***											
1 adult (%)	21.0	31.2	10.3	22.1	13.6	21.2	29.3	28.1	12.6	12.3	20.2
2 adults (%)	60.0	57.0	56.7	62.4	52.6	57.9	55.8	54.1	59.2	57.9	57.4
>2 adults (%)	19.0	11.8	33.0	15.4	33.8	20.9	14.9	17.8	28.2	29.8	22.5
Household's number of children (age 6-17)***											
No children 6-17 (%)	77.4	81.6	68.4	73.8	74.3	72.8	81.9	80.6	70.9	73.8	75.5
1 child 6-17 (%)	14.2	13.7	21.5	15.4	16.0	17.3	10.7	12.8	19.9	19.5	16.1
2 children 6-17 (%)	7.5	3.8	9.3	8.7	8.2	8.3	6.0	5.5	8.1	6.0	7.2
>2 children 6-17 (%)	0.8	0.9	0.8	2.1	1.6	1.6	1.5	1.1	1.1	0.7	1.2
Household's number of children (age 0-5) ***											
None child 0-5 (%)	85.6	91.9	88.8	90.0	90.8	89.8	92.2	90.0	83.6	90.7	89.3
1 child 0-5 (%)	11.1	6.7	9.4	7.8	8.0	8.0	6.2	8.1	13.3	8.2	8.7
2 children 0-5 (%)	3.2	1.1	1.6	2.0	1.2	1.8	1.4	1.3	2.9	0.8	1.7
>2 children 0-5 (%)	0.2	0.4	0.2	0.2	0.1	0.5	0.2	0.6	0.2	0.3	0.3

Note: CZ: Czechia, DE: Germany, ES: Spain, FR: France, IT: Italy, LT: Lithuania, NL: Netherlands, AT: Austria, PL: Poland; RO: Romania, ***p<.01; p-values are the result of Chi-square tests of independence of a categorical variable (e.g. age) across countries, indicating whether they are likely to be related or not. The Null hypothesis is that they are independent. Please note that differences across countries are to be expected as the populations from which the samples are extracted are not necessarily the same (e.g. the age structure is not the same in Latvia and Austria).

Source: Authors' own elaboration

Table 14. Sample lifestyle characteristics (per cent per country and totals)

	CZ	FR	DE	ES	IT	LT	NL	AT	PL	RO	Total
Total sample	2,032	2,005	2,007	2,008	2,004	2,022	2,008	2,008	2,019	2,020	20,133
Lived abroad (>1 month continuously)***											
Yes (%)	20.0	22.8	25.6	28.4	23.6	38.6	23.0	37.9	26.4	28.1	27.4
No (%)	80.0	77.2	74.4	71.6	76.4	61.4	77.0	62.1	73.6	71.9	72.6
Number of countries visited in a regular year											
None (%)	23.0	48.5	34.6	38.6	38.7	29.9	24.7	20.8	46.1	23.4	32.8
One or two (%)	64.5	46.0	57.8	55.6	54.0	59.1	62.1	61.4	48.0	63.4	57.2
More than two (%)	12.5	5.4	7.6	5.8	7.3	11.0	13.3	17.8	5.9	13.2	10.0
Purchased food in supermarket or similar shop in another European country***											
Yes (%)	61.1	45.9	54.7	54.4	49.0	67.7	60.0	73.0	52.0	68.3	58.6
No (%)	38.9	54.1	45.3	45.6	51.0	32.3	40.0	27.0	48.0	31.7	41.4
Noticed differences (other than the language) in the food packaging across countries***											
Yes (%)	73.4	66.0	58.2	65.7	74.9	62.6	61.9	64.3	61.9	81.5	67.1
No (%)	26.6	34.0	41.8	34.3	25.1	37.4	38.1	35.7	38.1	18.5	32.9

Note: CZ: Czechia, DE: Germany, ES: Spain, FR: France, IT: Italy, LT: Lithuania, NL: Netherlands, AT: Austria, PL: Poland; RO: Romania, ***p<.01; p-values are the result of Chi-square tests of independence of a categorical variable (e.g. having lived abroad) across countries, indicating whether they are likely to be related or not. The Null hypothesis is that they are independent. Please note that differences across countries are to be expected as the populations from which the samples are extracted are not necessarily the same (e.g. the share of people having lived abroad is not the same in Spain and the Netherlands).

Source: Authors' own elaboration

The frequency of purchase of the selected food products varies by the type of product and country (**Table 15**). Baby food and instant coffee are the least frequently purchased products while yoghurt and chocolate are the most frequently purchased ones. For example, baby food is rarely or never purchased by 93% of the sample in Lithuania and 91% in the Netherlands. In contrast, yoghurt is regularly purchased by 89% of respondents in Spain and 80% in Poland.

Table 15. Sample frequency of purchase of the selected food products (per cent of total sample) and countries with the highest and lowest percentages of purchase frequency categories

	Percentage	Countries with lowest percentage	Countries with highest percentage
Instant coffee (N=20,133)			
Never/rarely	54.7	Poland (34%); Spain (35%)	Netherlands (73%); Austria (70%)
From time to time	22.6	Netherlands (12%); Germany (15%)	Czechia (35%); Poland (32%)
Regularly	22.7	Netherlands (15%); Austria (15%)	Spain (36%); Poland (34%)
Crisps (N=20,133)			
Never/rarely	24.2	Spain (14%); Netherlands (18%)	Germany (33%); Lithuania (32%)
From time to time	30.8	Netherlands (23%); Italy (26%)	France (36%); Romania (35%)
Regularly	45.0	Lithuania (34%); Germany (38%)	Netherlands (59%); Spain (59%)
Baby food (N=20,133)			
Never/rarely	85.9	Czechia (76%); Poland (78%)	Lithuania (93%); Netherlands (91%)
From time to time	5.8	Lithuania (2%); Netherlands (3%)	Czechia (13%); Poland (9%)
Regularly	8.3	Lithuania (5%); Netherlands (6%)	Poland (11%); Italy (10%)
Fish fingers (N=20,133)			
Never/rarely	49.0	Italy (29%); Austria (42%)	Czechia (60%); Lithuania (58%)
From time to time	28.8	Netherlands (25%); France (27%)	Germany (34%); Austria (34%)
Regularly	22.3	Czechia (12%); Lithuania (14%)	Italy (43%); Spain (28%)
Chocolate (N= 10,069)			
Never/rarely	18.1	Romania (11%); Czechia (12%)	France (36%); Austria (17%)
From time to time	29.9	Italy (25%); Romania (29%)	Czechia (37%); Austria (30%)
Regularly	52.0	France (35%); Czechia (51%)	Italy (61%); Romania (60%)
Yoghurt (N=10,064)			
Never/rarely	7.2	Spain (3%); Poland (5%)	Lithuania (11%); Netherlands (9%)
From time to time	14.4	Spain (8%); Netherlands (13%)	Lithuania (22%); Poland (15%)
Regularly	78.3	Lithuania (67%); Netherlands (78%)	Spain (89%); Poland (80%)

Source: Authors' own elaboration

Consumers' values and related priorities can affect packaging perceptions, inferences about the product, and purchasing decisions when shopping for food. Respondents were asked to declare the three most important criteria that affected their food purchases from a list of 10 items (see Annex 3). Table 16 shows consumer priorities for food purchases as reported by respondents. As expected, the fundamental criterion when purchasing food is price in nearly all countries (exceptions being Germany and the Netherlands), followed by taste in almost all countries except for Italy; where the second most important criterion is origin. Then it seems that some countries value the origin of the ingredients more, such as Austria and France, while the others value healthiness more. Surprisingly, with differences between countries, the least valued criteria are sustainability (ranging from 3.7% in Romania to 20.2% in Austria) and fair trade (ranging from 3.0% in Czechia to 15.8% in Austria).

Table 16. Consumer priorities for food purchases by country (% of respondents)

	Country (%)										Total
	CZ	DE	ES	FR	IT	LT	NL	AT	PL	RO	
Price	74.5	60.6	60.4	60.1	52.5	73.4	71.9	61.1	64.9	59.2	63.9
Composition (ingredients)	53.2	38.0	37.6	49.4	42.8	48.1	35.3	32.3	55.8	49.7	44.2
Healthiness	28.4	29.1	48.5	19.3	27.5	39.3	45.2	30.1	32.8	46.0	34.6
Sustainability	6.2	18.4	11.4	6.6	12.9	5.1	14.5	20.2	7.2	3.7	10.6
Taste	61.9	67.7	48.9	51.9	41.0	61.2	72.6	58.9	53.5	54.5	57.2
Brand	18.9	17.7	15.4	18.6	20.9	11.3	21.9	16.0	17.4	21.3	17.9
Nutritional composition	16.2	19.5	30.5	24.1	21.8	36.5	10.8	13.8	33.1	22.2	22.9
Fair trade	3.0	12.7	7.4	7.5	6.44	4.5	9.7	15.8	4.4	5.2	7.6
Origin of ingredients	12.6	25.8	25.3	40.2	43.8	10.8	13.7	35.1	19.6	22.7	24.9
Place of production	25.3	10.5	14.9	22.1	30.4	9.7	4.5	16.7	11.3	15.6	16.1

Note: CZ: Czechia, DE: Germany, ES: Spain, FR: France, IT: Italy, LT: Lithuania, NL: Netherlands, AT: Austria, PL: Poland; RO: Romania. Columns add up to more than 100 as respondents could choose three factors affecting food purchases.

Source: Authors' own elaboration

Looking by age group (Table 17), although all differences are statistically significant, the criteria of price, sustainability, and taste stand out as more important for younger consumers. In contrast, the origin of the ingredients and the place of production seem to be more important for older consumers.

Table 17. Consumer priorities for food purchases by age group (% of respondents)

	Age group (%)				Total
	18-34	35-54	55-65	>65	
Price	68.5	64.8	61.9	58.0	63.9
Composition (ingredients)	39.8	46.1	46.1	44.5	44.2
Healthiness	31.3	35.1	35.9	36.6	34.6
Sustainability	13.3	9.6	9.5	10.2	10.6
Taste	60.8	58.9	57.1	49.5	57.2
Brand	20.0	18.7	15.8	15.9	17.9
Nutritional composition	22.5	23.1	23.4	22.5	22.9
Fair trade	9.2	6.7	6.8	8.3	7.6
Origin of ingredients	21.8	22.7	26.4	31.7	24.9
Place of production	12.7	14.3	17.2	22.9	16.1

Note: columns add up to more than 100 as respondents could choose three factors affecting food purchases.

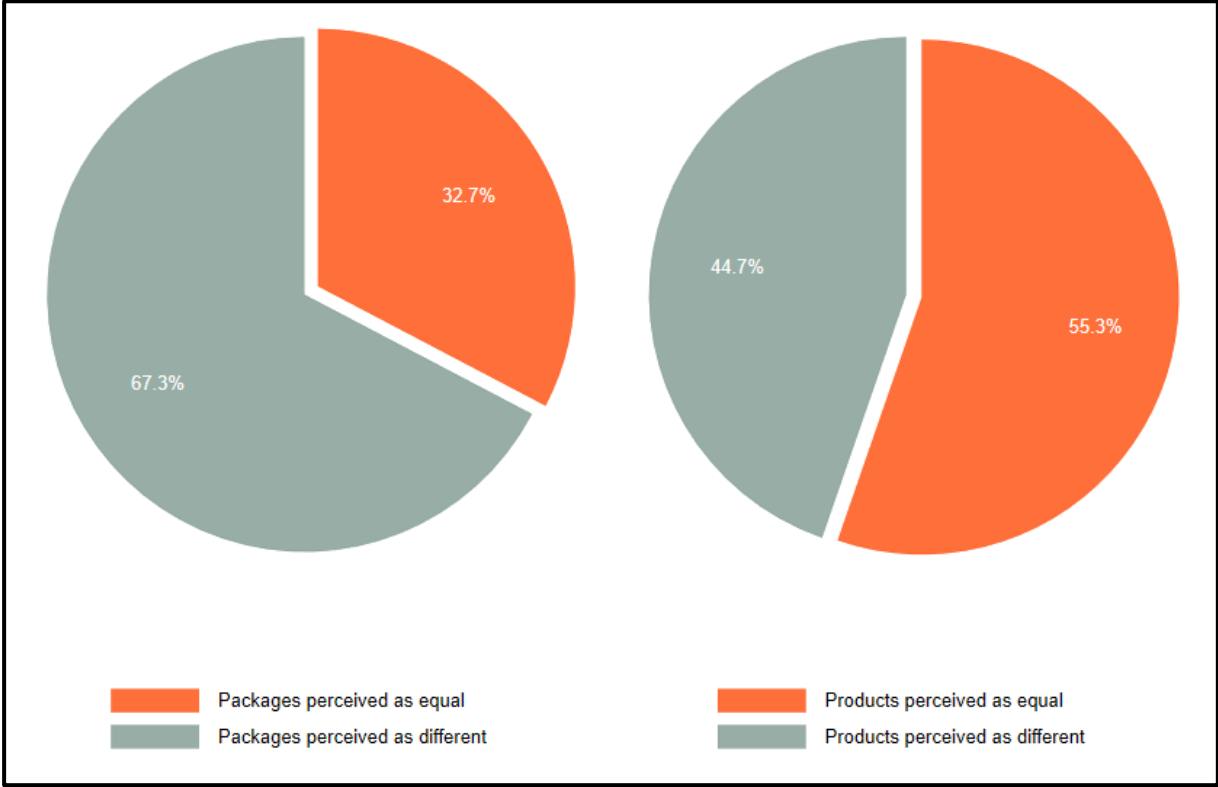
Source: Authors' own elaboration

4.2 Perception of package and product differences - descriptive statistics

4.2.1 Overall consumer perceptions

Pooling all choices together (10 per individual), consumers declared that they perceive the package as different more often than the same. In approximately two out of three comparisons assessed, consumers considered that the two versions of the package presented were different (Figure 8). As the package was different in at least two of the eight FOP elements analysed; these results confirm that on a majority of occasions consumers were capable of identifying these differences. After being asked whether the packaging was the same or different, consumers were asked whether they thought the product versions inside the package were the same or different. In this case, only less than half of the sample considered that the product versions inside the two packages presented were different, even when packaging differences had been observed (Figure 8).

Figure 8. Share of respondents who perceive the packages (left) and the product versions (right) as the same or different (%)

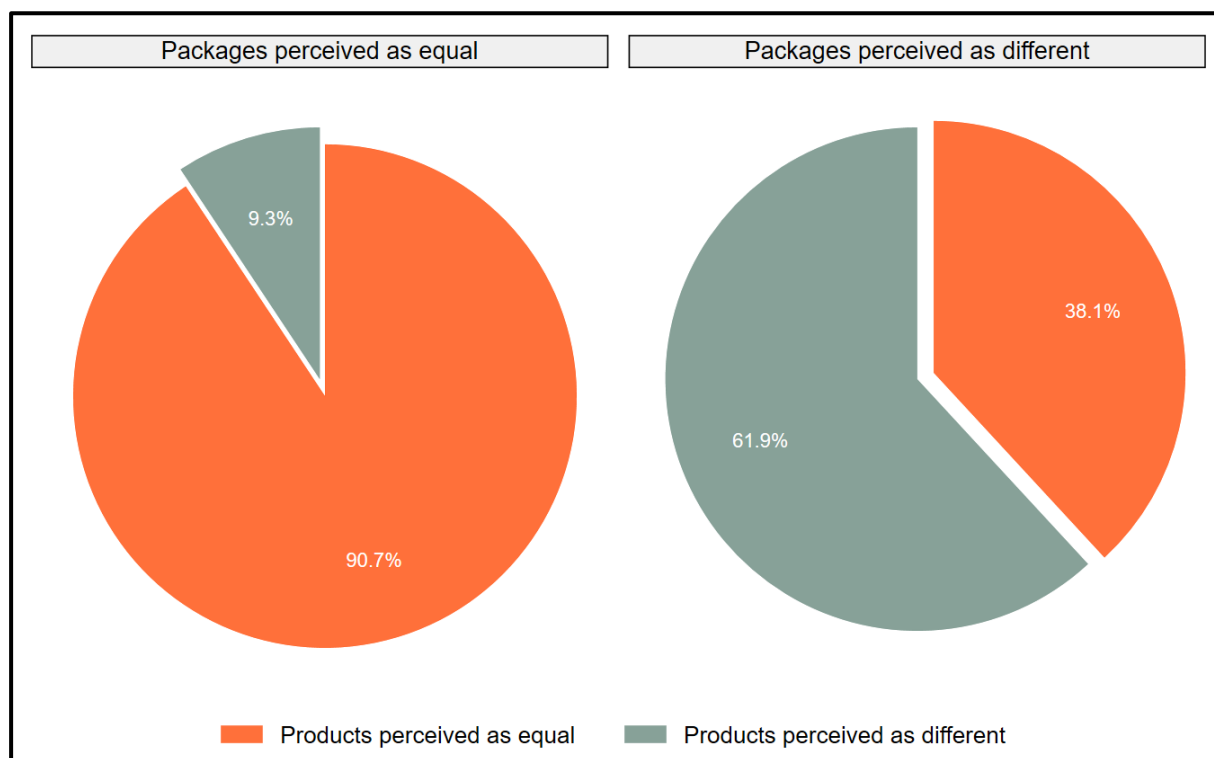


Source: Authors' own elaboration

Considering the responses about perceptions of the package and product version, results from a Chi-squared test²⁴ (Table 18) confirm that the two perception variables are significantly correlated. There is a correlation between consumers' perception of package version and product version (content of the package). In more than nine out of 10 cases, if consumers perceived the packaging as the same, they considered that the products inside the packages would also be the same (Figure 9 and Table 18), signalling that consumers respond consistently to both questions. On the other hand, if respondents perceived the package as different, the difference in packaging lead them to consider the products different in nearly two out of three cases (61.9%).

