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How do consumers react to food products labelled as “antibiotic-free”?

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Abstract

This study aims to answer the research question: How do consumers react to food products labelled as "antibiotic-free"?, by unraveling whether consumers are positively influenced by an "antibiotic-free" label affixed on products. We here investigate if the presence of an "antibiotic-free" label positively influences the respondent's purchase intentions, the product's perceived quality and taste, as well as the respondent's trust towards the product, the price he is willing to pay to acquire the product, and if this price is affected by the respondent's knowledge about antibiotics. We here focus on food products and more especially on meat, investigating the French market and French consumers, in a context of blurred legislations due to a controversial ratification of the CETA, and in a climate of sanitary crisis caused by the outbreak of the Covid-19.

By presenting respondents, thanks to an online experiment, with three different products bearing one, three and no "antibiotic-free" label at all, we came to the conclusion that the presence of an "antibiotic-free" label generates higher purchase intentions and willingness to pay, positively influences the product's perceived quality, and positively influences trust towards the product. However, we could not state that the presence of an "antibiotic-free" label on a product positively influences the perceived taste respondents report. In addition to that, we conclude that there is a positive significant correlation between the respondents' level of knowledge about antibiotics and their willingness to pay for products that bear at least one "antibiotic-free" label.

Therefore, creating an official "antibiotic-free" label could be beneficial for European and French meat producers, since there is a potential market for it. However, in order to maximize the sales, it seems to be crucial to educate the French public to deepen their knowledge about antibiotics. Customers with a thorough knowledge of antibiotics would be able to fully understand the advantages of such a label, providing an additional value for the product bearing it, compared to a product imported from Canada, which may even present risks for customers' health.

1. Introduction

The Comprehensive Economic Trade Agreement (CETA) was ratified between Canada and the European Union a few months ago. This agreement removes the custom duties between the two parties and facilitates cross-border trade. In Canada, meat products must comply with sanitary regulations that are different to French ones. This raises the concern for French consumers to see meat products treated with antibiotics be available in their supermarkets.
The concern falls within the framework of a general anxiety climate related to food consumption that came out since the 90's because of repeated food scandals.

Consequently, French consumers need to be reassured about the food items they wish to buy. Creating the "antibiotic-free" label represents a means to tackle this issue. Thus, we wish to understand how consumers would perceive products affixed with an "antibiotic-free" label, what would be their reactions and feelings towards them, and would it be translated into higher sales. This study could make contributions in the societal field, clarifying consumers' understanding of the antibiotic issue and raising awareness about the concrete risks; in the political field, highlighting the need to identify "antibiotic-free" products and the risk of the CETA; and in the managerial field, advising producers on how to act to market their products and get the most value out of them.

2. Literature review and hypotheses

2.1 Crisis of confidence in the food industry

2.1.1 Recurrent crisis situation

For the last 30 years, frequent food scandals have undermined French people's confidence in the agri-food sector, so well that food safety has now become an object of deep concern for the consumers, the producers, the retailers and the government.

The atmosphere of mistrust concerning food started in 1996, with the most publicized scandal: the BSE (Bovine spongiform encephalopathy) also commonly known as Mad cow disease. This disease affected the central nervous system and it led to 204 known cases of deadly transmission from animals to human beings, according to the Mr Mondialisation article "9 scandales de l'industrie alimentaire qu'on ferait bien de ne pas oublier!". Then, different scandals went on with the avian flu in 2005, the 2009 pandemic flu, the horse meat in 2013 and the eggs contaminated by Fipronil in 2017. In 2001 already, studies showed a growing health concern related to food consumption: in 1997, 55% of the consumers estimated that food products presented a risk for their health, in 2000, 4 years after the first scandal, they were 70% (Chameroy, 2013). These repeated food scandals led to the development of regulations in the European Union and in France, to set up clear policies with legal sanctions to frame the actions of big food companies. For instance, antibiotics considered as growth accelerators have been banned in the EU since 1996 (Commission Européenne, 2005). New initiatives have recently been developed to take even stricter measures. Indeed in accordance with the "One-Health" EU policy, a new "Ecoantibio 2" plan has been adopted in France in 2017, in order to reach a fully responsible use of antibiotics in 2022. This plan aims to regulate the preventive use of antibiotics in farming, by restricting the use of antibiotics of critical importance (3rd and 4th generation cephalosporins, and fluoroquinolones, (Roy, 2016)) and conditioning their prescription to a strict veterinary diagnostic (allowing the use when the animal is dying, and no alternative medicine can be used). This plan also tries to sensitize farmers to the existence of alternative curing methods, and tries to make them easily accessible

to farmers (Ministère de l'Agriculture et de l'Alimentation, 2019). This is the second "Ecoantibio" plan (2017-2021) carried out in France, the first one (2012-2017) decreased the antibiotic use by 39% over 6 years among all stock farming (exceeding the expectation of a 25% decrease) (Ministère de l'Agriculture et de l'Alimentation, 2018). France also set up a Priority Research Program on antimicrobial resistance, endowed with 40 million € over 10 years (Ministère des Solidarités et de la Santé, 2020). In light of the EU "One Health" politic and the efforts made by France to reach a reasoned use of antibiotics to avoid any risks caused by their use; the CETA ratification which occured in July 2019 is raising new concerns and issues. Indeed, the Comprehensive Economic and Trade Agreement, makes it easier for Canada to export its products in the European Union. Questions are raised, since Canada's regulations concerning antibiotics for farming are far less stringent than EU's. If we focus on meat, Canadian products can be treated with antibiotics which are not compliant with the EU regulations. According to the independent CETA commission, Canadian companies are incorporating antibiotics nearly systematically into farm animals' food to avoid cost-effectively the appearance of diseases. This behavior triggers risks, the main one being suspected to foster antibiotic resistance for humans in the long run.