²⁴ Chi2 tests are statistical tests examine whether two categorical variables are independent or not.

Figure 9. Percentage of respondents declaring they perceive the product version as the same or different by their perception of the package as the same or different



Source: Authors' own elaboration

Table 18. Cross-tabulation of responses to perceptions of package and product versions as different of the same

Product version perception	Package perception		
	The same	Different	Total
The same (n)	59,670	51,672	111,342
%	90.7	38.1	55.3
% of total sample	29.6	25.7	55.3
Different (n)	6,138	83,850	89,988
%	9.3	61.9	44.7
% of total sample	3.0	41.6	44.7
Total (n)	65,808	135,522	201,330
%	100.0	100.0	100.0
% of total sample	32.7	67.3	100.0

Chi squared value is = 49477.97; p-value < 0.001

Source: Authors' own elaboration

The other two combinations of responses represent cases where perceptions of packaging and product versions are not consistent. These patterns represent 29% of the comparisons made and includes two possible combinations. First, some consumers consider that even when the packaging is seen as identical, the product versions inside the packages differ. This pattern covers a relatively small share of responses (6,138 cases representing 3% of all choices). It represents a behaviour that does not seem rational, as there is no reason to believe that in two identical packages one can find different product versions²⁵. Reasons behind these responses may be related to errors in the first response (i.e. they responded that it was the same even when they thought it was different). We further analyse these responses to better understand what is behind them. Considering that participants made repeated choices²⁶, the response patterns for package and products can be the result of

²⁵ Some stakeholders raise the argument that consumers were aware that different product versions were sold in different countries with identical or very similar packaging. This does not seem to be the case (fewer than 10% of consumers show this response pattern).

²⁶ As mentioned in section 3, each consumer faced two choices for five products. The ordering of the products was random across consumers.

learning effects²⁷. We analyze the responses for each of the 10 choices for those who declared the package to be the same (Table 19). We can see that the percentage of inconsistent choices falls from 17.3% in the first choice to 7% in the fifth and subsequent choices. Then we isolated the first choice and analyzed the results independently from the subsequent nine where learning effects could be present. Comparing the two results (Figure 10) it is possible to detect some learning effects between the first and the following choices, with a decrease of nine percentage points (more than 50%) in the share of inconsistent choices. This difference is statistically significant (Table 20).

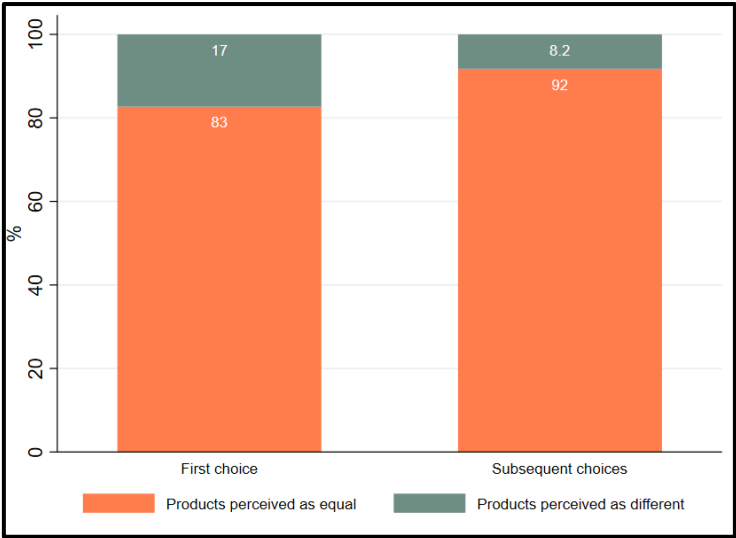
Table 19. Number and share of respondents who perceive the product versions as the same or different when the packaging was perceived as the same by the order of choices

Products perceived as:	Choice										Total
	1	2	3	4	5	6	7	8	9	10	
The same (n)	6,550	5,461	6,150	5,824	5,948	5,798	5,944	5,873	6,065	6,057	59,670
%	82.7	89.5	91.5	91.4	92.4	91.8	92.3	92.2	92.5	92.2	9067
Different (n)	1,370	638	574	549	493	518	496	499	490	511	6,138
%	17.3	10.5	8.5	8.6	7.7	8.2	7.7	7.8	7.5	7.8	9.3
Total (n)	7,920	6,099	6,724	6,373	6,441	6,316	6,440	6,372	6,555	6,568	65,808
%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Chi squared value = 725.979; p-value < 0.001

Source: Authors' own elaboration

Figure 10. Share of respondents who perceive the product versions as the same or different when the package was perceived as the same by the ordered choices (%).



Source: Authors' own elaboration

²⁷ Learning effects imply that the degree of randomness in the responses is larger in initial choice situations than in subsequent ones because respondents become more and more familiar with the choice context, the offered good, or the choice task (Meyerhoff and Glenk, 2015).

Table 20. Number and share of respondents who perceive the product versions as the same or different when the package was perceived as the same by the ordered choices (% of respondents and number of respondents).

		Choice		
		First	Subsequent	Total
The same (n)		6,550	53,120	59,670
	%	82.7	91.8	90.7
Different (n)		1,370	4,768	6,138
	%	17.3	8.2	9.3
Total (n)		7,920	57,888	65,808
	%	100.0	100.0	100.0

Chi squared value = 449.851; p-value < 0.001

Source: Authors' own elaboration

The analysis confirms that the proportion of respondents stating that the product is different when they have seen no differences in the package is higher in the first choice than in subsequent choices and mainly decreases as the number of choices undertaken increases (Table 19 and Table 20). This supports the hypothesis that the mismatch between responses could be errors. To further confirm this hypothesis we check whether the type of response is related to the treatments implemented. Notably, while being primed or not and watching the images for a longer or shorter time has no effect, it seems that when viewing the images sequentially, there is slightly more tendency to see the products as different even when consumers declare that the package is the same. Given that the probability of seeing products as different when declaring packages to be the same systematically decreases as choices progress and that this pattern seems more prevalent when consumers see the packages sequentially we exclude these observations from the analysis.

Table 21. Number and share of respondents who perceive the product versions as the same or different when the package was perceived as the same by treatment

Product perceived as:		Treatments					
		Primed		Presentation of packages		Time for which packages are shown	
		No	Yes	Sequential	Simultaneous	Short	Long
The same (n)		29,197	30,473	32,218	27,452	30,494	29,176
	%	90.7	90.6	90.4	91.0	90.7	90.6
Different (n)		2,981	3,157	3,407	2,731	3,117	3,021
	%	9.3	9.4	9.6	9.1	9.3	9.4
Total (n)		32,178	33,630	35,625	30,183	33,611	32,197
	%	100.0	100.0	100.0	100.0	100.0	100.0
p-value (Chi-squared test)		0.586		0.0234		0.630	

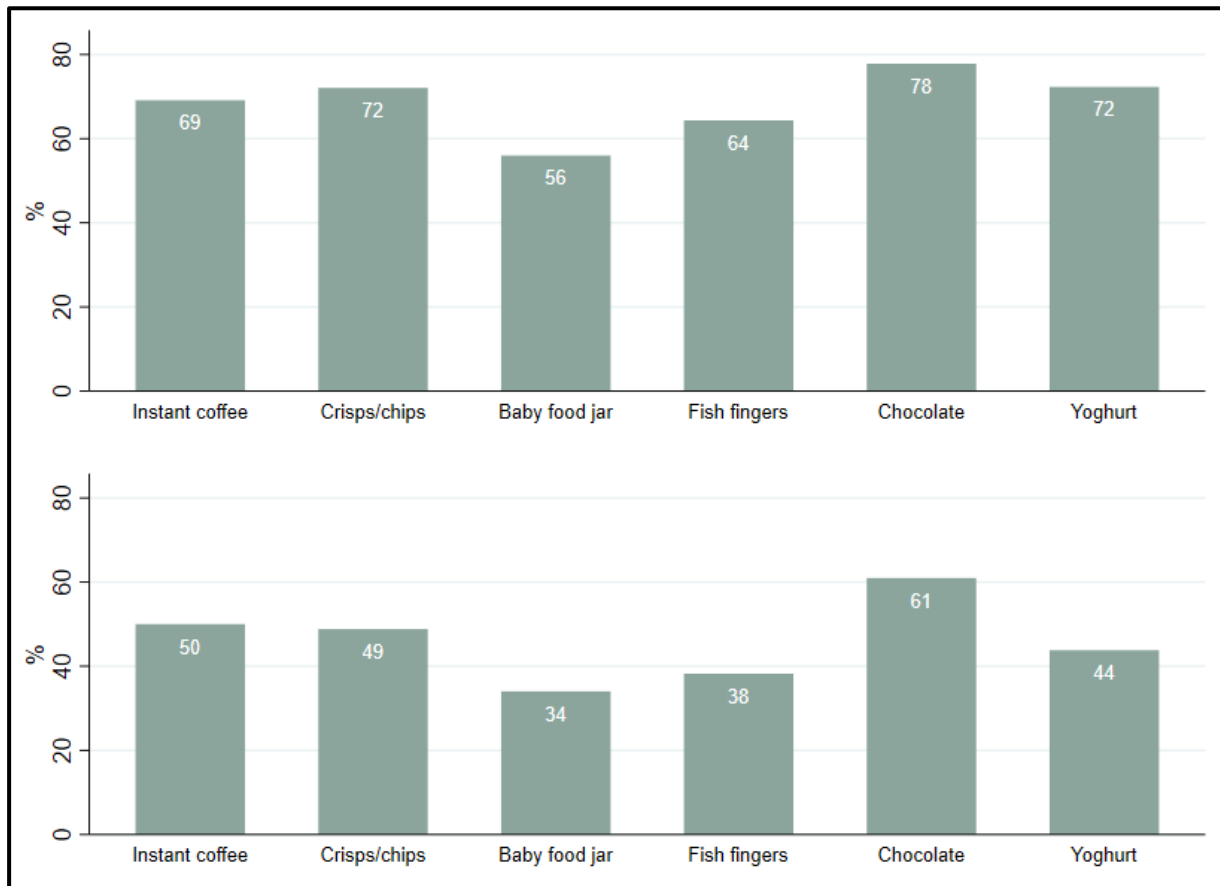
Source: Authors' own elaboration

Secondly, some consumers consider despite perceiving the package as different, that the product versions inside the package are still the same (26% of the total cases, or 38.1% of those declaring they perceive the package as the same). This behaviour is rational and from a policy perspective, it is crucial to detect which FOP elements (or combinations) fail to signal differences in product versions in order to make sure that differences in packaging are sufficient to inform consumers that the product versions are different. Therefore, we retain these observations in the analysis.

4.2.2 Consumer perceptions by product

The pattern described above appears to be consistent across the six products tested but some differences can be detected. For all products most participants declare they perceive the packages as different, heterogeneity in perceptions between products becomes evident with baby food (56%) and fish fingers (64%) as the products for which participants perceive the package to be different less frequently than the average of 67% (Figure 11, top). Focusing on perceptions regarding differences in product versions, only in the case of chocolate more than 50% of consumers perceive the product versions as different (Figure 11, bottom). It should be recalled from the analysis above that, overall, only 44% of consumers perceive the product versions to differ. The differences between products are significant (Table 22 and Table 23)

Figure 11. Share of respondents who perceive the package (above) and the product versions (below) different by product (%)



Source: Authors' own elaboration

Table 22. Number and share of respondents who perceive the package as the same or different by product

	Product						Total
	Instant coffee	Crisps	Baby food	Fish fingers	Chocolate	Yoghurt	
The same (n)	12,433	11,249	17,723	14,358	4,469	5,576	65,808
%	30.9	27.9	44.0	35.7	22.2	27.7	32.7
Different (n)	27,833	29,017	22,543	25,908	15,669	14,552	135,522
%	69.1	72.1	56.0	64.3	77.8	72.3	67.3
Total (n)	40,266	40,266	40,266	40,266	20,138	20,128	201,330
%	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Chi squared value = 4218.155; p-value < 0.001

Source: Authors' own elaboration

Table 23. Number and share of respondents who perceive the product versions as the same or different by product

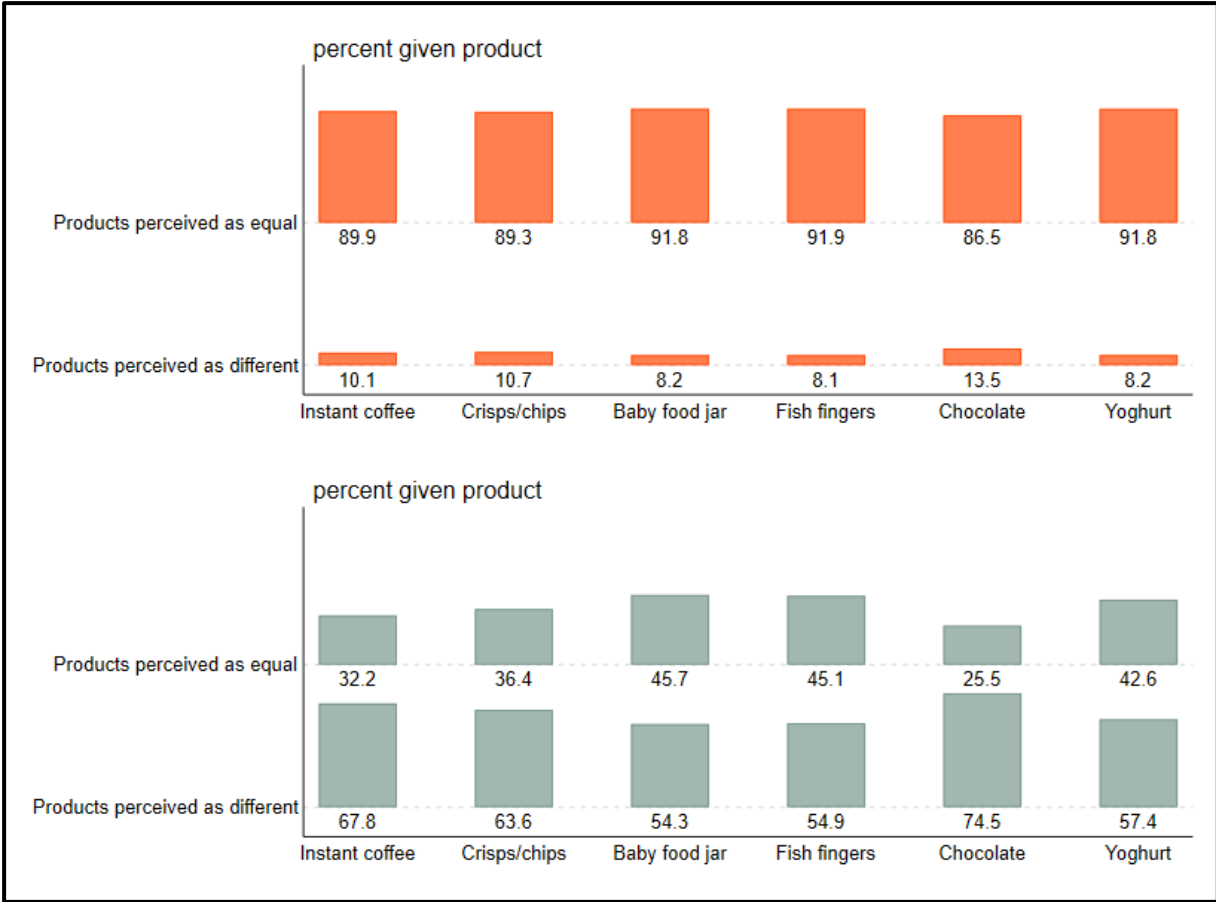
	Product						Total
	Instant coffee	Crisps	Baby food	Fish fingers	Chocolate	Yoghurt	
The same (n)	20,131	20,602	26,566	24,872	7,859	11,312	11,1342
%	50.0	51.2	66.0	61.8	39.0	56.2	55.3
Different (n)	20,135	19,664	13,700	15,394	12,279	8,816	89,988
%	50.0	48.8	34.0	38.2	61.0	43.8	44.7
Total (n)	40,266	40,266	40,266	40,266	20,138	20,128	201,330
%	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Chi squared value = 5439.775; p-value < 0.001

Source: Authors' own elaboration

We also check by product the prevalence of the inconsistent behavior of perceiving packages as the same but declaring that the product versions are different (Figure 12). This behavior seems to be more prevalent for some products than for others. For example, in the case of baby food and fish fingers, there is less expectation that the product versions will be different even if the packages are considered to be different (54.3% and 45.9%, respectively) and also if the package are perceived as the same (8.2% and 8.1% respectively). This could be because these products are the least frequently consumed by our sample (see Table 15). In contrast, in the case of chocolate, 13.5% expect the product version to be different when the packaging is seen as the same.

Figure 12. Share of respondents who perceive the product versions as the same or different conditional to whether they perceive the package as the same (top) or different (bottom) by product (%)



Source: Authors' own elaboration

4.2.3 Consumer perceptions by socio-demographic and lifestyle characteristics

This section further explores the heterogeneity of stated differences in package and product versions with regards to consumer demographic and lifestyle characteristics. We first examine the relationship between sample's demographic and lifestyle characteristics and their perceptions regarding differences in package and product version. We then examine the pattern of responses to both package and product version following the four-class typology discussed above.

Figure 13, compares the responses across countries. Most participants perceived packages as different regardless of product in all countries. The Netherlands and France stand out with 76% and 72% of participants, respectively, perceiving the packages as different. However, the share of respondents that perceive differences in the product versions is lower than for package across all countries. In only three countries (Spain, Italy and Romania), do we observe more than 50% of consumers perceiving the product versions as different. The reported differences between countries are significant for both package and product version assessment (

Table 24 and Table 25).