In parallel with the ongoing trend of mistrust caused by many food sanitary scandals, food companies' processes have evolved towards more processed food and less transparency for the consumers, who tend to have difficulties to understand and recognize ingredients, processes and products overall. Consumers now more and more show the desire for more disclosure and traceability and want to have a more active role in their consumption and purchase decisions.

To put it in a nutshell, repeated food sanitary crises and new corporate processes to produce more at a lower cost changed the relationship French people have with food : a shift has indeed been observed by consumers, from faith or lack of concern to a climate of anxiety. This rise of distrust towards big corporations has been observed and quantified thanks to a Eurobarometer study, assessing that in 2010, 63% of consumers are suspicious when it comes to major producers, compared to 53% in 2001 (Eurobaromètre 74 - November 2010). In 2019, this distrust has stabilized around 44%, but is still very present in customers' mind and therefore in their purchase decisions (Eurobaromètre 91 - Juin 2019).

2.1.2 Consequences

These events created a very special climate where consumers experience anxiety and a feeling of discomfort that lead them to distrust processed food whose composition became unclear (Fischler 1996). Consumers tend to mainly perceive the risk in meat products; In the study from Credoc in 2001, 68% of the respondents answered meat, 66% cold meat and 63% poultry when asked to cite the items the most anxiety-provoking.

In response to this stress, they need to be reassured (Gallen 2001). This is a phenomenon which can also be explained by the concept of homeostasis (Wilde, 1982). This concept stipulates that people seek an equilibrium when they are in an uncomfortable situation. In order to face it, consumers implement a strategy that aims at reducing the risk (Stone and Gronhaug 1993). A way to reduce the perceived risk generated by purchase uncertainty could be through the search of information (Dowling and Staelin 1994). Locander and Hermann (1979) cite different types of risk reducers that are independent sources (consumer associations), advertisements, sources resulting from direct experience, etc. Among them, the quality signs such as labels reassure consumers in their food choices, they are used as a guarantee of quality. Consumers tend to trust official labels since they are certifications of quality accredited through independent organizations and following a number of regulated controls (Grunert, Larsen, Madsen, Baadsgaard, 1996).

Today, ¾ of the consumers read the information presented on the packaging and 40% do it all the time (Credoc 2001). Consumers heavily rely on labels and information on the packaging to make up their mind about a product. In order to provide an effective framework for labels, a certain amount of regulations have been developed. Since the 25th October 2011, the minimum quality of a product is defined by a the n°1169/2011 European rule, so that consumers have information about the food items sold inside the EU. These information are conveyed to customers through different means including the use of logos, which can be European or national. In France, the Institut National de l'Origine et de la Qualité (INAO) produces official labels for products that benefit from an official identification sign of quality and origin. These signs make it possible for customers to identify products which respect strict production conditions

validated by the State, and which are tested and controlled regularly by independent state-approved certifying bodies.

Currently, there are five official labels in France, which are supervised by INAO. One of the labels currently in effect is the "Agriculture Biologique" (AB) label, which identifies organic products. This label garanties that the food is composed of at least 95% of ingredients coming from a production method that is organic, it also limits the fortuitous presence of GMOs to a ceiling of 0,9%. Furthermore this label guarantees that the certification is under the control of an organization approved by the french public authorities and meets the criterias of independence, impartiality, competence and efficiency which is defined by the European standard EN 45011 norm. In France, in 2018, the market of products labelled as "Agriculture Biologique" represents about 9,7 billion euros, engaging 2 million hectares in organic production. Another label which is used in France is the "Appellation d'Origine Protégée/Contrôlée" (AOP/AOC) label. This label identifies and preserves products with a protected designation of origin, it pinpoints agricultural products that have been produced and processed in a specific geographical area, using ingredients from the region concerned, with a specific know-how of local producers. This label is currently used for more than 500 products, and concerns wine (the AOP "Crémant d'Alsace" which is produced in the east of France), dairy products (the AOP butter "Beurre de Charentes-Poitou" coming from this region for instance or the cheese called "Crottin de Chavignol" which comes from the city of the same name), meat (the AOP chicken "Poulet de Bresse" coming from Bresse for instance), oils (AOP "Huile d'olive de Nîmes"), fruits and vegetables (AOP "oignons de Roscoff" coming from a town in Brittany). To give here again a little bit of insights on the figures, the turnover in 2017 represented about 23 billion euros for all the products bearing the label AOP, with more than 21.2 billion generated by the wine products. Furthermore, there is the "Indication Géographique Protégée" (IGP) label, which pinpoints products with a protected geographical indication. This label is not as thorough as the AOP one, since it only requests that the production or the transformation happens in specific conditions. We can here name a few examples, with the "Jambon de Bayonne IGP", the "Miel des Cévennes IGP" or the "Riz de Camargue IGP". In France in 2017, more than 140 IGP labelled products were registered, generating a turnover of about 3,7 billion euros. Another label is the "Spécialité Traditionnelle Garantie" (STG) label,

which guarantees that the product is a traditional specialty. This label does not refer to an origin, but it aims to enhance a traditional composition of the product or a traditional mode of production. Only one STG is French and it concerns the mussels “Moules de Bouchot”.

Finally, France also has the “Label Rouge”, which identifies products that have an outstanding level of quality. This label only exists in France and is affixed to products such as “Gros Sel de Guérande” produced by Le Guérandais or the “Thon Blanc Germon au naturel” produced by Connétable. In 2018, the “Label Rouge” label was affixed on 434 products, 213 of them being poultry products. It then represented about 1.5% of all the food production, with a turnover of about more than 1.5 billion euros.

Products can also bear several labels. For instance, the Languedoc Poultry (“Volaille fermière de Languedoc”) bears 2 labels: the IGP label and the “Label Rouge” one. The Lautrec pink garlic (“Ail rose de Lautrec”) also bears both of them.