Figure 13. Share of respondents who perceive the package (top) and the product versions (bottom) as different by country (%)



Source: Authors' own elaboration

Table 24. Number and share of respondents who perceive the package as the same or different by country

	Country										Total
	CZ	DE	ES	FR	IT	LT	NL	AT	PL	RO	
Same (n)	7,663	7,191	6,740	5,661	6,663	6,806	4,872	6,478	7,239	6,495	65,808
%	37.7	35.8	33.6	28.2	33.3	33.7	24.3	32.3	35.9	32.2	32.7
Different (n)	12,657	12,879	13,340	14,389	13,377	13,414	15,208	13,602	12,951	13,705	135,522
%	62.3	64.2	66.4	71.8	66.8	66.3	75.7	67.7	64.2	67.9	67.3
Total (n)	20,320	20,070	20,080	20,050	20,040	20,220	20,080	20,080	20,190	20,200	201,330
%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Chi squared value = 1266.494; p-value < 0.001

Source: Authors' own elaboration

Table 25. Number and share of respondents who perceive the product versions as the same or different by country

	Country										Total
	CZ	DE	ES	FR	IT	LT	NL	AT	PL	RO	
Same (n)	10,293	12,601	9,648	11,470	9,190	11,629	13,150	11,765	12,936	8,660	111,342
%	50.7	62.8	48.1	57.2	45.9	57.5	65.5	58.6	64.1	42.9	55.3
Different (n)	10,027	7,469	10,432	8,580	10,850	8,591	6,930	8,315	7,254	11,540	89,988
%	49.4	37.2	52.0	42.8	54.1	42.5	34.5	41.4	35.9	57.1	44.7
Total (n)	20,320	20,070	20,080	20,050	20,040	20,220	20,080	20,080	20,190	20,200	201,330
%	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Chi squared value = 4673.710; p-value < 0.001

Source: Authors' own elaboration

Focusing on the relationship between assessment of packages and of product versions, Figure 14 compares by country the responses to whether participants perceive the product versions as the same or different conditional to whether they perceive the package as the same or different. Most respondents who perceive the package as the same also perceive the product versions as the same in all countries (ranging from 84.8% to 94.8% of respondents across countries). From a Member State perspective Italy, Romania and Spain show the highest percentages of respondents who perceive the package as the same but believe the product version to be different. Contrastingly, when participants perceive the package as different, there is more variation between countries in responses to whether they also perceive the product versions as different or the same. The Netherlands and Poland stand out as the countries with the fewest participants perceiving the product versions as different (i.e. highest consistency between assessments of product and package), and Czechia and Romania as the countries with the most participants perceiving the products as different when they perceive the packaging as different.

Figure 14. Share of respondents who perceive the product versions as the same or different conditional to whether they perceive the package as the same (top) or different (bottom) by country)



Source: Authors' own elaboration

Next, we explore how consumer perceptions relate to the sample's lifestyle characteristics. Results summarized in Table 26 provide interesting findings. For instance, they show that living in another country for more than one month continuously does not affect consumers' perception of differences in package. In contrast, a greater number of countries visited in a year, and the fact of having purchased food products in another country increases the propensity to perceive differences in packages.

Table 26. Number and share of respondents who perceive the product package as the same or different by different lifestyle characteristics

		Same		Different		Total		p-value
		N	%	N	%	N	%	
Lived more than one month continuously abroad	Yes	17,980	32.6	37,250	67.5	55,230	100.0	.44
	No	47,828	32.7	98,272	67.3	146,100	100.0	
	Total	65,808	32.7	135,522	67.3	201,330	100.0	
Number of countries visited in a normal year	None	22,812	34.5	43,258	65.5	66,070	100.0	<.0001
	One or two	36,768	31.9	78,392	68.1	115,160	100.0	
	More than two	6,228	31.0	13,872	69.0	20,100	100.0	
	Total	65,808	32.7	135,522	67.3	201,330	100.0	
Bought food products in another country	Yes	37,856	32.1	80,164	67.9	118,020	100.0	< 0.001
	No	27,952	33.6	55,358	66.5	83,310	100.0	
	Total	65,808	32.7	135,522	67.3	201,330	100.0	

Source: Authors' own elaboration

Looking at perceptions regarding product versions (Table 27), the following can be mentioned. First, consumers tend to see the products as less different when they have lived abroad. Second, as the number of countries visited in a year increases and third, if they have bought food in another country, the number of consumers who see the products as different increases.

Table 27. Number and share of respondents who perceive the product versions as the same or different by different lifestyle characteristics

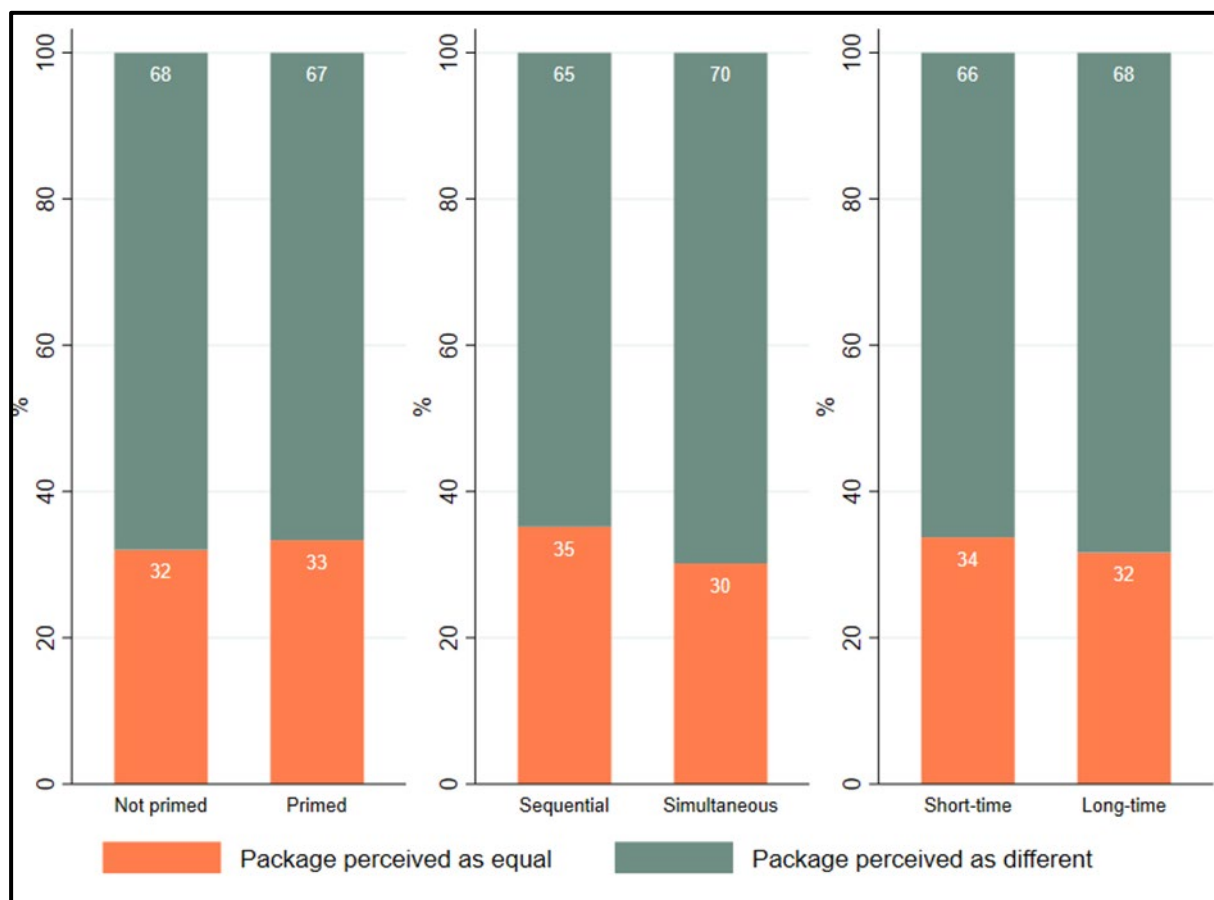
		Same		Different		Total		p-value
		N	%	N	%	N	%	
Lived more than one month continuously abroad	Yes	81,891	56.1	64,209	44.0	146,100	100.0	< .0001
	No	29,451	53.3	25,779	46.7	55,230	100.0	
	Total	111,342	55.3	89,988	44.7	201,330	100.0	
Number of countries visited in a normal year	None	37,233	56.4	28,837	43.7	66,070	100.0	< .0001
	One or two	63,112	54.8	52,048	45.2	115,160	100.0	
	More than two	10,997	54.7	9,103	45.3	20,100	100.0	
	Total	111,342	55.3	89,988	44.7	201,330	100.0	
Bought food products in another country	Yes	46,887	56.3	36,423	43.7	83,310	100.0	< .0001
	No	64,455	54.6	53,565	45.4	118,020	100.0	
	Total	111,342	55.3	89,988	44.7	201,330	100.0	

Source: Authors' own elaboration

4.2.4 Consumer perceptions by experimental treatments

Primed participants (those who have been told to treat the products they will see in the experiment as the branded products from the same category they usually buy) see the package as different less often than non-primed participants. Therefore, it seems that if the brand is known or people are familiar with it, there may be a greater tendency to see product package of the same brand as the same (Figure 15). Therefore, our previous results, which are made considering both priming treatments together, would underestimate the capacity of consumers to identify different packages. In contrast, when people look at the package versions simultaneously, they perceive differences in package more often than those who look at them sequentially. Similarly, those who look at the package versions for a longer time also perceive differences more often (Figure 15). All these differences across treatments are statistically significant (Table 28). However, the effects in percentage points are quite small and probably made statistically significant by the large sample size. Carrying out the analysis by country we see that: i) the priming treatment is significant in four out of 10 countries; ii) the presentation treatment in nine; and iii) the time treatment in seven.

Figure 15. Share of respondents who perceive the package as the same or different by treatment (%)



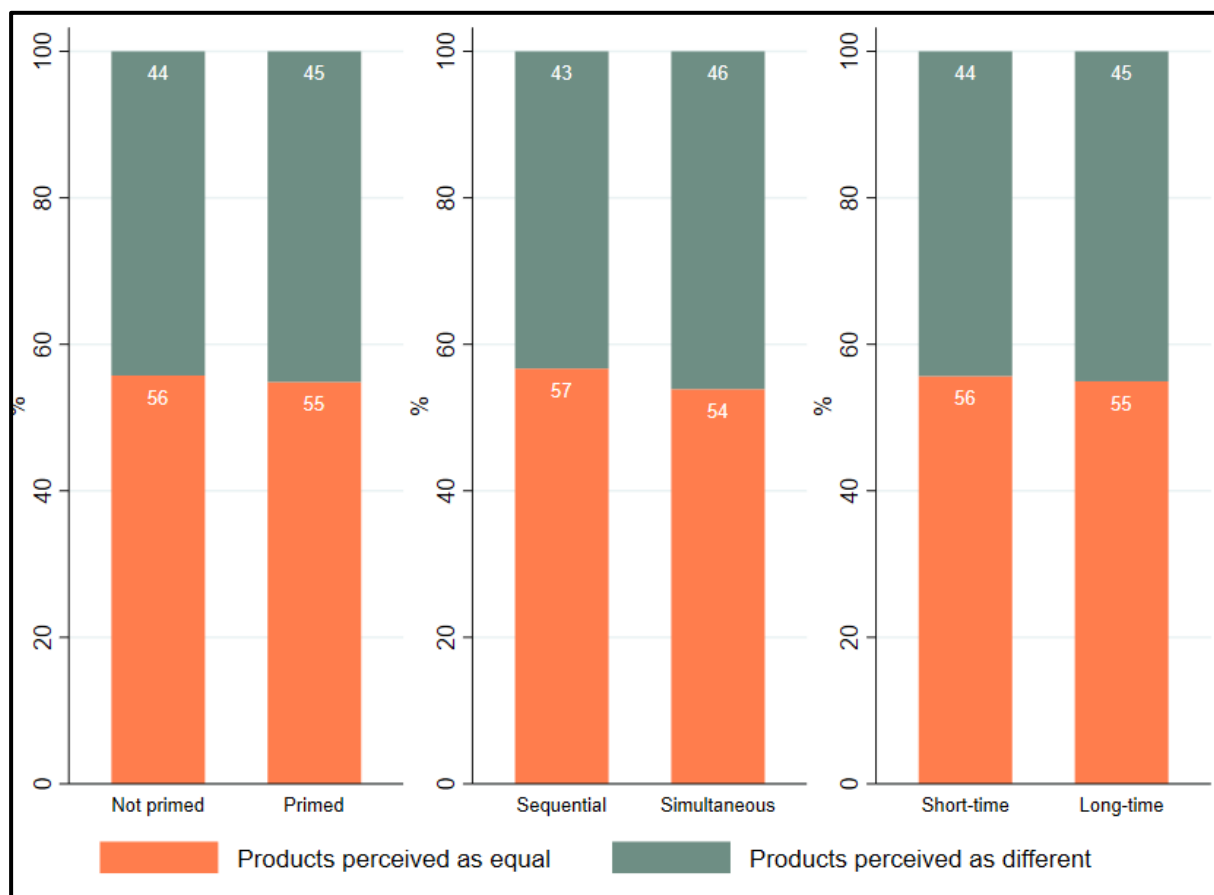
Source: Authors' own elaboration

Table 28. Number and share of respondents who perceive the packages as the same or different by treatment

Product versions are perceived as:	Treatment					
	Primed		Presentation of packages		Time for which packages are shown	
	No	Yes	Sequential	Simultaneous	Short	Long
The same (n)	32,178	33,630	35,625	30,183	33,611	32,197
%	32.0	33.3	35.2	30.2	33.7	31.7
Different (n)	68,282	67,240	65,615	69,907	66,009	69,513
%	68.0	66.7	64.8	69.8	66.3	68.3
Total (n)	100,460	100,870	101,240	100,090	99,620	101,710
%	100.0	100.0	100.0	100.0	100.0	100.0
p-value (Chi squared test)	< 0.001		< 0.001		< 0.001	

Source: authors' own elaboration

Figure 16. Share of respondents who perceive the products as the same or different by treatment (%)



Source: Authors' own elaboration

In contrast to package differences, consumers more frequently perceive product differences when they are primed. Finally, in line with package perceptions, consumers believe more frequently products are different when they see the products simultaneously and for longer time.

Table 29. Number and share of respondents who perceive the product versions as the same or different by treatment

Product versions are perceived as:	Treatment					
	Primed		Presentation of packages		Time for which packages are shown	
	NO	YES	Sequential	Simultaneous	Short	Long
The same (n)	56,004	55,338	57,405	53,937	55,451	55,891
%	55.8	54.9	56.7	53.9	55.7	55.0
Different (n)	44,456	45,532	43,835	46,153	44,169	45,819
%	44.3	45.1	43.3	46.1	44.3	45.1
Total (n)	100,460	100,870	101,240	100,090	99,620	101,710
%	100.0	100.0	100.0	100.0	100.0	100.0
p-value (Chi squared test)	< 0.001		< 0.001		< 0.001	

Source: authors' own elaboration

4.3 Estimation of the impact of front-of-pack attributes on consumer perceptions

In the first phase, the relationship between the variables describing differences in the FOP elements (e.g. number of differences, elements that are different and their combinations) and the perception of differences in the

package and the product was analysed by estimating logistic and ordered logistic models²⁸ (see Annex 6 for the definition of variables).

4.3.1 Impact of the number of front-of-pack elements that differ

The positive and significant relationship detected between the differences in FOP elements between the two packages presented to consumers and the perception of differences in package and product, confirms hypothesis 1. Specifically, **the greater the number of differences between two packages, the greater the likelihood of consumers being able to perceive package and products as different**. While this finding might seem trivial, our data set opens up a range of possibilities to explore and isolate the impact of individual characteristics, product types, and individual FOP elements.

For example, if we focus only on our control variables, we can expand the findings reported in section 4.2.3. In our results we can see that while Czechia is the country where respondents detect fewest differences in packages, this country is among the ones that more often infer differences in product versions. This seems to be in line with the importance the topic of DC-SIP has had in this country²⁹. In terms of gender, men are less likely to perceive packages as different than women are. Contrastingly, the reverse pattern is observed when assessing differences in product versions. In terms of age, the youngest (18-34) and oldest (>65) extremes of the age distribution tend to perceive the package as different compared with the intermediate age groups. However, in terms of product versions, those over 55 believe these are different more often.

The effect of income is only significant for the perception of differences in product versions. The higher the income, the less consumers expect differences in these. Interestingly, participants who have lived abroad and bought food in another country are more likely to expect the product versions to be different but this does not affect the ability to identify differences in package. In contrast, participants who visit other countries but do not live in them are more likely to perceive the packages as different but not the product versions.

Not surprisingly, participants who consider price one of the three most important factors when shopping are more likely to see packages and products as identical. If price is the most important factor when shopping, consumers look for the cheapest product, so they pay less attention to packaging and therefore might not perceive differences. Moreover, if they care about composition (ingredients) and taste, they are more likely to see product versions as identical. As the ingredients list is not one of the FOP elements considered in the study they do not see one of the elements to which they attach importance and they pay less attention to the rest. If consumers shop based on taste, this is a characteristic that is learned from experience and therefore once they know that a product is amenable to their taste they do not focus so much on FOP elements. Contrastingly, if they care about the origin of the ingredients, they are more likely to see product versions as different, probably driven by the fact that the origin of ingredients is one of the FOP elements that vary across the package versions. However, this does not affect the probability of declaring that the packages are different. More insights into this are provided when analysing how FOP elements affect the characteristics for which consumers expect differences across product versions (section 4.4).