All these labels have been defined by decrees and are under the supervision and control of the independent INAO. Beside these official labels, various additional and non-official labels are to be found, such as the “Saveurs de l’année” label, for products selected each year by a panel of clients or the press. An increasing proliferation of marketing promesses is also witnessed for products sold in supermarkets, with products’ packaging promoting benefits through claims, such as “Rich in vitamin C” for instance.

This official label policy is quite successful on the French market in times where the consumer is getting more skeptical towards traditional marketing techniques (Roux, 2007). Indeed, more than 13% of the cheese, 11% of bovine meat and 10% of poultry, commercialized in France are bearing one of the above labels, (INAO Report, 2018), and more than half of the French consumers are keen on products with labels (TNS Sofres study, 2011). To be more specific, the Label Rouge is seen by consumers as a historic guarantee of quality (Tavoularis, Recours, Hebel, 2007), and the consumer association UFC-Que Choisir describes it as being the most famous label benefiting from a 83% rate of confidence among French people.

Labels are generating a significant commitment for consumers, in a context of complexification of the product offer and companies’ mix, and the increasing

difficulties consumers encounter when estimating the quality of the product. This situation can be qualified as an asymmetric information situation, where consumers have a poor comprehension of the offer which leads to hesitation, mistrust and insatisfaction (Larceneux, Rieunier, Fady, 2007). Labels are becoming a token of quality more than brands (Tavoularis, Recours, Hebel, 2007). Therefore, it's essential for companies to demonstrate their quality to consumers by all means. For instance, according to the organization Santé publique France (2018), 33 of them - including large companies like Danone, Bonduelle, Auchan, Casino, etc. - take part in the "Nutri-Score" program and affix the healthiness score of their products on the packaging. According to Ingrid Dupichot (2018), there is also a boom in the products that define themselves to be "free" - sugar free, gluten free, additive free, antibiotic free- or have "clear labels" with the least ingredients possible.

With the rise of concerns related to the antibiotics used in meat production, affixing a label that guarantees that the product is "antibiotic-free" could help reduce the perceived risk and reassure the consumers. We will therefore focus in a second part, on the impact of an "antibiotic-free" labelling strategy. Could this strategy influence consumers purchasing intentions and decisions, in a positive way?

2.2 An "antibiotic-free" labelling strategy : the impact on customer decision

2.2.1 The label as a new brand

In times, where consumers are increasingly concerned about food and the incidence it could have on their health and planet, the expectations for food safety, quality and transparency are set even higher. The Impact of Food Labeling on Consumer Purchasing Decision with special reference to faculty of agricultural sciences (Bandara et al., 2015), reminds that labels are crucial since they provide customers with information about ingredients, nutritional properties, preparation or storage. This is key since these information are the ones which shape consumer's perception of a product and they are therefore decisive in the purchase decision. The study completed in the paper surveys 90 respondents to assess their

reactions towards food labelling. It shows that the vast majority of interviewees pays attention to the labels, with 98% of respondents examining labels on food products when making a purchase. If we go further in detail, we discover that 85% of them check the labels to avoid diseases related to food, hereby showing that labels are a way to reassure customers and restore their trust in the food industry. We have to open a parenthesis here to make comments about the numbers we cited above. Indeed, it is important to mention here that the research location of this Bandara et al., 2015 study, was a Faculty of Agricultural Sciences. Therefore, the target population were persons who were randomly selected out of a pool of 275 students of the Faculty. The sample of interviewees is made of persons who have a similar profile; it is important to keep that in mind because it could explain why the percentage rates are so high (98% and 85%).

For the consumer, what matters most when it comes to labels, is the food safety, environmental protection, food origin and brand reputation. These criterias are under the spotlight because they tend to be very controversial as we have seen in our first part, with the existence of official and regulated labels and non official and non regulated ones.

Before the final step of the purchase of a product, consumers go through a process where they analyze its different aspects, as it has been shown by the cognitivist models. According to Hair et al (1992), the product's overall evaluation results from the evaluation of each and every attribute that composes the product. Therefore, in order to choose the best solution that will answer their needs, consumers get into a process of collecting and analyzing information. Here the importance of the label steps in and comes into the "learning process". The study presented in Giraud's paper (2000), aims to unravel which attributes (price, origin, label, brand) of a product matter most to the consumer. Giraud performs a conjoint analysis with a "Jambon de Bayonne" (Bayonne Ham), presenting the respondents with several options for each 4 attributes: three possible prices (1.9€, 3.9€, 5.9€), three brands ("Fermier", "Champion", "Aoste"), three labels ("Label Rouge", "IGP, none) and four possible origins ("Bayonne", "Auvergne", "Ibérique", none). This experiment shows that three attributes are particularly important for the consumer: a low to moderate price (1,9€ and 3,9€), a qualitative origin (respondents value "Bayonne" or "Auvergne", way more than the indication "Ibérique" or none at all), and a label which is a guarantee of quality

(respondents value the presence of the french “Label rouge” sign, and the IGP label, way more than the absence of any label). The brand attribute appears to be less important for the consumer. Here we can conclude that the “labels” and “region of origin” attributes are ones of the most important factors affecting consumers’ preferences. Most of all, consumers definitely prefer products that bear a label compared to those that have none.

The strategic importance of labels also becomes clear, when assessing the market. It can be characterized by a situation of information asymmetries between producers and consumers. Producers possess information that consumers are unaware of. These informational issues lead to an anti-selection effect, where consumers have difficulties to get access to the quality of a food product before buying and using it. In this kind of situation, where consumers can not evaluate the quality of the goods, it’s in the producers’ interest to overestimate their products’ quality and sell those at the highest price possible. Consumers lose their trust in producers and the quality of their products, and the price can no longer be considered as a good indicator of quality, since consumers face products with very different levels of quality for the same price. For the producers who sell high quality products at high prices but who have high costs, the situation becomes difficult when they face producers offering poor quality products with low costs but at a high price-point.

As a result, Akerlof showed (1970) that the mean of quality tends to decrease and the poor quality products overflow the market. In order to address this issue, a version of the signaling strategy could be implemented, but not based on prices, since those are no longer considered as guarantee of quality. Labels could be a credible criteria, consumers could base their choice on. The efficiency of this strategy would then depend on the perceived independence of the third-party entity delivering the labels, as well as the credibility and the reputation of this entity (Golan, Kuchler and Lorraine, 2000). According to Larceneux (2004), the credibility of a sign is two-dimensional : involving the knowledge of the sign and the trust the consumer can put in it. If we consider the possibility of an “antibiotic-free” label, producers would have the possibility to use an incontestable credible sign (a label) or a sign quite less credible (a marketing promise). If the sign is credible, it will influence the perception of the consumer and help shape it in a positive way (Erdem et Swait, 1998).

2.2.2 Label as a way to implement the economic strategy, of signaling in a situation of information asymmetry between the market's actors

Just like brands, labels can be seen as having a capital. Brands are crucial for the customer in the purchase decision. Keller's (1993) well known customer-based brand equity pyramid identifies a brand's capital as a set of different dimensions that need to be apprehended to build the capital of a brand : the brand awareness, which relies on memory and recognition of the brand, and the brand resonance, which focuses on the extent to which customers feel that they are "in sync" with the brand and how they act accordingly. Associations are the fundamental pieces of knowledge consumers have of a brand on their memory, and the set of associations linked to a brand compose the brand image. The "label's capital" could therefore be defined as "the associations and consumer behaviours towards labelled products that give them a competitive advantage compared to other products not labelled", according to Larceneux (2004). Just like brands, labels can thus create associations, and can influence consumer's preferences in three different ways, as stated in the author's thesis. First of all, a labelling strategy can make it possible to improve the perceived quality the consumer has of a product. The perceived quality of a product is defined to be "the set of expectations, beliefs about the anticipated performance of a product" (Siriex and Dubois, 1999). Because the consumers are unable to assess the quality of the product before the consumption, they use external signs provided by an independent entity to evaluate the quality, here the labels. Secondly, labels allow a sense of uniqueness to the product. The objective of a producer is to place its products as far away as possible from the "mean product" in order to be perceived as unique. The uniqueness of a product is its capacity to stand out from other products in its category and be perceived as more specific. In a food market characterized by abundant offerings, the labels can be used to differentiate the products. Because labelled products hold a distinctive sign, they are likely to be chosen more often. Lastly, labels help build up the reputation of the brand which is commercializing the product, having effects far beyond the product bearing the label, more broadly on the brand, and allowing to build a long-lasting and true relationship with the customers. Labels can be considered as second brands, that can be used in a strategy of co-branding. There is an undoubted spill-over effect (Simonin et Ruth,

1998) when two brands connect in an alliance. Therefore, if a consumer identifies a label as being inline with his belief, the benefits of the label will transfer onto the brand, and enhance his esteem of the brand.

Labels can therefore be an efficient way to signal improved quality in a situation of information asymmetry. They are used as a sign of reassurance and result in a decrease of the perceived risk linked to a purchase decision.

2.2.3 The influence of the crisis situation

Larceneux's paper (2004) which focuses on a study of the organic label, called "Agriculture Biologique " in the EU and France, has shown that a label which has credibility, influences consumer's purchase decision positively. Labels address the information asymmetry situation by providing credible and differentiating information to the customer, and enable to build the brand's reputation that the customer clearly identifies and trusts. When it comes to products that are "antibiotic-free", no official label currently exists to certify a product. We would like to investigate further, if consumers would have the same behavior observed in the previous Larceneux study towards an "antibiotic-free" label. Our objective in this thesis will be to demonstrate that, indeed, an "antibiotic-free" label can influence consumers as much as an "AB" label and leads to an improved consumer perception. We therefore aim to test the following hypotheses:

H1.1: *The "antibiotic-free" label generates higher purchase intentions.*

H1.2: *The "antibiotic-free" label positively influences the product's perceived quality.*

H1.3: *The "antibiotic-free" label positively influences the product's perceived taste.*

H1.4: *The "antibiotic-free" label positively influences trust towards the product.*

H1.5: *The "antibiotic-free" label positively influences the price one is willing to pay for a product.*

The veracity of this hypothesis may be greatly influenced by the situation generated by the CETA. Thanks to all the information spread out to customers by press and internet, consumers will perceive a high risk and a threat for their health. According to Stone and Gronhaug (1993), consumers will implement a

strategy to reduce the risk, and will therefore search for additional information and look out for labels.

2.2.4 Factors possibly affecting consumers' reactions towards products labelled as "antibiotic-free"

Some elements could bias consumers' reactions towards products labelled as "antibiotic-free", and therefore influence the purchase decision. First of all, the notion of typicality could influence consumers' decisions. Just like a brand seen as a fit for a category, if a label is considered typical for a certain type of product or category, it will lead to better acceptance and recall from the consumer. For example, unprocessed food products will be seen as more fit to bear the "Agriculture Biologique" label than industrialised foods. We hope to get the same result with the "antibiotic-free" label. European and French producers have more chance to be seen as actors who are in accordance with the implications of the "antibiotic-free" label because of the many regulations that exist in the EU. On the contrary, products coming from Canadian producers have less chance to be innately associated with such a label. The fact that European and French producers could be seen as typical for the production of "antibiotic-free" labelled products will foster the positive perception consumers have of the product, and they will be more likely to buy it.