As for the impact of the treatments, if participants are primed, they are more likely to see the packages as the same but product versions as different. As we consider this treatment a proxy for familiarity with the brand, it seems that the consumers believe that versions of branded products differ more frequently, even if they are more likely to fail to detect differences in package. Brand seems to reduce the importance of FOP elements signalling differences in package, but consumers believe that familiar brands can have different product versions. Finally, the results confirm, as expected, that if participants see the products simultaneously and for a longer time, they are more likely to identify difference in packages, and believe that the product versions inside them are different.

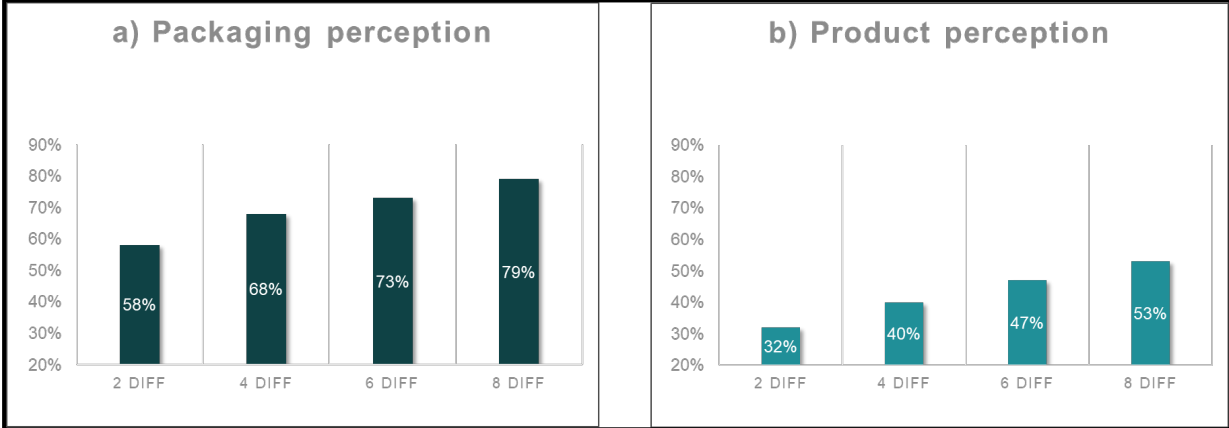
To analyse the size of the impact of the number of FOP elements that differ between packages on the probability of declaring differences in packages and product versions, we need to compute the marginal effects from equation [1]. The marginal effects inform us of the probability that our outcome variable is equal to one (i.e. package or product versions are perceived as different) given the value of the explanatory variable (e.g. two elements in the FOP change from one version to the other) and with all other variables at constant values. For all products pooled, the probability of perceiving the package as different when the differences between two packages increase from two elements to four increases by 10%, and is significant. It increases by 21% when

²⁸ Logistic regression is a process of modelling the probability of a discrete outcome given one or more input variables. Ordered logistic regression is a process of modelling the probability of an ordered outcome given one or more input variables.

²⁹ This country has even introduced a ban on dual quality of foodstuffs in its legislation with Act 174/2021 (see www.peytonlegal.cz/en/dual-quality-food/).

the number of FOP elements that change moves from two to eight. Pairwise comparisons (t tests³⁰) across the different number of FOP elements that change show that more FOP differences consistently imply a greater likelihood of perceiving differences in package and product version. The results of the regressions are summarized in Figure 17. The horizontal axis shows the different numbers of differences in FOP elements between the two versions. The vertical axis presents the marginal effects, which show the probability of perceiving differences in a) package or b) product version for each number of FOP differences, holding all other variables constant.

Figure 17. Probability of perceiving differences in (a) package and (b) product version depending on the number of FOP elements that change

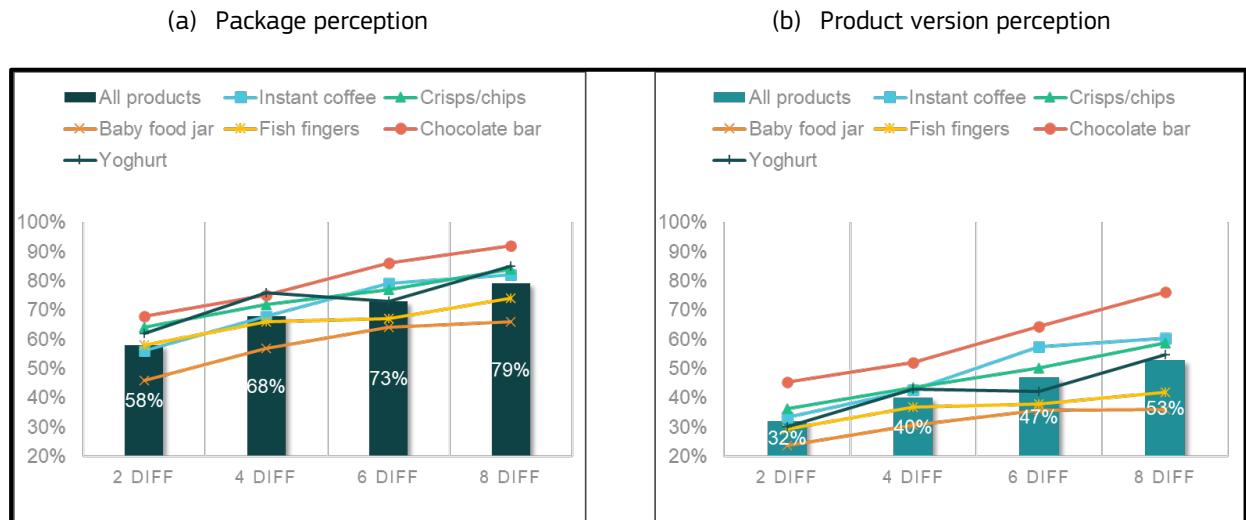


Source: Authors' own elaboration

Moreover, we fit equation [1] for each product individually to understand if the effects are homogenous across products. This is relevant. While we use the same set of FOP elements for all products, the way in which the specific FOP element is translated into the package design of each product varies due to design constraints when constructing the images and the fact that each product is different in nature (recall the specific implementation of the FOP elements in the six products presented in **Table 8**). This means that the degree of change and, therefore, the impact on consumer perception can vary between products depending on the nature of the texts of the claims and colours used. Results of the individual product models are summarised in Figure 18.

³⁰ Comparisons are made using the lincom command in Stata to calculate linear combinations of parameters.

Figure 18. Probability of perceiving differences in (a) package and (b) product version depending on the number of FOP elements that change, by product type

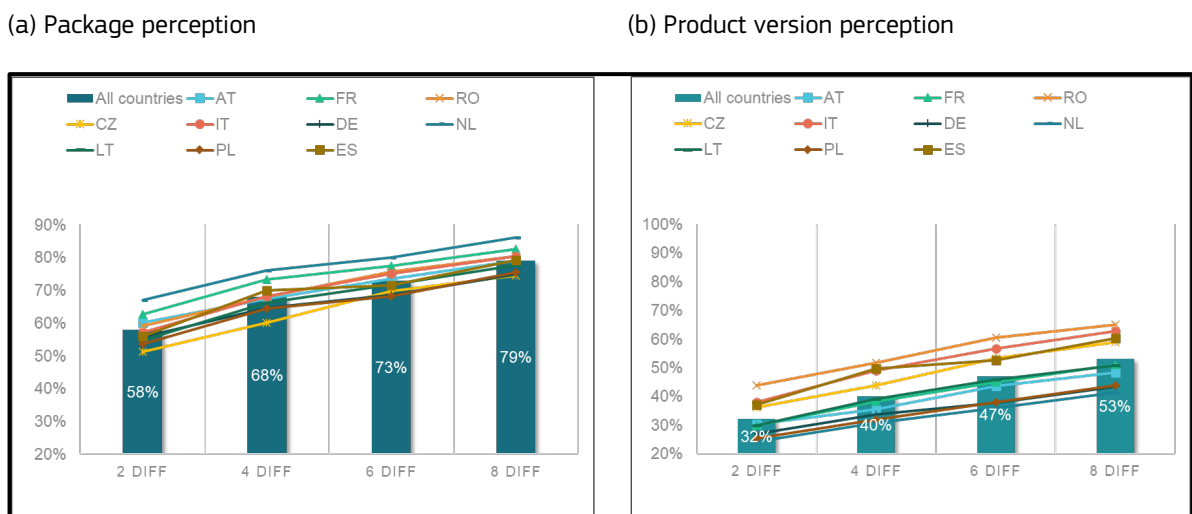


Source: Authors' own elaboration

The results confirm that the probabilities of perceiving differences in package and inferring that product versions are different increase with the number of differences for all products, yet with different intensities. They suggest that the specific implementation of the FOP elements has different implications for different types of products driven by the exact way on which the change is implemented in the design. Note that for each product, the differences in perception between the number of FOP elements varying from one package version to the other (two, four, six or eight) are mostly statistically significant. There are two exceptions; increasing the number of FOP elements from four to six elements does not increase the probability of detecting differences for fish fingers and it reduces the probability for yoghurt. This might be driven by the combination of FOP elements implemented when the number of difference increases from four to six (see results for hypothesis 4 in section 4.3.3) and how the specific FOP elements were applied to the yoghurt package.

We also fit model [1] for each country individually to understand if the perception of differences changes by country. Figure 19 presents the results based on the calculation of the marginal effects.

Figure 19. Probability of perceiving differences in (a) package and (b) product version depending on the number of FOP elements that change, by country



Source: Authors' own elaboration

Like the analysis by product, the results confirm that the probabilities of perceiving differences in package and product increase with the number of differences for all countries, yet at different levels. Some curious results are, for example, that Poland has the lowest probability of seeing differences in both the package and the product, while the Netherlands has the highest probability of perceiving differences in the package but the lowest probability of seeing differences in the product. In contrast, Czechia has a low probability of perceiving differences in the package but a high probability of perceiving differences in the product. All the differences between levels reported are statistically significant based on results of t tests³¹.

Our results support hypothesis 1: the higher the number of FOP elements that change between packages, the higher the probability that individuals will declare they perceive the packages are different, and that they believe the product versions are different. In particular, we find the following.

- The probabilities are significantly different between the four number of FOP element that vary (i.e. 2, 4, 6 and 8).
- The probabilities of perceiving differences in packaging are always higher than the probabilities of perceiving differences in product versions. As a matter of fact, except for the case of eight FOP elements changing our results show that average consumers would be more likely to consider the product versions to be the same (probability of believing the product versions are different is below 50%).
- A general pattern holds for the six products analysed: the probabilities of perceiving differences in the package and the product versions increases with the number of differences and the probabilities of perceiving differences in packaging are higher than the probabilities of perceiving differences in product versions.

However, we detect some product and country specific results:

- If the number of FOP elements that vary between versions is four, consumers would be able to detect that the packages are different (probability above 50%) for all products but will infer differences in product versions only for chocolate, instant coffee and crisps.
- Consumers are capable of detecting differences in package for the four levels of varying FOP elements. However only in Romania (from four varying FOP elements) and Czechia, Spain and Italy (from six varying FOP elements) do most consumers believe the product versions are also different.

While we confirm hypothesis 1 (the number of varying FOP elements influences the perception of differences in packaging and in product versions) this is not sufficiently informative. It is important to determine whether the impacts are specific to each type of FOP element considered. It is also crucial to consider whether the way in which the variation between FOP elements was implemented in the package design also has an impact.

4.3.2 Impact of the specific front-of-pack elements

The results for hypothesis 2 (impact of specific FOP elements) and Hypothesis 3 (impact of specific FOP elements and their combinations with other FOP elements) show the clear influence of the different elements and their combinations with other elements as explanatory factors for the perception of differences in the package and the product. Moreover, this analysis allows us to rank the different FOP elements and combinations thereof in terms of impact. Hypothesis 2 suggests that different FOP elements influence consumers' perceptions of whether package and product versions are the same or different to varying degrees. In addition, hypothesis 3 suggests that the number of FOP elements that vary with each FOP element also influences the perception of differences to varying degrees.

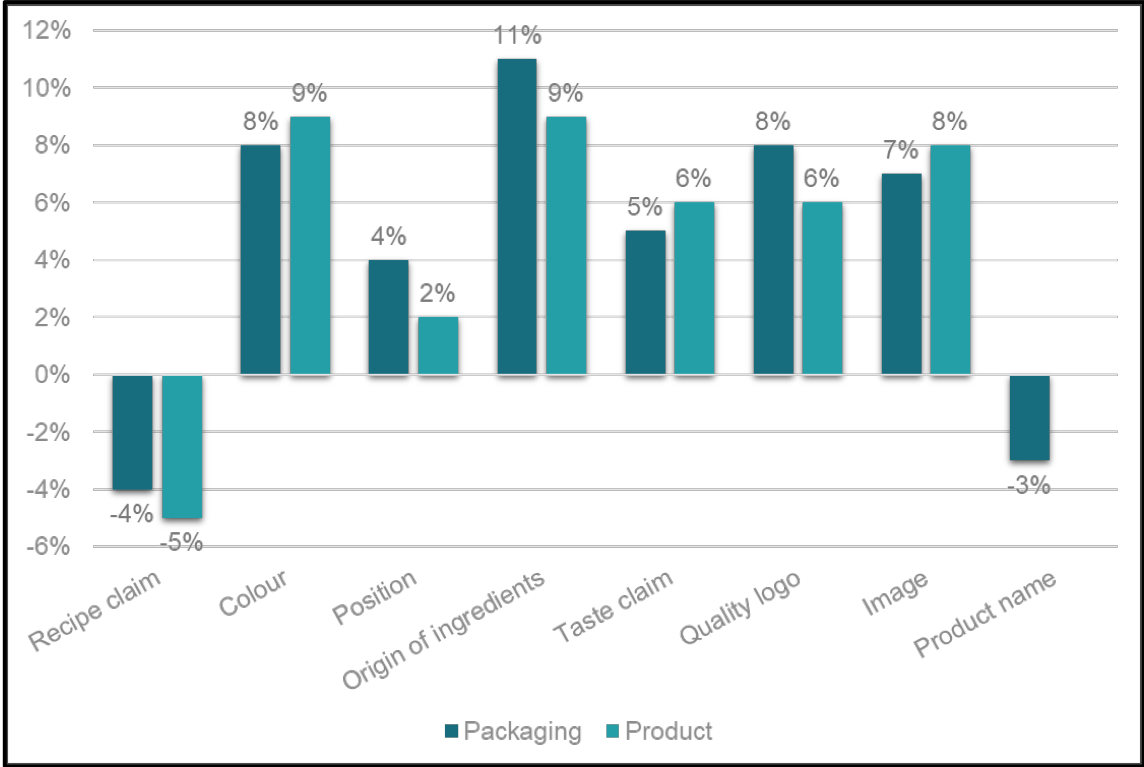
To test hypothesis 2 we run model [1] including as independent variables in the regression the number of differences in FOP elements (as in section 4.3.1) and include a dummy variable for each specific FOP element that varies using the change in shade of colour as a reference. The models are fitted for consumers' perception of both (i) package and (ii) product versions as different.

The marginal effects show that differences in most FOP elements increase the probability of perceiving package and product versions as different and in most cases the probabilities are higher for the perception of package differences than for product version ones. Three exceptions are worth signalling. When the FOP element that varies is the product description (how the product is described, e.g. in the case of chocolate changing from milk chocolate to smooth chocolate) the overall probability of perceiving the packages as different decreases and

³¹ Using the `lincom` command in Stata to calculate linear combinations of parameters.

there is no significant effect on the perception in product differences. When the FOP element that varies is the recipe claim, we observe a reduction in the probability of perceiving both package and product versions as being different. Last, when the FOP elements that change is colour, image or a claim on taste, the impact on product version difference is higher than that on package difference (Figure 20).

Figure 20. Change in probability of perceiving differences in package and product version depending on the changing FOP elements (compared with reference element change in shade of colour)



Source: Authors' own elaboration

Based on these results we can rank the eight FOP elements considered in the study according to the size of their impact on consumer perceptions (Table 30). The presence or absence of the claim on origin of ingredients and the change in colour of the package dominate the ranking. Interestingly, this ranking shows then that changing an image in the package has less impact than the presence or absence of a quality logo on the consumer perceptions of differences in the package but has more impact on consumer perceptions that the product version is different. The change in product description (see above) and the presence or absence of the recipe claim are the FOP elements that have least impact. Note, however, that a particular recipe claim (i.e. Original) and specific product descriptions have been implemented in this study. These findings cannot be extrapolated to other types of recipe claim or product descriptions.

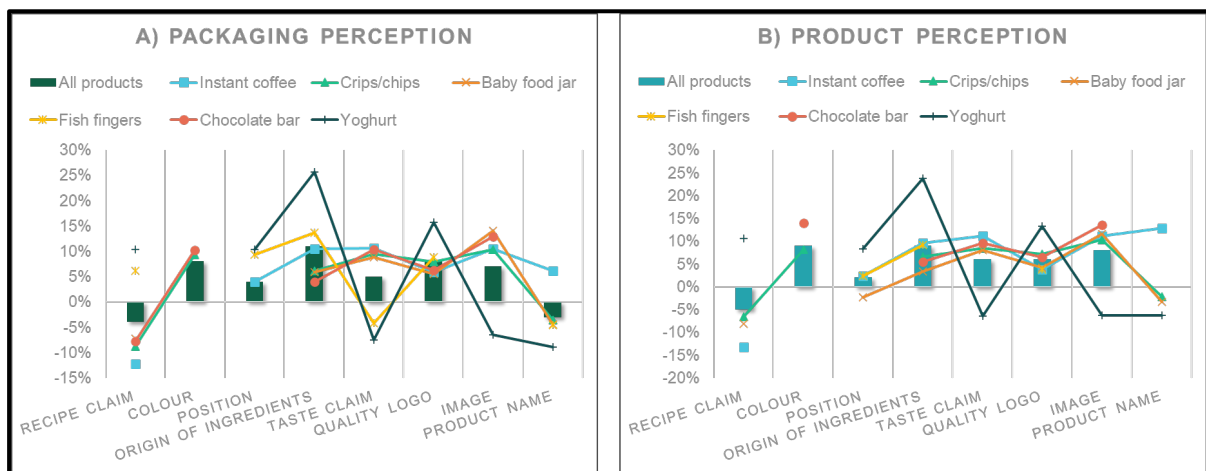
Table 30. Ranking from highest to lowest of the impact of packaging elements on consumer perceptions of packaging and product differences

Rank	Packaging	Rank	Product
1	Origin of ingredients	1	Origin of ingredients
2	Colour	2	Colour
3	Quality logo	3	Image
4	Image	4	Quality logo
5	Taste claim	5	Taste claim
6	Position	6	Position
REF	Colour shade	7	Product description
7	Product description	REF	Colour shade
8	Recipe claim	8	Recipe claim

Source: Authors' own elaboration

Once again, we analyse whether the impact of the individual FOP attributes varies by product type, as the product specific implementation of each FOP element could have an effect. Our results show that indeed the impact of each FOP element does differ by product. For instance, the change in product description influences the perception of package and product differences positively only for the instant coffee (the change in product description here was from 'Noir' to 'Gold'). The presence of the taste claim influences the perception of package and product differences negatively for yoghurt ('fresh and fruity') but positively for instant coffee ('pure aroma'), chocolate ('perfectly silky'), crisps ('packed with flavour') and baby food ('your baby's first tastes') (Figure 21).