Furthermore, it is important to say that the multiplication of labels has made it difficult for the consumers to make a difference between them and to identify which ones are official, awarded by an independent third-party and therefore a true guarantee of quality. In France for example, beside the 5 official labels discerned by the INAO, you can also find regulated rewarding references ("Viande de France" for instance, which stamps meat coming from animals raised in France), but you also have commercial labels such as "Saveur de l'année" or "Elu produit de l'année", where brands need to pay a high fee to be evaluated by a small panel of consumers, who are not experts, and who neither take into account the global quality of the product nor its impact on health. Consumers therefore tend to be lost in this context of proliferation of labels, may they be official ones or marketing claims. Furthermore, as stated in Bandara et al (2015), consumers tend to not consider and not examine labels because of the complicated nature of food labels. The risk here, is that beyond the fact that people have trouble

identifying official and trustworthy labels, that they don't understand them. Indeed, according to Jacoby, Chestnut and Silberman (1977), despite consumers' interest in nutrition information for example, they lack ability to use this information effectively, and end up interpreting advertising, general and specific nutritional content claims wrong and as misleading generalizations (Andrews et al, 1998). Consumers seem to be missing the keys to read through product information, and this has also been confirmed by Grunert et al (2001), pointing out that certain labels have failed because of the unfamiliarity of consumers towards them or because of the misinterpretation they have aroused. Moreover, if we now focus on an "antibiotic-free" label, consumers tend to demonstrate a lack of shortfall when it comes to the understanding of the antibiotic situation. A study conducted in Karavolias et al (2018) paper, brings out the existence of a gap between consumers' perception generated by food marketing and actual implications from production methods. In the study's experiment, consumers purchase poultry raised without antibiotics because they believe that it promotes healthier animals. In practice, producers who want to be present on the no-antibiotic segment will eliminate access to antibiotics without modifying production methods, thereby increasing risk and severity of certain diseases, reducing animal welfare. The findings of this study are consistent with Goddard et al (2017), who states that consumers are not aware of the fact that if a producer restricts or bans the use of antibiotics, this might have negative repercussions for animal welfare. Mundy also raises awareness on this issue in his article (2015), stipulating that "antibiotic-free" labels don't change the welfare of the animals and encourage producers to wait longer before they treat the animal, in order to still be able to sell in the "antibiotic-free" supply chain. This highlights the fact that overall, consumers don't understand what is at stake in the antibiotic issue, and this might affect their perception of products bearing an "antibiotic-free" label and influence their purchase intention and decision. Therefore, we make the following hypothesis, that we would like to test in our study:

H2*: The more knowledge people have about antibiotics, the more they are willing to buy a product bearing an "antibiotic-free"label.*

In order to test this hypothesis, we decided to split it up, into 4 sub hypothesis, formulated as such :

H2.1*: The higher the knowledge score is, the higher is the willingness to pay for a product bearing multiple "antibiotic-free" labels (Product A, see Methodology)*

***H2.2**: The higher the knowledge score is, the higher is the willingness to pay for a product bearing a single"antibiotic-free" label (Product C, see Methodology)*

***H2.3**: The higher the knowledge score is, the smaller is the willingness to pay for a product bearing no "antibiotic-free" label (Product B, see Methodology)*

***H2.4**: The correlation between knowledge and willingness to pay is stronger for the product bearing multiple labels (A) than for the product bearing a single label (C).*

Our hypothesis aims to answer a global and more broad research question. This question could be formulated as such : How do consumers react to products labelled as "antibiotic-free"?

3. Methodology

In order to answer the hypothesis mentioned above, we decided to go through by setting up an experiment.

3.1 Participants

Our objective was to reach a pool of respondents of 100 respondents. We sent out the survey to 188 persons, thanks to a link to the Qualtric survey. The context of the study was not explained to any of the respondents, in order to prevent any bias : trigger them about the importance of the labels beared by each product. There is no reward or financial contribution for the respondents : the participants do so voluntarily.

Concerning the selection of participants, we have a convenience sample. Our selection focuses on individuals aged from 20 to 75 years old, since persons in this age range will be more likely to have a significant budget that will allow them to be able to make their own choices when going grocery shopping. We tried as much as possible to select participants who are the ones who are responsible for running errands in a household. The selection also tries to preserve a diversity (half-half) concerning the age, the gender and the socio-professional criteria, but interviewing people who at least have their baccalaureate, by choosing persons over 18 years old.

We aimed our respondent distribution to be as follows :

	Variable	% (Frequency)
Gender		
	Women	50%
	Men	50%
Age (y.o.)		
	18-24	25%
	25-34	20%
	35-44	20%
	45-54	20%
	55-64	10%
	+65	5%
Profile		
	Student	45%
	Working	30%
	Retired	10%
	Unemployed	5%
	On maternity leave	5%
	Other	5%

Our study is targeted at Europe and especially at France. Indeed a lot of our respondents for the survey were French speakers, and the brand we used ("Picard") is available in all Europe but is a French brand.

3.2 Study Design

The experiment we built aims to test each of the hypotheses mentioned above. The experiment showcases several versions of the same product bearing one "antibiotic-free" label, multiple "antibiotic-free" labels and not a single label.
By using identical products but packaged differently, we will be able to assess the interviewee's feelings and perceptions about the presence of a label, and the amount in which it is present.
Due to the current sanitary situation, we decided to build our experience online thanks to a survey on Qualtrics presenting different version of the same product : a packaged slice of rumsteak, presented in 3 versions:

- Product A: a packaged slice of rumsteak bearing 3 different "antibiotic free" labels

- Product B: a packaged slice of rumsteak free of any label

- Product C: a packaged slice of rumsteak bearing one “antibiotic free” label

We will now go deeper into each part of our survey and explain how they will help us test our hypotheses and potentially validate them.

In the first part of our experiment, the respondent is presented with the 3 packages of rumsteaks in a row. The order in which the respondent sees the products A, B and C is randomized, in order to prevent any question order bias. Indeed the respondent will only be aware of the importance of the labels on the product when he will see the second product, that he will differentiate from the previous one by the addition or removal of labels. The randomization will here allow the avoid the flow of a first fixed product influencing people’s opinions about the second and third product. By randomizing the order question, each product will influence the other.

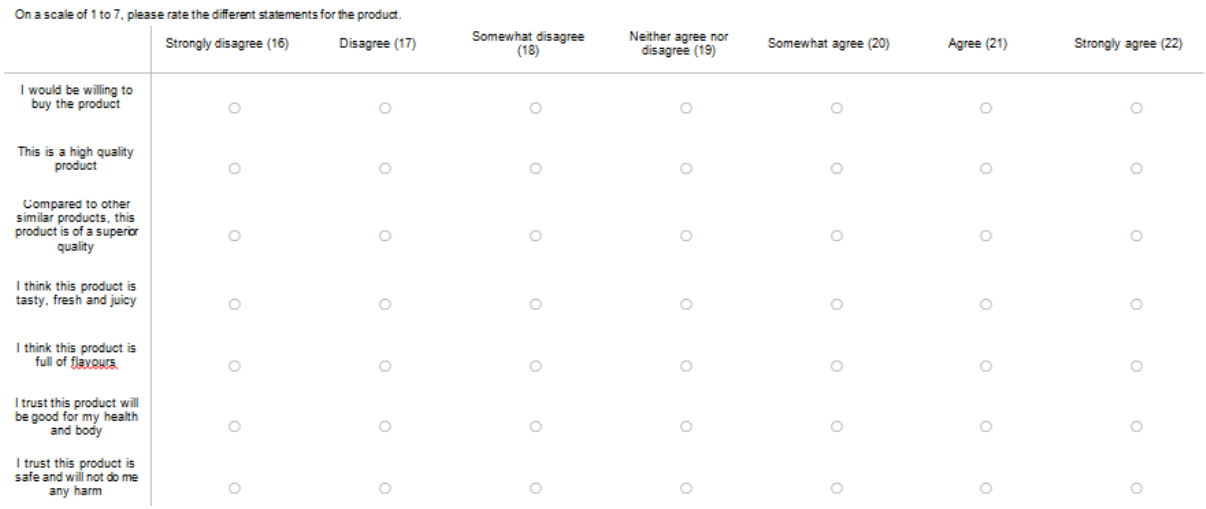
The same questions are asked to the respondent for each 3 versions of the product: the questions are statements the respondent has to rate. The closed character of the question will help ease the analysis, by providing quantitative data.

The respondent is asked to rate the following 7 statements through a matrix table with a single answer on a Likert scale. Our Likert scale has 7 possible answers : Strongly disagree, Disagree, Somewhat disagree, Neither agree nor disagree, Somewhat agree, Agree and Strongly Agree. Each possible answer is numbered from 16 (Strongly Disagree) to 22 (Strongly Agree).

The presented statements are the following ones :

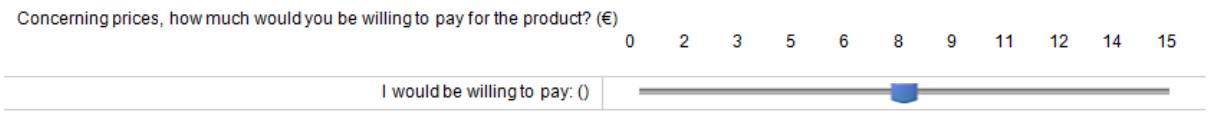
- I would be willing to buy the product
- This is a high quality product
- Compared to other similar products, this product is of a superior quality
- I think this product is tasty, fresh and juicy
- I think this product is full of flavours
- I trust this product will be good for my health and body
- I trust this product is safe and will not do me any harm

The first statement is a general one, it assesses the general perception the respondents have of the product. After this first global assessment, the respondent is invited to go a little bit deeper and to give his opinion on two statements regarding each time the quality, the taste and the trust towards the presented product (6 statements in total).


On a scale of 1 to 7, please rate the different statements for the product.

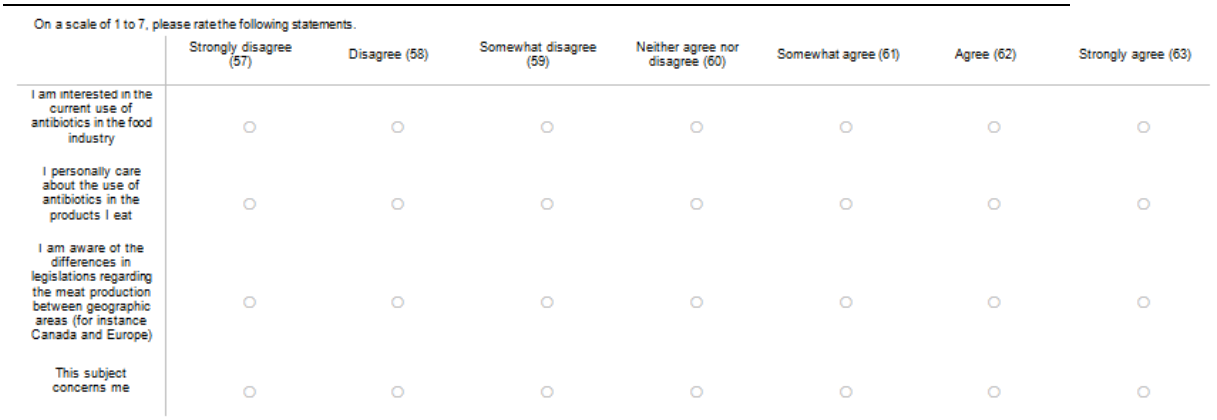
	Strongly disagree (16)	Disagree (17)	Somewhat disagree (18)	Neither agree nor disagree (19)	Somewhat agree (20)	Agree (21)	Strongly agree (22)
I would be willing to buy the product	○	○	○	○	○	○	○
This is a high quality product	○	○	○	○	○	○	○
Compared to other similar products, this product is of a superior quality	○	○	○	○	○	○	○
I think this product is tasty, fresh and juicy	○	○	○	○	○	○	○
I think this product is full of flavours	○	○	○	○	○	○	○
I trust this product will be good for my health and body	○	○	○	○	○	○	○
I trust this product is safe and will not do me any harm	○	○	○	○	○	○	○