Figure 21. Change in probability of perceiving differences in a) package and b) product version depending on the changing FOP elements by product type



Source: Authors' own elaboration

Based on the regression results, the FOP elements can be ranked by product as presented in Table 31 and Table 32. Note that for some products (e.g. for crisps), the ranking of FOP elements by likelihood of perceiving differences in package is aligned with the ranking by likelihood of perceiving differences in product version.

Table 31. Ranking from highest to lowest of the impact of FOP elements on consumer perceptions of package differences

Rank	Instant coffee	Crisps	Baby food	Fish fingers	Chocolate	Yoghurt
1	Taste claim	Image	Image	Origin of ingredients	Image	Origin of ingredients
2	Image	Taste claim	Taste claim	Image position	Taste claim	Quality logo
3	Origin of ingredients	Colour	Origin of ingredients	Quality logo	Colour	Recipe claim
4	Quality logo	Quality logo	Quality logo	Recipe claim	Quality logo	Image position
5	Product description	Origin of ingredients	Colour	Colour	Origin of ingredients	Colour
6	Image position	Image position	Image position	Image	Image position	Image
7	Colour	Product description	Product description	Taste claim	Product description	Taste claim
8	Recipe claim	Recipe claim	Recipe claim	Product description	Recipe claim	Product description

Note: Shaded cells represent the reference FOP element against which the rest are compared. We differentiate the change in colour of package into two categories: colour and shade. For instant coffee, baby food, fish fingers and yoghurt the practical implementation of this change in design used not different colours but different shades of the same colour.

Source: Authors' own elaboration

Table 32. Ranking from highest to lowest of the impact of FOP elements on consumer perceptions of product version differences

Rank	Instant coffee	Crisps	Baby food	Fish fingers	Chocolate	Yoghurt
1	Product description	Image	Image	Origin of ingredients	Colour	Origin of ingredients
2	Taste claim	Taste claim	Taste claim	Quality logo	Image	Quality logo
3	Image	Colour	Quality logo	Image	Taste claim	Recipe claim
4	Origin of ingredients	Quality logo	Origin of ingredients	Image position	Quality logo	Image position
5	Quality logo	Origin of ingredients	Colour	Taste claim	Origin of ingredients	Colour
6	Image position	Image position	Image position	Colour	Product description	Product description
7	Colour	Product description	Product description	Recipe claim	Image position	Image
8	Recipe claim	Recipe claim	Recipe claim	Product description	Recipe Claim	Taste claim

Note: Shaded cells represent the reference FOP element against which the rest are compared. We differentiate the change in colour of package into two categories: colour and shade. For instant coffee, baby food, fish fingers and yoghurt the practical implementation of this change in design used not different colours but different shades of the same colour.

Source: Authors' own elaboration

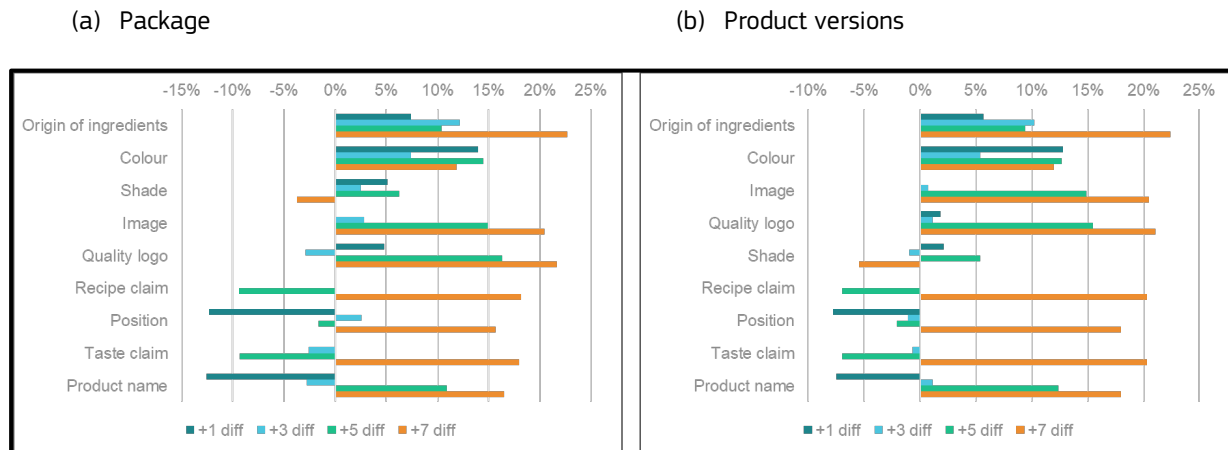
However, our experimental design does not change any individual FOP element in isolation between product versions but changes each in combination with one, three, five or seven other elements (see section 3.2.5). Therefore, the impact of individual FOP elements has to be considered taking into account how many other FOP elements change simultaneously between the two versions presented. To this end, we test our hypothesis 3 with one model per FOP element running equation [1] for each FOP element and including as additional independent variables the total number of elements that change simultaneously.

The results show, that regardless of the number of differences, the impact on perceived differences in package is always positive for differences in colour, presence or absence of claim regarding the origin of ingredients and differences in image. On the other hand, the impact on perceived differences in products is always positive for changes in colour, presence or absence of the claim on the origin of ingredients, changes in image and presence or absence of the quality logo claim. Therefore these FOP elements are complements to others in signalling

differences both in package and product. On the other hand others, such as claims on recipe or taste, provide contradictory signals which prevent consumers from identifying differences.

Figure 22 shows the change in probability for each FOP element with respect to no differences in the corresponding element. It can be observed that the change does not monotonically increase with the number of differences. For example, when the colour changes between package versions, the consumers are more likely to perceive differences in the package and product versions when the total number of FOP elements that change is six than when it is eight. This may suggest that when a specific FOP element (e.g. colour) differs, it could be sufficient for only another five elements to change to lead the consumers to perceive differences.

Figure 22. Change in the probability of perceiving differences in a) package and b) product version depending on the changing FOP elements and the number of other elements changing simultaneously



Source: Authors' own elaboration

Table 34 summarizes the total probability of consumers detecting differences in packages and believing that the product versions differ by individual FOP element considering the additional FOP elements that change between package versions. The second column (headed 'alone') shows the probability that if only one FOP element changes consumers will be capable of considering the two packages different. When our experimental design did not implement the specific combination of specific FOP element and additional FOP elements changing simultaneously (e.g. recipe claim and one or three additional elements) we do not report results. For all FOP elements, if they change between package versions, there is a probability higher than pure chance (i.e. higher than 50%) of consumers considering the two packages different. Changing the colour of the package (69% probability) is the FOP element that best makes consumer aware that packages are different. That is also the case when this FOP element changes simultaneously with one, three or five other FOP elements. However, it is not the case when seven FOP elements change simultaneously with the specific FOP element, in that case the presence of a taste or recipe claim leads to the highest probability (84%).

Focusing on part (b) of Table 34 (probability of consumers believing that the product versions are different), the situation changes. No FOP element is capable of making consumers believe that product versions are different by itself (probability below 50% for all FOP elements in the 'alone' column) nor if combined with three additional FOP elements varying. Combined with either one or five other FOP elements changing, only colour is capable of making more than 50% of consumers declare that the product versions are different. Last, if the shade of colour changes in combination with seven additional FOP elements, consumers will not be able to infer that product versions are different.

Table 33. Probability of perceiving differences in (a) package and (b) product version depending on the changing FOP elements and the number of other elements changing simultaneously (%)

(a) Package					
FOP element	alone	+1 difference	+3 differences	+5 differences	+7 differences
Recipe claim	65%	Not present	Not present	56%	84%
Colour	67%	81%	75%	82%	79%
Picture position	66%	54%	69%	64%	82%
Ingredients origin	58%	66%	70%	69%	81%
Taste claim	66%	Not present	63%	57%	84%
Quality logo	59%	64%	56%	76%	81%
Picture	60%	Not present	63%	75%	81%
Product description	63%	51%	61%	75%	80%
Colour shade	69%	74%	71%	75%	65%

(b) Product version					
FOP element	Alone	+1 difference	+3 differences	+5 differences	+7 differences
Recipe claim	39%	Not present	Not present	32%	60%
Colour	41%	54%	46%	54%	53%
Picture position	40%	32%	39%	38%	58%
Ingredients origin	33%	39%	43%	42%	55%
Taste claim	40%	Not present	39%	32%	60%
Quality logo	34%	35%	35%	49%	55%
Picture	34%		35%	49%	55%
Product description	36%	28%	37%	48%	54%
Colour shade	44%	46%	43%	49%	38%

Source: Authors' own elaboration.

Moreover, the analysis by product shows that the patterns are not homogenous across them. For example, changing the product description simultaneously with one other FOP element does not increase the probability of perceiving differences in package for any product except coffee. This further highlights the need to consider the type of product when analysing the impact of specific combinations of FOP elements changing simultaneously.

This leads us to put forward hypothesis 4, which states that the specific combinations of FOP elements that change between packages influence the package and product version perceptions.

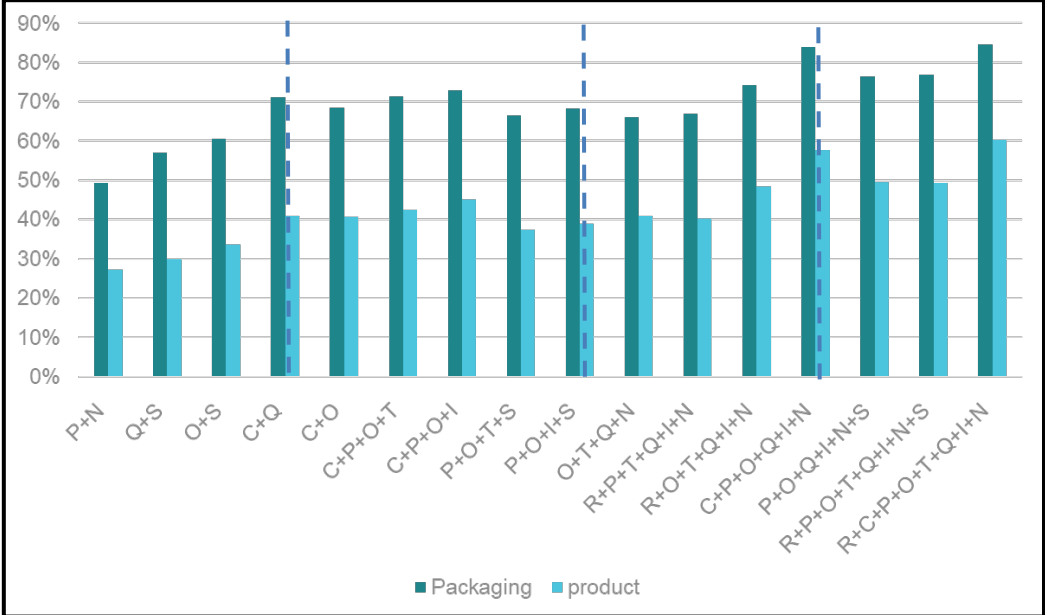
4.3.3 Impact of combinations of front-of-pack elements

For this analysis, we run equation [1] using as independent variables the specific combinations of FOP elements that change between the two versions of the package presented. The results confirm that different combinations affect perceptions differently. In addition, statistical tests³² confirm that each combination has a significantly different impact from the others. We find two exceptions for difference in packages and two for difference in product version. For the former the combination of 'position of the image, claim on origin, claim on taste and colour shade' and the combination of 'claim on origin, claim on taste, claim on quality and product description' do not have significantly different impacts. For the latter the combination of 'colour and claim on quality' and the combination of 'colour and claim on origin of the ingredients' also do not have significantly different impacts.

Figure 23 shows that, when considering differences in package, only the combination of 'picture and product description' fails to predict that individuals would detect difference (>50%). Just two changes in FOP elements could be sufficient to allow the average consumers to detect that the packages are different (i.e. better than a random guess) if the changes include colour, claim on quality or claim on origin of the ingredients. If four, six or eight elements change, any combination would suffice for consumers to notice the packages are different.

However, if one wants to signal that the product version is also different, six or eight FOP elements change will need to change. If different colours are among the six or eight attributes that change between the two versions, the likelihood of perceiving differences is highest.

Figure 23. Probabilities of combinations of FOP attributes changing simultaneously as predictors of perceiving differences in package and product version



Note: P: position of the image; N: product description; Q: claim on quality; S: colour shade; R: recipe claim; O: claim on origin; C: colour; I: image use; T: claim on taste; T: claim on taste

Source: Authors' own elaboration

³² Using the lincom command in Stata to calculate linear combinations of parameters.

Based on the regressions for each product, we can rank the impact of the specific combinations on the package and product perceptions, as depicted in Table 34 and Table 35.

Table 34. Ranking from highest to lowest of the impact of combinations of FOP elements on consumer perceptions of package differences

Rank	Instant coffee	Crisps	Baby food	Fish fingers	Chocolate	Yoghurt
1	P+O+Q+I+N+S	R+C+P+O+T+Q+I+N	R+O+T+Q+I+N	R+P+O+T+Q+I+N+S	R+C+P+O+T+Q+I+N	R+P+O+T+Q+I+N+S
2	R+P+O+T+Q+I+N+S	C+P+O+Q+I+N	R+P+O+T+Q+I+N+S	P+O+Q+I+N+S	C+P+O+Q+I+N	P+O+Q+I+N+S
3	R+O+T+Q+I+N	C+P+O+Q+I+N	P+O+Q+I+N+S	P+O+I+S	R+O+T+Q+I+N	P+O+I+S
4	O+T+Q+N	C+P+O+I	R+P+T+Q+I+N	P+O+T+S	R+P+T+Q+I+N	P+O+I+S
5	R+P+T+Q+I+N	C+P+O+T	P+O+I+S	R+O+T+Q+I+N	C+P+O+I	R+O+T+Q+I+N
6	P+O+T+S	C+Q	O+T+Q+N	O+S	C+Q	O+S
7	P+O+I+S	C+O	P+O+T+S	O+T+Q+N	C+O	O+T+Q+N
8	P+N	R+P+T+Q+I+N	O+S	R+P+T+Q+I+N	C+P+O+T	Q+S
9	O+S	O+T+Q+N	Q+S	Q+S	O+T+Q+N	R+P+T+Q+I+N
10	Q+S	P+N	P+N	P+N	P+N	P+N

Note: P: position of the image; N: product description; Q: claim on quality; S: colour shade; R: recipe claim; O: claim on origin; C: colour; I: image use; T: claim on taste; T: claim on taste

Source: Authors' own elaboration

Table 35. Ranking from highest to lowest of the impact of combinations of FOP elements on consumer perceptions of product version differences

Rank	Instant coffee	Crisps	Baby food	Fish fingers	Chocolate	Yoghurt
1	P+O+Q+I+N+S	R+C+P+O+T+Q+I+N	R+O+T+Q+I+N	P+O+Q+I+N+S	R+C+P+O+T+Q+I+N	R+P+O+T+Q+I+N+S
2	R+P+O+T+Q+I+N+S	C+P+O+Q+I+N	P+O+Q+I+N+S	R+P+O+T+Q+I+N+S	C+P+O+Q+I+N	P+O+Q+I+N+S
3	R+O+T+Q+I+N	R+O+T+Q+I+N	R+P+O+T+Q+I+N+S	R+O+T+Q+I+N	R+O+T+Q+I+N	R+O+T+Q+I+N
4	O+T+Q+N	C+P+O+I	R+P+T+Q+I+N	P+O+I+S	R+P+T+Q+I+N	1P+O+T+S
5	R+P+T+Q+I+N	C+P+O+T	P+O+I+S	O+T+Q+N	C+P+O+I	P+O+I+S
6	P+O+T+S	R+P+T+Q+I+N	O+T+Q+N	P+O+T+S	C+O	O+T+Q+N
7	P+N	C+Q	P+O+T+S	O+S	C+P+O+T	O+S
8	P+O+I+S	C+O	Q+S	R+P+T+Q+I+N	C+Q	Q+S
9	O+S	O+T+Q+N	O+S	Q+S	O+T+Q+N	R+P+T+Q+I+N
10	Q+S	P+N	P+N	P+N	P+N	P+N

Note: P: position of the image; N: Product description; Q: claim on quality; S: colour shade; R: recipe claim; O: claim on origin; C: colour; I: image use; T: claim on taste; T: claim on taste

Source: Authors' own elaboration

The analysis by product shows that for some of them, consumers have the highest probability of perceiving differences with combinations of six elements (e.g. instant coffee). In comparison, for others, this is achieved with eight elements. It seems that in the case of coffee, as we had already observed in the previous analyses, the change in product description (from 'Noir' to 'Gold') appears to be a determining element that in the case of coffee transmits differences in the characteristics of the product, which is analysed later.

4.3.4 Impact of FOP elements by country and product

The effects vary by country and product. For example, at product level, baby food and fish fingers see the lowest likelihood of perceiving differences in both packages and products. On the other hand, chocolate is the product for which the differences in packages and products are most noticeable.

Considering the interaction between the individual FOP elements and the country and the FOP elements and the product, the results in Table 36 and Table 37 show that the FOP elements effects vary by country. In particular, some FOP elements seem to signal differences in packaging and products more than the image in all countries, while others, (e.g. claim on recipe) do not. The same is true of products. There is no variation between products in the effect of some FOP elements on perception, but the effect of others does vary. For example, a change in the image signals a difference in the packaging of instant coffee, baby food and chocolate but not in the other products.

Table 36. Countries where each specific FOP element has a significant positive effect

Element	Package perception	Product version perception
Recipe claim	None	2 (DE, PL)
Colour	All	All
Ingredient origin	All	All
Taste claim	None	All
Quality logo	All	All
Image	None	None
Product description	None	None
Image position	Omitted	Omitted

Source: Authors' own elaboration

Table 37. Products for which each specific FOP element has a significant positive effect

Element	Package perception	Product version perception
Recipe claim	None	None
Colour	1 (Chocolate)	1 (Chocolate)
Ingredient origin	All	All
Taste claim	1 (Instant coffee) 5 (instant coffee, crisps, baby food, chocolate, yoghurt)	2 (Instant coffee, yoghurt) 5 (Instant coffee, crisps, baby food, chocolate, yoghurt)
Quality logo		4 (instant coffee, crisps, baby food, chocolate)
Image	3 (Instant coffee, baby food, chocolate)	
Product description	None	1 (instant coffee)
Image position	Omitted	Omitted

Source: Authors' own elaboration

4.3.5 Impact of front-of-pack elements by situational treatments

The results indicate that consumers who have been primed are less likely to perceive differences in package but believe there are more difference in the product. These effects, however, are not significant for instant coffee and baby food in terms of package perceptions, nor are they significant for crisps and chocolate in terms of product version perceptions. On the other hand, as we expected, consumers are more likely to perceive

differences in both package and product version when they see the images simultaneously and for a longer time. Again, however, these effects are not significant for all products. For example, they do not affect perceptions in the case of chocolate, suggesting that the differences in the case of chocolate are sufficiently evident to trigger system 1 thinking with no need to see images simultaneously or for a longer time.

4.3.6 Predicting the probability that consumers will be able to identify packages as different and believe the product versions are different

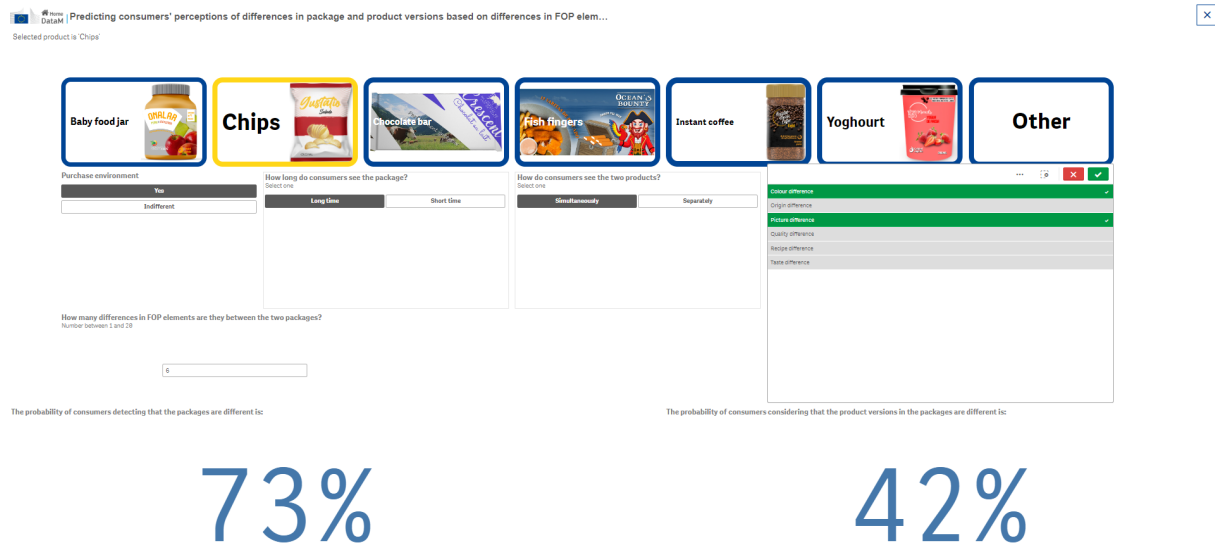
Using expression [2] one can predict the probability that individuals will be able to detect differences in package or product based on the responses obtained in our experiment. This prediction has to be taken with caution and considered only a first appraisal. One has to keep in mind that the implementation of our experiment implies that differences are product specific (e.g. the change in product description is implemented in a specific way for each product, and the differences in colour can be larger or smaller) and that when evaluating this for other products outside our experiment the actual impact will depend on how that change is present in the actual package. Therefore, the results of this prediction are not intended for regulatory purposes or to guide market interventions. Rather, it is a first indication of whether consumers would be able to perceive the differences in the packaging and whether they would infer that the product inside the package is the same or different.

To take into account that in real life the number of differences between packages can be different to the ones used in the experiment (two, four, six and eight), the independent variable reflecting the number of FOP elements that vary between product versions is included as a continuous variable. In addition, we also include as independent variables the difference in specific attributes. The model is run for each product separately and for all products pooled. The predictions are done following a sequential approach depending on the type of product and FOP element the user wants to assess.

1. If the differences the user wants to evaluate relate to one of the six products assessed in this study, the results of the product-specific models are used. If the product is different, then the pooled results are used.
2. Next, the user has to assess the total number of FOP differences between the two package versions and distinguish between those that have been included as FOP elements in this study and those that have not.
3. Then the user inserts the values for the independent variables (number of FOP differences and whether each of the FOP elements is considered in the study). For example, if the two packages differ in seven FOP elements and three of them are those assessed here, the model considers four additional differences (i.e. the number of differences variable takes the value four) and the actual differences in the attributes.

Our results provide the probability of consumers detecting the differences in packaging and of believing that the product versions are different. **Figure 24** shows an example of what such a prediction tool could look like. In this example, the results for the predicted probability of consumers perceiving the packages and the product versions as different are provided for two packages of crisps when six FOP elements change between them, including difference in colour and picture. The two packages are seen simultaneously and for a long time. The prediction are that consumers have a 72% probability of being able to detect that the packages are different and that the probability of assuming that the product versions are different is 42%.

Figure 24. Screenshot of prediction tool results



Source: Authors' own elaboration

4.4 Consumers' expectations about food product characteristics in relation to changing front-of-pack elements

For this analysis we fit equation [1] using as dependent variable the products' characteristic(s) that consumers consider different, if they have declared that the product versions are different. The results (see **Table 38**) show that the FOP elements that convey a difference in specific product characteristics lead consumers to think that products are more likely to be different in those characteristics. For example, the probability of perceiving differences in the product quality between the two versions is larger when there is a difference in the quality logo than in other FOP elements. Similarly, when there is a difference in the claim on origin of the ingredients, the probability of believing the product versions differ in the origin of ingredients is larger. This result confirms that the design of our FOP elements did manage to convey the underlying concepts behind them, and it can be extended to the fact that claims do influence perceptions. Conversely, the quality logo has opposite effects on the probability of perceiving differences in quality (increasing) and in the origin of ingredients (decreasing) between the two product versions. This could be because, once the claim signals the difference in this product characteristic between the two product versions, it crowds out any other inferences regarding product differences. Furthermore, the claim on origin of the ingredients positively affects perceived differences in the place of production, sustainability, healthiness, composition (ingredients) and nutritional composition.

Differences in the background colour increase the likelihood of perceiving differences in food product taste, origin of ingredients, place of production and composition (ingredients). Moreover, in line with previous results, the recipe claim ('original') does not contribute to seeing differences in the given characteristics. In contrast, the claim on taste has a positive effect mainly, as expected, on the probability of believing that there is a difference in taste between the two product versions. In addition, it also leads to believing that the two product versions differ in the origin of ingredients and place of production.

The image positively affects the perception of differences in all product characteristics across product versions, except healthiness, nutritional composition and product quality. Importantly, the product description affects the perception of differences in composition (ingredients), nutritional composition and taste between the two product versions. However, we know from the analysis that the product description has less impact than other FOP elements.

Table 38. Probability of consumers believing product versions differ in product characteristics by change in FOP elements

Product characteristics	FOP element							Product description
	Recipe claim	Colour	Image position	Origin of ingredients	Taste claim	Quality logo	Image	
Quality	0.058	-0.081***	0.059**	-0.034	-0.12**	1.02***	-0.095*	-0.42***
Ingredients	-0.014	0.10***	-0.015	0.080***	0.036	-0.070**	0.093*	0.29***
Nutritional composition	-0.0051	-0.021	0.079***	0.050*	0.017	0.017	0.025	0.15***
Healthiness	-0.073	-0.18***	0.042	0.068**	0.034	0.051	0.038	0.016
Sustainability	-0.088	-0.055	-0.069**	0.25***	0.095	-0.090*	0.14*	-0.073*
Taste	-0.22***	0.11***	0.11***	-0.0085	0.30***	-0.057*	0.12**	0.37***
Ingredients origin	-0.25***	0.15***	-0.20***	0.73***	0.37***	-0.36***	0.34***	-0.053*
Place of production	-0.29***	0.092**	-0.13***	0.47***	0.34***	-0.38***	0.33***	-0.0041

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' own elaboration

4.5 Impact of front-of-pack attributes on consumer choices

For this analysis, we fit the model in equation [4] using the responses from the consumers to the DCE question. The results in Table 39 show that all tested FOP elements affect consumer choices, but some impacts vary slightly by product and FOP element.

Notably, consumers show a negative valuation of higher prices, as expected, for all products. In addition, we see that for the six products considered, consumers would rather buy any version of the product than forgo having it (they gain a higher utility from buying than not buying as shown by the negative coefficient of the 'no buy' term). The size of the preference for buying the product is correlated to the frequency of consumption as expected. Further, when converting the preferences into WTP using equation [5], we see that some FOP elements (e.g. the ingredient origin claim, the quality logo or the taste claim) have a higher impact on consumer choice in all products (i.e. consumers are willing to pay more for products that carry that FOP element).

Moreover, we see that the change in product description can even have a negative value attached to it. For example, we see that for instant coffee, respondents prefer the product description 'Noir' to 'Gold'. This is also the case for a change in image in the case of chocolate, where consumers are willing to pay more for the package that carries a picture of a cow than for the one that has a picture of chunks of chocolate. Finally, another interesting finding relates to the relative valuation of claims and logos (explicit cues) versus tweaks (implicit cues). The presence or absence of attributes such as claims and logos affects choices relatively homogeneously across products, even if the product-specific texts vary. In contrast, the effect of attributes in the form of tweaks (colours, images, position of images, product description) for which there are two options (e.g. purple versus brown colour for chocolate) is more diverse across products. For example, the image is not relevant for the crisps and the fish fingers, but it is relevant for the rest.

Table 39. Estimated coefficients and WTP for the impact of FOP elements and prices on consumer choices

Variables	Instant coffee		Crisps		Baby food		Fish fingers		Chocolate		Yoghurt	
	Choice	WTP	Choice	WTP	Choice	WTP	Choice	WTP	Choice	WTP	Choice	WTP
No buy	-4.899***	-5.43***	-4.491***	-0.97***	-4.006***	-0.87***	-4.723***	-2.41***	-3.695***	-1.70***	-5.330***	-2.00***
Price	-0.901***	n.a.	-4.637***	n.a.	-4.607***	n.a.	-1.964***	n.a.	-2.174***	n.a.	-2.664***	n.a.
ORIGIN	0.398***	0.44***	0.297***	0.06***	0.488***	0.11***	0.427***	0.22***	0.229***	0.11***	0.673***	0.25***
TASTE	0.554***	0.62***	0.389***	0.08***	0.498***	0.11***	0.425***	0.22***	0.281***	0.13***	0.395***	0.15***
QUALITY	0.466***	0.52***	0.388***	0.08***	0.501***	0.11***	0.371***	0.19***	0.275***	0.13***	0.249***	0.09***
RECIPE	0.283***	0.31***	0.228***	0.05***	0.297***	0.06***	0.298***	0.15***	0.244***	0.11***	0.448***	0.17***
COLOUR	0.161***	0.18***	0.0990***	0.02***	-0.0210	0	0.114***	0.06***	0.0461*	0.02*	-0.0309	-0.01
PICTURE	0.134***	0.15***	0.0175	0	0.0720***	0.02***	0.00868	0	-0.454***	-0.21***	0.0769***	0.03***
POSITION	0.0133	0.01***	-0.0195	0	-0.0229	0	-0.0326**	-0.02	0.0698***	0.03***	-0.123***	-0.05***
DESCRIPTION	-0.0504*	-0.06*	0.118***	0.03***	-0.106***	-0.02***	0.197***	0.1***	-0.104***	-0.05***	-0.308***	-0.11***
Observations	120,798		120,798		120,798		120,798		60,414		60,384	

n.a.: not applicable *** p<0.01, ** p<0.05, * p<0.1

Source: Authors' own elaboration

5 Conclusions

This study has analysed the influence of changes in FOP elements on consumers' perception of differences in package and product versions of food products. The aim of the study was to determine how certain FOP elements lead consumers to perceive packages and product versions as the same or different, and to expect differences in specific characteristics of the different product versions (e.g. ingredients, quality, nutritional composition). In addition, the study analyses the influence of these FOP elements on consumers' purchasing decisions.

Findings are based on an online behavioural experiment that was run in 10 EU countries for six products and eight FOP elements. Consumers were confronted with different versions of packages and asked to:

- declare whether they believed FOP designs shown to them were the same or different;
- declare whether they believed that the versions of the products in the packages were the same or different, and to what degree;
- declare which characteristics of the product versions they believed varied if they responded positively to the question above; and
- choose which version they would purchase if they found them in their regular supermarket.

In this experiment, consumers were presented with pairs of images of the same hypothetical product differing in two to eight FOP elements. To assess whether the decision environment affected our results, the two products were presented to consumers either:

- simultaneously or consecutively;
- for longer or shorter time; and
- With or without consumers being made aware of the fictitious brands used in the experiment to see whether product awareness influenced the results.

Overall, the results obtained indicate that the FOP elements studied are capable of signalling differences in the package and product version of seemingly identical food products. Therefore, we confirm the importance of packaging as a tool for conveying information to consumers, particularly to signal when two seemingly identical products are not the same so that consumers can make informed decisions. This also implies that the FOP elements must be capable of influencing the purchase choice. We also tested for this by conducting a discrete choice experiment in which, after prices were added to the different products, consumers had to choose the versions they would buy.

The first finding is that **the number of FOP elements changing together in a package design matters**. The more elements change, the more likely it is for the consumer to perceive differences in the package and believe that the product versions differ. This is consistent with previous studies that find that the impact is stronger when several FOP elements provide the same message (here that packages are different as more elements vary). Second, the **signal is stronger for perceptions of the package than of the product version**. Specifically, the probability of perceiving differences in package increases from 58% when two FOP elements vary to 79% when the variation is of eight elements. In contrast, with respect to the perception that the product versions differ, the probability ranges from 32% for two differences to 53% for eight differences. Therefore, even **when consumers perceive differences in the package, this does not always imply that they will believe that the products are different**. This result is of particular interest when it comes to understanding what makes consumers believe that two product versions inside the packages are different because of differences in their package. This leads to the third finding: **that the types of FOP elements changing in the package also matter**. Some elements (e.g. product description) need to change simultaneously with five other elements; some (e.g. recipe claim) need to change together with seven others. By contrast, some are capable of signalling difference when occurring simultaneously with only one additional element. For example, a claim of ingredient origin and colour needs only one other varying element to affect both perceptions of the package and perceptions about the product version. The quality logo needs to vary together with one other element to affect perceptions about the product version. The **results allow ranking FOP elements according to the probability of suggesting differences** (see Table 30).

In this respect, concerning the perception of differences in package the results show that, only the combination of the image position and product description (e.g. 'Salted' versus 'Salt flavoured' for crisps) would fail to communicate differences in package to a majority of consumers (probability <50%). In contrast, two FOP

elements differing simultaneously could be sufficient if the FOP elements that vary includes the origin of ingredients claim, colour or quality logo.

The most prominent effects are found for eight FOP elements varying simultaneously and for six if these include an origin claim, change in colour and quality logo. Concerning perceptions regarding product versions, only six (including origin claim, change in colour and quality logo) or eight differences (if these are not included) are needed for consumers to believe that the products are different (probability >50%).

However, the fourth finding points to the fact that results also depend on the type of product. Not all FOP elements affect all products in the same way. For example, for instant coffee, the change in product description (from 'Noir' to 'Gold') is the element with the largest impact on the perception of the difference between product versions followed by the claim on taste. For a product like chocolate it is the change in colour that matters most followed by the change in image (from a cow to chunks of chocolate). This result suggests that different elements have different impacts, depending on the product. The particular implementation of the element on the packaging also matters. Again, in the instant coffee example, it seems that the description amounts to a difference between packages, whereas, in the case of crisps, the description ('Salted' versus 'Salt flavoured') hardly suggests any difference. This is a clear signal that evaluating whether a package is seemingly identical has to be done on a case-by-case basis.