After those 7 statements, the respondent is asked to report the price he is willing to pay for the product, thanks to a slider scale. The respondent can report a number between 0€ and 15€.



With this first part, we test *H1.1 to H1.5*. We expect Product A and C to get higher ratings than Product B. We chose to assess the products, by letting the respondent assess 2 statements for each: "quality", "taste" and "trust towards the product", because 2 is the number of statements used and recommended by Larceneux (2004) and Chameroy (2013) in their study. Thanks to the ratings on those 6 statements, and on the first, general one ("I would be willing to buy the product"), information will be collected concerning the respondent's perception of each product. Furthermore, by comparing the prices respondents report on the slider scale for Product A, B and C, we will also be able to get information on respondents' willingness to pay and on which product the respondent values the most.

In a second part, after assessing each of the 3 products, a few general questions are asked to the respondent. We here want to know more about him: is he aware of the antibiotic issue, different existing legislations according to the countries and overall does he feel personally concerned by this issue.
We here use the Likert scale with 7 possible answers, which are the same as for the previous set of 7 statements. The answers are here numbered from 57 (Strongly Disagree) to 63 (Strongly Agree).



On a scale of 1 to 7, please rate the following statements.

	Strongly disagree (57)	Disagree (58)	Somewhat disagree (59)	Neither agree nor disagree (60)	Somewhat agree (61)	Agree (62)	Strongly agree (63)
I am interested in the current use of antibiotics in the food industry	○	○	○	○	○	○	○
I personally care about the use of antibiotics in the products I eat	○	○	○	○	○	○	○
I am aware of the differences in legislations regarding the meat production between geographic areas (for instance Canada and Europe)	○	○	○	○	○	○	○
This subject concerns me	○	○	○	○	○	○	○

Following these questions, we will present the respondent with a quiz of 8 questions. This quiz aims to unravel the level of knowledge the respondent has of the antibiotic issue. Three questions target the knowledge about the general use of antibiotics (Q1, Q6, Q7) and five of them focus on the specific use of antibiotics in farming (Q2, Q3, Q4, Q5, Q8). Before inserting the quiz into the survey, we tested it on three different people :

- a student (23 y.o.), having significant concern about antibiotic overall (farming and human use of antibiotics), who got a score of 7 correct answers out of 8
- an adult (53 y.o.), having some concern about antibiotics overall, trying to do organic shopping when it is possible, who got a score of 5 correct answers out of 8
- an adult (67 y.o.), who has rather low concern about antibiotics in farming but some knowledge about the use of antibiotics for human health, who got a score of 3 correct answers out of 8

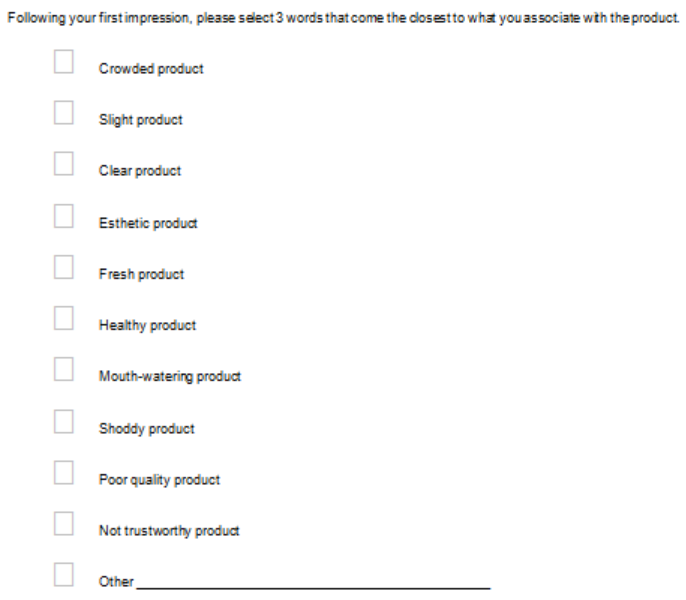
We consider those 3 scores as being weak and superficial (3/8), intermediate (5/8), and advanced and thorough (7/8) scores. Thanks to the score the respondents get in this quiz, we will be able to judge whether they have a broad and deep knowledge of antibiotics. This will give us insights about how informed the respondents were when they answered the first part of our survey.

In our opinion, the third part of our survey will help us test *H2*. Indeed, we will be able to see if there is a correlation between the score the respondents will get on the quiz and their ratings of the different products A, B and C for the "I would be willing to pay x for this product" statement. We will here see if the understanding

of the antibiotics issue is an essential prerequisite for “antibiotic-free” labels to have an impact.

In a fourth part, the respondents are again presented with the three different packages of rumsteak A, B and C. They are asked to select from a list, the different adjectives that, in their opinion, qualify best the products at hand. They are also invited to type in answers, if they don’t find adjectives that match their opinion in the provided list.