Our fifth finding is that changes in different FOP elements that convey specific differences in product characteristics (e.g. ingredient composition, taste), are the most efficient in making consumers believe products versions are different. It becomes, therefore, essential to know what each element conveys. For instance, the claim on origin of ingredients leads consumers to expect differences not only in the ingredients' origin but also in the place of production, ingredients, healthiness of the product and nutritional composition. Colour, in turn, suggests differences in origin of ingredients, taste, ingredient and place of production. The taste claim increases the expectation of differences not only in taste, but also in the origin of ingredients and place of production.

Our sixth finding concerns the ability to make informed purchase decisions based on the differences in FOP elements. For this, it is essential that the FOP elements make consumers believe that product versions are different, but also that they affect purchase decisions. Despite the significant impact of price in purchase decision, which will lead consumers to prefer the cheapest version if they consider that the packages and products are the same³³, the study reveals that **the FOP elements tested go beyond affecting consumers' perceptions of package and product version. They affect purchase decisions, and consumers are willing to pay more for a package that includes different FOP elements.** Returning to the case of instant coffee, it is observed that the differences in the product description not only are perceived by consumers and lead them to think that the product versions are different but also affect their purchase decision (they are willing to pay more for the version described as 'Noir' than for the one described as 'Gold'). Regarding choices, it also seems that **claims and logos (explicit cues) affect all products in the same manner while the impacts of tweaks such as colour, image, image position, and product description are more product specific.**

Finally, another interesting result is derived from the effect of varying experimental conditions on the impacts of varying FOP elements. The study analyses the effect of viewing products simultaneously or sequentially (trying to mimic cases in which consumers do not see the product at the same time in the same place) and for longer or shorter time (trying to mimic the time pressure on buyers). As expected, in general, when products are viewed simultaneously and for a longer time, the likelihood of perceiving differences in package and product versions is higher. However, there are exceptions, such as in the case of the chocolate bar, where these effects are not present. This leads to the conclusion that when differences in FOP elements are particularly evident, as in the case of the chocolate, the differences could be perceived under real shopping conditions and even when consumers do not see the two packages together.

However, this study has some limitations. The main limitation is that the products are hypothetical, so they are not real market products. However, to overcome this, we tried to make the designs as realistic as possible, and they were tested in focus groups and adjusted accordingly. On the other hand, the advantage of being hypothetical is that they can be designed as necessary to address the research questions. Thus, all the elements established in the experimental design can be tested without copyright limitations. Another limitation comes from the cost of designing different product versions, which constrains the number of elements and

³³ Evidence from Eurobarometer surveys show that price is still the main driver of consumer food choices. In 2020, based on responses from representative sample of EU-27 citizens cost was the third most important factor when purchasing food, after only taste and safety (European Commission, 2020). As taste and safety were invariant in our experiment, price would be the most important driver of the choices for our sample.

combinations that can be tested. In addition, we have no information on the sample's awareness of the DC-SIP issue so we cannot conclude whether FOP elements signal differences more efficiently when consumers care more about DC-SIP. However we find that the Czech and Romanian samples (two countries where the DC-SIP debate has received widespread attention) have a higher probability of believing product versions are different; this points towards a positive relationship between awareness of DC-SIP and capacity of consumers to detect differences in packages and have the impression that the product versions are different.

As a general conclusion, changes in FOP elements can help consumers to identify product packages as different and infer that the product versions inside the packages are different, too. This shows the importance of the design of the packaging as a part of the tool-box to tackle the DC-SIP issue. The reported effect varies with each FOP element, the elements with which it appears and the product in which they are implemented. In addition, the perceptions and purchasing criteria associated with what consumers perceive and decide about food products could be further analysed. This is important because the relative importance of price or other criteria such as ingredient composition could distort the effect of packaging elements on perceptions and choices. Our results highlight the need to qualify the concept of a *seemingly identical product* on a case by case basis

In turn, this study is a good example of the analysis of the role of packaging in DC-SIP issues. Using a simulation tool, one could obtain preliminary evidence of whether the differences in FOP elements between two packages are sufficient to allow consumers to notice them (detect that the packages are different) and whether the consumers will believe that the product versions inside them are different or not. However, the findings are not a litmus test. They could be further confirmed repeating the analysis, or a similar one, for the specific changes introduced in each of the relevant cases.

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Abbreviations

FOP	Front of Package
DCE	Discrete choice experiment
DC-SIP	Different composition, seemingly identical product
DFQ	Dual Food Quality
JRC	Joint Research Centre of the European Commission
UCPD	Unfair Commercial Practices Directive (Directive (EU) 2019/2161)
WTP	Willingness to pay

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Annexes

Annex 1. Design of the focus group discussion guide

The final discussion guide consisted of eight parts:

- **Part 1:** Introduction to the focus group
- **Part 2:** General open questions and discussion
- **Part 3:** Rapid impressions of the attributes
- **Part 4:** Differences in FOP attributes for product 1
 - **Part 4.1:** Consumers' perception of differences in FOP attributes
 - **Part 4.2:** Consumers' expectations about products
 - **Part 4.3:** Consumers' transactional purchase decision
- **Part 5:** Differences in FOP attributes for product 2
 - Following the same structure as Part 4 but for a different product
- **Part 6:** Differences in FOP attributes for product 3
 - Following the same structure as Part 4 but for a different product
- **Part 7:** Consumers' perception of differences in FOP
 - For images not discussed in Part 4, 5 or 6
- **Part 8:** Conclusion and thanks

In each focus group, five products were discussed at a high-level (Parts 3 and 7 of the discussion guide), and three of them were further discussed in-depth (Parts 4, 5 and 6). Across all focus groups, 15 products were discussed at a high-level, of which 10 were further discussed in depth.

After the English language version of the focus group guide was signed off, it was translated to local languages by the consortium. The local language guides were used in the focus group discussions.

Annex 2. Implementation of the focus groups

One focus group was held in each of the countries. Focus groups were held online using Microsoft Teams or Zoom, with five or six participants per focus group³⁴. Participants were recruited using free-find recruitment techniques, and a recruitment filter ensured that the groups consisted of participants with different characteristics. Recruitment criteria for the focus groups were based on gender, age, education, grocery shopping frequency³⁵ and being a primary shopper for the household³⁶.

All focus group participants provided consent to participate, to be recorded and to be observed by members of the JRC project team. Except for the Polish and Lithuanian focus groups, all discussions were observed by at least one member of the JRC project team. **Table 40** provides a summary of the fieldwork dates.

Table 40. Summary of focus group fieldwork

Date	Starting Time (local time)	Country
31 March 2021	17:30	Czechia
01 April 2021	18:30	France
06 April 2021	16.30	Romania
06 April 2021	18.30	Italy
07 April 2021	14:00	Poland
07 April 2021	19:00	Netherlands
08 April 2021	14:00	Germany
08 April 2021	17:00	Spain
08 April 2021	18:00	Austria
08 April 2021	18:00	Lithuania

³⁴ Five participants in Germany, the Netherlands, Poland and Romania; six participants in Austria, Czechia, Spain, France, Italy and Lithuania.

³⁵ All participants should regularly do grocery shopping.

³⁶ At least one participant per focus group.

Annex 3. Final survey questionnaire

Part 0: General information and screeners

Thank you for your interest in this study. We are inviting you to take part in this survey on consumer attitudes and purchase of food products. This research has been funded by the European Commission and is implemented by LE Europe and Ipsos.

We will show you a series of pictures of food packages and we will ask you a couple of questions about them. Finally, we will ask you to choose which one you would prefer. The survey will last between 10 and 15 minutes.

Your response will be strictly confidential. The European Commission will not receive any information that would allow you to be identified, such as your name. Your response will be grouped together with the responses provided by all the participants.

Q1: Do you regularly (at least once a month) shop for food products?

- 1) Yes
- 2) No

If NO: SCREENOUT, thank participant

Q2 (Age): What is your date of birth?

If 2021 minus date of birth less than 18 SCREENOUT

Q3 (Gender): Are you ...

- 1) Female
- 2) Male
- 3) Other
- 4) Prefer not to answer

Q4 (Region): In which region do you live?

Q5 (Income): Could you please indicate your household's monthly income (that is, after income taxes have been paid)?

Your total household income includes your own income plus the incomes of all household members who live together with you. The total income includes income from jobs, pensions, social security, interest, dividends, capital gains claimed, profits from businesses, unemployment payments, and all other money you received.

- 99) Prefer not to answer
- 999) I don't know

Part 1: About your purchase behaviour

Q6: Do you currently purchase the following products?

	Never	Rarely (one to three times a year)	From time to time (one to two times, every three months)	Regularly (one to three times a month)	Often (one or more times a week)
Instant coffee					
Crisps					
Baby food					
Fish fingers					
Chocolate/yoghurt [#]					

[#] Chocolate for AT FR RO CZ IT / Yoghurt for DE NL LT PL ES

PRIMING TREATMENT – only showed to half of the sample

In this survey you will see five products from five fictitious brands

You do not need to memorise these brands. Just keep in mind that despite being fictitious when answering the questions, you should consider that they are the ones you normally purchase or are familiar with. Only for convenience, we use fictitious brands.

Product	Brand name
Instant coffee	
Crisps	
Baby food	
Fish fingers	
Chocolate	
Yoghurt	

Part 2: Perception of food packaging

Now you will see different pairs of product packaging [PROG: IF TREATMENT = 1, 2, 5 OR 6: one after another; IF TREATMENT = 3, 4, 7 OR 8: simultaneously]. After each two products, we want to know whether you consider that the **packages** and the **products** inside are the same or different. Rather than trying to get the 'correct' answer, we want to know what you think when seeing the packages and what you expect with regards to the products inside.

Q7: In your opinion, the two packages of [PRODUCT] that you have just seen are:

- 1) THE SAME
- 2) DIFFERENT

if Q7 = different

Q7.1: You have answered that the packages you saw were different. How different did you feel these packages were on a scale from 1 to 5?

- 1) 1 – Slightly different
- 2) 2
- 3) 3
- 4) 4
- 5) 5 – Very different

Q8: You have answered that the packages you just saw were [the same / different]. Would you expect the product to be

- 1) THE SAME
- 2) DIFFERENT

NEW SCREEN; show only if Q8 = DIFFERENT

Q9: In which of the following characteristics do you expect [PRODUCT] to be different? Please note that in this question we are interested in the product properties, not in the characteristics of packaging.

Multiple answers are possible.

Ingredients	The ingredients are different between products
Healthiness	One product is better or worse for your health than the other
Sustainability	One product is more sustainable than the other (for example, it has a lower environmental impact)
Nutritional composition	The levels of one or more nutrients (for example, calories, fat or proteins) are different between the products
Taste	The products would taste differently
Origin of ingredients	The ingredients of the two products come from different places
Place of production	The product was produced in different places
Quality	The quality of one product is higher than the other

[Repeat questions 7, 8 & 9 ten times – 2 per product]

Part 3: Product preference

Q10: Imagine you have walked into a supermarket and **you want to buy** [PRODUCT]. Below, we show two versions of this product and their price. Please select which you would like to buy, or if you would not want to buy either.

Please make your decision as if these were the only available [PRODUCT] in the supermarket.

Imagine you have walked into a supermarket and you want to buy jelly beans. Below, we show two versions of this product and their price. Please select which you would like to buy, or if you would not want to buy either.

Please make your decision as if these were the only jelly beans in the supermarket.



€ 1,50



€ 1,33



I would not buy either of these products



[Repeat questions 7, 8 & 9 ten times – 2 per product]

Part 4: About the respondent

Q11 Please indicate the size of your household and composition.

For example, if there are two adults in your household (including yourself), two children between age 6 and 17 and no children aged 5 or younger, please write “2” for Adults and “2” for Children between 6 and 17 and “0” for Children aged 0 to 5.

	Number
Adults (18+)	
Children aged 6 to 17	
Children aged 0 to 5	

Q12 As we are interested in how product packages in different countries differ, now we want to understand your exposure to products in another country than the one you live in.

Have you lived in another country for a period longer than 1 month continuously during your adult life?

- 1) Yes
- 2) No

Q13 On average, how many countries would you visit in a normal year?

- 1) None
- 2) Between one and two
- 3) More than two

Q14 Have you bought food products in a supermarket or similar shop in another European country than your home country in the last three years?

- 1) Yes
- 2) No

Q15 ASK ONLY IF Q12 = Yes OR Q14 = Yes Did you notice any differences (other than the language) in the packaging of the same product (for example, same brand of pizza) when you bought food in a supermarket or similar shop in another European country?

- 1) Yes
- 2) No

Q16 Please rank your first three options. What is important to you when buying food?

- 1) Price

- 2) Composition (Ingredients)
- 3) Healthiness
- 4) Sustainability
- 5) Taste
- 6) Brand
- 7) Nutritional composition
- ~~8) *Removed*~~
- 9) Fair Trade
- 10) Origin of ingredients
- 11) Place of production

[END OF SURVEY]

Annex 4. Implementation of fieldwork of the online experiment

Fieldwork of the online experiment proceeded in three steps:

1. a focus group-based pre-test;
2. pilot fieldwork;
3. roll-out of the experiment.

Each stage is detailed below.

Pre-test

The first stage of the fieldwork consisted of the pre-test. The pre-test consisted of four focus groups; two in Germany and two in the Netherlands. During the focus groups, participants first completed the survey on their own. After all participants finished the survey, the survey questions were discussed qualitatively among the participants. The pre-test topic guide is included as Annex 5 below.

The aim of the pre-test was to qualitatively validate the survey questionnaire and adjust where necessary prior to the pilot fieldwork. Furthermore, data from the pre-test was used as input into outstanding questions regarding the design of the survey. For example, the pre-test gauged the minimum time required by participants to internalise features of the FOP design. This was used to set the timers for Part 2 of the survey.

Prior to the pre-test, the survey was fully scripted in German and Dutch, and tested by the consortium to ensure that the survey functioned as intended. Details of the focus groups are below:

- **Germany:** two focus groups were held in a physical location in Berlin on the 28 July 2021 (14:00 and 16:00 local time). Due to COVID-19 restrictions, the group sizes for the focus groups were limited. The first group consisted of four participants, whereas the second group consisted of five participants. Dr. Sara Elisa Kettner observed both groups as an expert.
- **The Netherlands:** two focus groups were held online via Microsoft Teams on the 29 July 2021 (16:00 and 17:00 local time). The first group consisted of four participants whereas the second group consisted of six participants. Wouter Landzaat observed both groups as an expert. The first group was also observed by the JRC.

Learnings from the pre-test

Following feedback obtained in the pre-test, the most important revisions to the survey were as follows:

- mobile phones were excluded from the survey due to the relatively poor legibility of text on product images for small screen sizes;
- the minimum length of the timers in Part 2 of the survey (see 0) was set at 4 seconds as this was just about comfortable for participants in the pre-test;
- the introduction to Part 2 of the survey was adjusted to steer respondents away from interpreting the task as a "spot-the-difference" exercise.

Furthermore, minor textual changes were made to some questions to improve clarity.

Pilot fieldwork

Following the pre-test, agreed changes were implemented into an adjusted survey script. As before, this revised script was tested by the Consortium to ensure that changes had been implemented correctly. The survey was translated into the seven remaining languages not used in the pre-test³⁷, and the Dutch and German language scripts were adjusted for the changes agreed following the pre-test.

Pilot fieldwork was conducted between 1 and 4 of September 2021, with the bulk of the pilot data collected on 1 and 2 September. Ten observations were collected per country. The table below provides an overview of the fieldwork per country.

Table 41. Summary of pilot fieldwork.

Country	Fieldwork dates	Observations	Percentage female	Average age
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³⁷ Czech, Spanish, French, Italian, Lithuanian, Polish and Romanian. Note that the German translation for Austria and Germany was identical.

Austria	1-2 September	10	50%	45.5
Czechia	1-2 September	10	30%	50.3
France	1-2 September	10	50%	56.2
Germany	1-4 September	10	50%	57.6
Italy	1-2 September	10	70%	56.8
Lithuania	1-2 September	10	50%	48.2
The Netherlands	1-3 September	10	30%	55.4
Poland	1-2 September	10	50%	52.8
Romania	1-3 September	10	50%	48.7
Spain	1-2 September	10	70%	53.5
All	1-4 September	100	50%	52.5

The main purpose of the pilot fieldwork was to test the functioning of the survey. For example, the pilot was used to check if randomisations of variables, or routing in the survey were recorded correctly. No issues were found in the implementation of the survey.

Learnings from the pilot fieldwork

The data from the pilot fieldwork were also used to revise and finalise the survey. The main revisions were as follows:

- the timers for Part 2 of the survey were finalised accounting for data obtained from the pilot;
- an additional question (Q7.1) was added after Q7 in the survey (see 0); and,
- the routing between Q7 and Q8 was finalised with Q8 always being asked irrespective of the answer to Q7.³⁸

Main stage fieldwork

Following the pilot fieldwork, the agreed changes were implemented into the script, and translations were adjusted to reflect the changes. The consortium tested the script to ensure that all changes had been implemented correctly.

Prior to the commencement of the main fieldwork, the translations for all languages were checked by native speakers at the JRC. Similarly, as noted above, the images used in the experiment were inspected by the JRC. Changes to both the translation and the images were implemented following feedback from the JRC, with the final images approved on 13 October and the final, translated script approved on the 19th of October by the JRC.

Main stage fieldwork ran from 22 October until 9 November 2021. The table below provides an overview of the fieldwork for each country.

³⁸ Participants in the pre-test suggested that Q8 might not need to be asked if packages looked the same (Q7 = the same), but the pilot fieldwork showed that a small proportion of respondents still answered that the products were different (Q8 = different) even if the packages were the same (Q7 = the same). Given this, it was agreed that Q8 would always be asked.

Table 42. Summary of main stage fieldwork.

Country	Fieldwork dates	Observations	Percentage female	Average age
Austria	22 October – 8 November	2,008	47.4%	46.3
Czechia	22 October – 5 November	2,032	50.1%	49.2
France	22 October – 2 November	2,005	54.2%	49.6
Germany	22 October – 5 November	2,007	52.4%	51.3
Italy	22 October – 5 November	2,004	52.3%	50.5
Lithuania	22 October – 9 November	2,022	54.0%	44.6
Netherlands	22 October – 5 November	2,008	52.8%	50.9
Poland	22 October – 7 November	2,019	54.3%	47.0
Romania	22 October – 9 November	2,020	48.7%	45.8
Spain	22 October – 9 November	2,008	48.0%	47.8
All	22 October – 9 November	20,133	51.4%	48.3

Note: Data have not been weighted.

The sampling method aimed to obtain a representative sample based on gender, age, income group and geographical region. This was implemented through a quota selection system. Pre-defined sub-sample sizes (i.e. quotas) were defined for each country following official statistics sourced from Eurostat. Ipsos's proprietary sampling software selected potential respondents to fulfil these quotas.

Because of the requirement to obtain large samples in all countries, these quotas could not be fulfilled perfectly in the following two instances:

1. the regional quotas within each country were somewhat relaxed to ensure that sufficient number of completes could be reached within each country;
2. a lower percentage of people aged 65+ were reached than targeted in Lithuania and Romania, and – to a lesser degree – in Austria and Spain.³⁹

Sampling weights were calculated for each respondent, and provided along with the data, so that these discrepancies can be accounted for in analysis of the data. Data was based on age, gender and region.

Weights were generally within acceptable margins. As **Table 43** below shows, the vast majority of observations fall within acceptable bounds for weights. Only 366 observations received a weight larger than 2, and only four observations received a weight larger than 5⁴⁰. These four cases all represented respondents from Corsica.

Table 43. Summary statistics on sampling weights.

Statistic	Value
Minimum	0.66789
1 st percentile	0.69156
5 th percentile	0.72691
1 st quartile	0.89776
Median	0.95431
Mean	1.00000
3 rd quartile	1.02587
95 th percentile	1.36969
99 th percentile	2.38461
Maximum	17.7314

³⁹ Difficulty reaching older respondents in Lithuania and Romania is partially because internet penetration is lower in these countries, especially among older age groups. Thus, the online panels did not contain sufficient people aged 65+ to fulfil the quota.

⁴⁰ Respectively 17.35017 in three cases and 17.7314 in one case.

Annex 5. Topic guide for the pre test

This annex provides the discussion guide for the pre test in Germany and the Netherlands. The following colour code is used:

- text in black provides instructions to the moderator/expert
- text in blue provides text provided to participants;
- text in red provides additional instructions.

Introduction to the pre-test (5 minutes)

- Thank participants for taking part.
- Introduce self and Ipsos
- **Introduce the pre test:** This pre test in which you will participate today, is part of a larger research project which the European Commission Joint Research Centre is conducting to understand how consumers think about food products based on their packaging. The research project consists of several tasks. One of these tasks is the realization of an online survey with consumers which will be conducted in ten European countries in the autumn. In order to test this online survey, one pre test is being conducted in Germany and one in the Netherlands to ensure that the online survey works well.
- The pre-test consists of a first part in which you will be asked to fill out the online survey, and a follow-up part in which you will be asked questions about the online survey, for example questions asking whether all survey questions were clear and easy to understand, whether you encountered difficulties with specific questions, whether you had enough time for specific exercises in the survey etc. The outcomes of this pre test will help to fine-tune the online survey. The outcomes of the final online survey, which will be conducted in the autumn, will help to address an existing policy knowledge gap on how variations in front of package design influence consumer understanding and decision-making.
- It's important to note that the questions in the second part of this pre test, after you have filled out the survey, are aimed at getting insight into how you experienced the survey, the parts that were clear to you and were easy to fill out, as well as the parts that were more difficult, where certain aspects were unclear, or where you would have liked to have a bit more time to finalize. Any input you can give on improvements would be very helpful for us. It is also perfectly fine if people disagree with one another. There are no right or wrong answers. There is also no previous knowledge required to engage in this pre test.
- We want to emphasize that all views and opinions expressed will remain completely confidential and anonymous outside of this group. We will not report data in a way that could lead to individuals being identified. **Are there any questions about how your privacy will be ensured when processing the data from the pre test?** (Note to the pre test supervisor: To answer possible questions, please see the Privacy Notice which we prepared for this pre test and which includes all measures that are put in place for this study to ensure that the privacy of the research participants is protected throughout this study)
- **For the pre test in Germany: Request permission for the research team at ConPolicy, with whom Ipsos is working together to conduct this study, to observe the pre-test and ask questions in the second part of the pre test.** Identifiable information which is disclosed in the pre-test, will be kept confidential by the research team members.
- **For the pre test in the Netherlands: Request permission for the research team at Le Europe and the European Commission Joint Research Centre, with whom Ipsos works together to conduct this study, to observe the pre test and ask questions in the second part of the pre-test.** Identifiable information which is disclosed in the pre-test, will be kept confidential by the research team members.
- The pre test will last approximately 60 minutes in total. In terms of the practicalities of the second part of the pre test, that is after you have filled out the survey, I will pose a series of questions and present some slides to visualize these questions, and I will ask for your views on each question in turn. So that we are not all speaking at the same time, I will invite you to give your views one at a time so please **raise your hand (in the offline setting in Germany)/ use the hand raise function (in the online setting in the Netherlands)** to indicate when you have something to say. May I also ask you to check whether your mobile phone **and programs that are running on your**

computer in the background (the latter only for the online setting in the Netherlands) are muted so that these cannot interrupt this session.

- Any questions before we begin?

Part 1: Survey (30 minutes, could be more depending on time participants need to complete survey)

- Ask participants to start filling out the survey in its entirety (**Note to the pre-test supervisor in Germany: please ensure that 2 participants have to fill out survey on tablet, 3 on laptop.**)
- Note to supervisor/expert in the Netherlands and Germany: informally time participants to see how long they take to complete and note these approximate timings down. We are aiming for 25 minutes to complete the survey in its entirety, but please allow people to finish the survey in the time they need to do this (although 40 minutes should be the absolute maximum, otherwise there is not enough time left for the second part of the pre test).

Part 2: Questions about survey (30 minutes)

- Note to supervisor/expert: When all participants have completed the survey (or after 40 minutes have passed – see above note on this), please start chronologically addressing each part of the survey, as outlined below. Also start presenting the PowerPoint presentation which visualizes the questions for each part.

Part 1: Q1 through Q6 – general information and purchase behaviour (2 minutes)

- Generally ask whether participants understood the questions:
 - was it clear what was asked of them?
 - were there certain words or phrases they did not understand right away?
- Did they feel answer options were missing?
- Anything else they noticed while filling out the survey which might be of importance to improve the quality and flow of the survey? PROBE when showing the questions on the slide.

Part 2: Q7 through Q9 – Perceptions of food packaging (15 minutes)

- After you filled out some general information at the start of the survey, you saw images of brands (show slide):
 - Was it clear to you that these images were of brands that are not real?
 - And was it clear that these brands were used in the task following?
- You may have noticed that we asked you the same questions 10 times but for different products and different combinations of package designs. Was it clear to you from the beginning what you needed to do?
 - If not, at what point did you understand what you needed to do?
 - Would an example beforehand have helped you?
 - Or can you think of other ways in which we could have made this question clearer?
- Overall, did you find the questions we asked in this part easy to understand? Did any question stand out to you in any way? ALLOW PEOPLE SOME TIME to have a look again at the survey questions on the slide so they can recollect their thoughts.
- **FOR Q8; ONLY THOSE FOR WHOM Q8 WAS ALWAYS ASKED:** Some of you may have noticed that you were first asked whether you thought the two packages looked the same. Then, you were asked whether you thought the two products were the same, even when you thought the packages were the same.
 - For those who did at any point say that the two packages were the same, did the follow-up question make you re-evaluate or question your first answer? Did this second question influence how you answered similar questions the next time they came up in the survey?
- **FOR Q8; ONLY THOSE FOR WHOM Q8 WAS ONLY SHOWN IF ANSWER TO Q7 WAS 'DIFFERENT':** You were asked whether you thought the product packages looked the same to you. If you said 'yes, they look the same', does this also mean that you believe that the products in the packages are the same?
- **FOR Q9:** Was it clear to you what the various product characteristics meant? Would you have preferred some explanation? (show slide with product characteristics)

Part 3: Q10 – Product preference (5 minutes)

- In this part as well, you may have noticed that we asked you the same question 10 times but for different products and different combinations of package designs. Was it clear to you from the beginning what you needed to do?
 - If not, at what point did you understand what you needed to do?
 - Would an example beforehand have helped you?
 - Or can you think of other ways in which we could have made this question clearer?

Part 4: Q11 through Q16 – About the respondent (3 minutes)

- Generally ask whether participants understood the questions:
 - was it clear what was asked of them?
 - were there certain words or phrases they did not understand right away?
- Did they feel answer options were missing?
- Anything else they noticed while filling out the survey which might be of importance to improve the quality and flow of the survey? PROBE when showing the questions on the slide.

Part 5: (Only for German pre test): size of screen (2-3 minutes)

- Expert to show parts 2 and 3 of the survey (i.e. the parts with pictures) to respondents on a smartphone, and ask whether they feel they could have answered the survey equally well on a screen of this size.
 - Ask participants whether the side-by-side pictures are clearly visible to them on a screen with of size.
 - Ask them whether they would need to zoom in in order to clearly see the side-by-side visuals.
 - Ask them which elements of the visuals attract their attention at first sight.
 - Ask them whether they think that answering these specific survey questions (i.e., with visuals) would be more difficult on a smartphone compared to laptop/tablet, or whether they think this would not make a difference for them.

Part 6: Timings for part 2 (5 minutes)

- You may remember that in parts of the survey, you only saw images for a limited time. We would like to understand the minimum time we need to keep these images on screen for you to make a good decision.
- The idea is here to understand how long you need to get a reasonable idea of the package, but not how long you need to really study it.
- We will now show you a couple of images on the screen for a pre set number of seconds. Please tell us when you think the picture disappears too quickly.

SUPERVISOR/EXPERT TO SHOW SLIDES WITH IMAGES FOR 2, 3, 4 OR 5 SECONDS. Pause after each timed slide to ask participants whether the timing was

- too short
- just right
- too long

Close and thanks (1 minute)

Thank you very much for participating in this pre test; both we as well as the research team at LE Europe and the European Commission Joint Research Centre very much appreciate the time you have given to do so. Your participation has been very helpful for us. I want to emphasize again that all views and opinions expressed in the discussion will remain completely confidential and anonymous outside of this group. We will not report data in any way that could lead to you being identified. Before closing this session, I would like to ask, is there anything else you would like to say about the topics we have discussed today, and that we have not covered yet?

SUPERVISOR TO THANK PARTICIPANTS FOR THEIR PARTICIPATION AND CLOSE SESSION.

Annex 6. Econometric analysis of front-of-pack elements as predictors of perceiving packaging and product differences, and expected product differences

Using econometric regressions, we analyse the effect of the front-of-pack elements on consumers' perception of differences in food packaging and products, controlling for demographic characteristics (e.g. country, age, gender and income level); lifestyle characteristics (e.g. having lived abroad or the number of countries visited in one year) and shopping priorities (e.g. price, product healthiness or sustainability (Table 44)). The main effects we focus on are the number of differences in front-of-pack elements, differences in the individual FOP elements such as including or not a specific claim or logo and the specific combinations of FOP elements.

Variables

Table 44. Dependent variables.

Name	Description
Packages perceived as different	0 = No 1 = Yes
Degree of perceived difference in packages	0 = packages perceived as the same 1 = Slightly different 2 = Somewhat different 3 = Moderately different 4 = Different 5 = Very different
Product versions perceived as different	0 = No 1 = Yes
Expected difference in ingredients between product versions	0 = No 1 = Yes
Expected difference in healthiness between product versions	0 = No 1 = Yes
Expected difference in product sustainability between product versions	0 = No 1 = Yes
Expected difference in nutritional composition between product versions	0 = No 1 = Yes
Expected difference in taste between product versions	0 = No 1 = Yes
Expected difference in origin of ingredients between product versions	0 = No 1 = Yes
Expected difference in place of production between product versions	0 = No 1 = Yes
Expected difference in product quality between product versions	0 = No 1 = Yes

Note: Text in bold is the reference level for factor variables

Table 45. Independent variables (main effects).

Name	Description
Number of differences in packaging elements	<p>2 = Two differences 4 = Four differences 6 = Six differences 8 = Eight differences</p>
Difference in recipe claim	<p>0 = No 1 = Yes</p>
Difference in in background colour	<p>0 =No 1 =Yes</p>
Difference in in background colour shade	<p>0 =No 1 =Yes</p>
Difference in image position	<p>0 =No 1 =Yes</p>
Difference in origin of ingredients claim	<p>0 =No 1 =Yes</p>
Difference in taste claim	<p>0 =No 1 =Yes</p>
Difference in quality logo	<p>0 =No 1 =Yes</p>
Difference in image	<p>0 =No 1 =Yes</p>
Difference in Product description	<p>0 =No 1 =Yes</p>
Combinations of differences in FOP elements	<p>1 = image position + product description 2 = quality logo + colour shade 3 = ingredients origin + colour shade 4 = colour + quality logo 5 = colour + ingredients origin 6 = colour + image position + ingredients origin + taste claim 7 = colour + image position + ingredients origin + image 8 = image position + ingredients origin + taste claim + colour shade 9 = image position + ingredients origin + image + colour shade 10 = ingredients origin + taste claim + quality logo + product description 11 = recipe claim + image position + taste claim + quality logo + image + product description 12 = recipe claim + ingredients origin + taste claim + quality logo + image + product description 13 = colour + image position + ingredients origin + quality logo + image + product description 14 = image position + ingredients origin + quality logo + image + product description + shage 15 = recipe claim + image position + ingredients origin + claim taste + quality logo + image + product description + shade 16 = colour + recipe claim + image position + ingredients origin + claim taste + quality logo + image + product description + shade</p>

Note: Text in bold is the reference level for factor variables

Table 46. Independent variables (main effects).

Name	Description
Socio-demographic variables	
Country	1 = Austria / 2 = France/ 3 = Romania / 4 = Czechia 5 = Italy / 6 = Germany / 7 = Netherlands / 8 = Lithuania / 9 = Poland / 10 = Spain
Age group	1 = 18-34 years old / 2 = 35-54 years old / 3 = 55-65 years old / 4 = >65 years old
Income group	1 = Very low / 2 = Low / 3 = Medium 4 = High / 5 = Very high / 6 = Prefer not to answer 7 = Don't know
Number of adults in household	Number of adults
Number of children between 6 and 17 years old	0 = No children from 6-17 years old 1 = One child 6-17 or more
Number of children between 0 and 5 years old	0 = No children 0-5 years old 1 = One child 0-5 or more
Lifestyle variables	
Lived abroad (>1 month continuously)	0 = Yes 1 = No
Visited other countries in a regular year	0 = Yes 1 = No
Purchased food products in another country	0 = No 1 = Yes
Noticed differences across countries in food packaging (other than language)	0 = Yes 1 = No
Product type	
Product	1 = Instant coffee / 2 = Crisps / 3 = Baby food 4 = Fish fingers / 5 = Chocolate/ 6 = Yoghurt
Situational treatments	
Primed	0 = No 1 = Yes
Simultaneous visualisation	0 = No 1 = Yes
Longer time visualisation	0 = No 1 = Yes
Priority factors when buying	
Composition (ingredients)	0 = No 1 = Yes
Healthiness	0 = No 1 = Yes
Sustainability	0 = No 1 = Yes
Taste	0 = No 1 = Yes
Brand	0 = No 1 = Yes
Nutritional composition	0 = No 1 = Yes
Fair trade	0 = No 1 = Yes
Origin of ingredients	0 = No 1 = Yes
Place of production	0 = No 1 = Yes
Other controls	
Choice order	1 (=1st choice) to 10 (=10 th choice)

Note: Text in bold is the reference level for factor variables

Model Specification

To test hypothesis 1 to 7 and 9 and 11 logistic (or ordered logistic according to the dependent variable) regression analyses were conducted. The regression models explain whether packages are perceived as the same or different, the degree of perceived difference between packages and whether consumers believe the product versions inside the packages are the same or different and in which characteristic. To test hypothesis 8 we run a conditional logit model whereby we explain the purchase decision based on the FOP elements that differ between versions. Therefore we use three different types of econometric models to test the different hypotheses as summarised in **Table 47**.

Table 47. Correspondence between models used and hypothesis tested.

Econometric model	Hypothesis	Dependent variable	Relevant independent variables
Logit	1	(a) Difference in package (b) Difference in product version	Number of FOP elements
	2	(a) Difference in package (b) Difference in product version	Individual FOP elements
	3	(a) Difference in package (b) Difference in product version	Individual FOP elements Individual FOP elements x number of FOP elements
	4	(a) Difference in package (b) Difference in product version	Specific FOP element combinations
	5	Difference in product characteristics	Individual FOP elements
	6	Difference in package Difference in product version	Individual FOP elements x country
	7	Difference in package Difference in product version	Individual FOP elements x product
	9	Difference in package Difference in product version	Time for which packages are shown treatment (short or long)
	10	Difference in package Difference in product version	Presentation of packages treatment (simultaneous or sequential)
	11	Difference in package Difference in product version	Priming treatment (primed or not primed)
	Ordered logit	1	Degree of difference in product version
Conditional logit	8	Purchase decision	Individual FOP elements

In addition, we use control variables for country, age, gender, income, lifestyle, purchase priorities and products.

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