We built this list of 10 adjectives by testing the products on the three people we already tested the quiz on. We provided them with the three packages and asked them to give us the adjectives they were thinking about when seeing the items. We then collected those adjectives and transformed them so that they could fit the “x product” form. We can identify two groups of adjectives : the one with a positive connotation (Slight, Clear, Esthetic, Fresh, Healthy, Mouth-watering) and the one with a negative connotation (Crowded, Shoddy, Poor quality, Not trustworthy).


Following your first impression, please select 3 words that come the closest to what you associate with the product.

- ☐ Crowded product
- ☐ Slight product
- ☐ Clear product
- ☐ Esthetic product
- ☐ Fresh product
- ☐ Healthy product
- ☐ Mouth-watering product
- ☐ Shoddy product
- ☐ Poor quality product
- ☐ Not trustworthy product
- ☐ Other _____

Finally, to have more information about the respondents profile, we inserted some socio-demographic questions at the end of the survey, about the gender, the age and the professional status of the respondents. Since the survey will be administered online, it has the potential to reach different types of profiles.

3.3 Study analysis procedure

In order to test our hypotheses, we decided to use different methods.

In order to test *H.1.1* to *H1.4*, we decided to use ANOVA models, in order to falsify their corresponding null hypotheses. Each *H1.1* to *H1.4* was associated to a respective null hypothesis numbered *H1.1-0* to *H1.4-0*.

We then performed an F test, by calculating the variance between and within groups thanks to the following formulas :

$$Variance\ between\ groups : \frac{\sum \frac{t_i^2}{n_i} - \frac{T^2}{N}}{c-1}$$

$$Variance\ within\ groups : \frac{\sum x^2 - \sum \frac{t_i^2}{n_i}}{N-c}$$

We here have the following variables :

-c: number of groups, here we have 3 different groups being : Product A, Product B and Product C.

-x: an observation within a group

-i: variable which takes 3 values : 1, 2, 3 since we have 3 distinct groups : Product A, Product B and Product C.

-n(i): is the number of observation in the i-th group

-N: the overall size of the sample

-t(i): the sum of the observations within a group : here the sum of the ratings for one product for one statement

-T: the sum of all observation of the sample

We then compare the variance between and within groups, by calculating F:

$$F : \frac{\sigma^2\ between\ groups}{\sigma^2\ within\ groups}$$

If F(observed) > F (critical), and the p-value is significant, then we can reject the null hypothesis.

We also use the Z test in order to compare means, by calculating Z and the corresponding p-value:

$$Z = \frac{|\bar{x}_i - \bar{x}_j|}{\sqrt{\frac{\sigma residual^2}{n_i} - \frac{\sigma residual^2}{n_j}}}$$

We here have the same variables as before, and additionnaly:

-j: variable which takes 3 values: 1,2, 3, since we have here 3 distinct groups : Product A, Product B and Product C, but which is different to i when calculating Z

- $\bar{X}$(i): the mean of observations within the i-th group

Furthermore, in order to test *H1.5*, we used linear regression models as well as multiple ones to assess the degrees of correlation between the variables for each Product.

Concerning *H2 (*split into *H2.1* to *H2.4),* we decided to run linear regression models in order to assess the correlation between the respondent's scores at the knowledge quiz and their reported willingness to pay.

For every analysis, we used an alpha of 0,05 to determine whether our models and results were significant. If the p-value < 0.05, then the results were considered statistically significant.

4. Results

4.1 Demographics

4.1.1 Demographics analysis

Variable		% (Frequency)
Gender		
	Women	44%
	Men	56%
Age (y.o.)		
	18-24	63%
	25-34	22%
	35-44	3%
	45-54	2%
	55-64	3%
	+65	7%
Profile		
	Student	59%
	Working	28%
	Retired	9%
	Unemployed	2%
	On maternity leave	1%
	Other	1%

Let's focus on the profile of our convenience sample respondents. Concerning gender, we have a majority of women answering the survey. Indeed 56% of the pool of respondents is constituted by women, and 44% of men. Concerning the age repartition we observe a category that stands out in terms of frequency. We have a majority of respondents which are part of the 18-24 years old category, representing 63% of the respondents. Another age category is well represented : the 25 to 34 years, counting as 22% of the respondents. The three 35-44, 45-54, and 55-64 categories don't seem to be significant. Concerning the professional situation of our respondents, we here again have a majority for a category. Indeed the "Student" category represents about 59% of all the respondents. The second category that is well represented is the "Working" category: out of all the respondents, the working ones represent around 28%. We then have the four remaining categories, which represent a smaller amount in percentages of all the respondents and which don't seem to be significant.

In addition to questioning the respondents about their gender, age and profile, we also asked them to rate four statements so that we could assess how our convenience sample stood towards the antibiotic issue.

It can be noted here that the statement which gets the highest ratings is : "I personally care about the use of antibiotics in the products I eat" (m=61.4). The one which has the lowest mean is the statement about the different legislations that are applicable (m=60.25), it is also the statement that has the highest standard deviation (sd=2.094).

Statements (Likert scale from 57 to 63)	Means	Variance	Standard d
I am interested in the current use of antibiotics in the food industry	60,96	3,23841584	1,7
I personally care about the use of antibiotics in the products I eat	61,40	2,50158416	1,5
I am aware of the differences in legislations regarding the meat production between geographic areas (for instance Canada and Europe)	60,25	4,38811881	2,0
This subject concerns me	61,38	2,3170297	1,5

Concerning the size of our sample, out of the 188 persons who started to answer our survey, only 103 finished it and can therefore be considered as respondents. However, for some of our analysis, the number of observations n within a group are different due to either : a suppression of aberrant responses (the standard residuals should remain between -1.96 and 1.96, which represents 95% of the normal distribution), or the fact that some questions were not mandatory and thus were skipped by participants.

4.1.2 Demographics discussion

Thanks to the demographic questions of our survey we can see here that the categories that are the most represented for each question are the categories of : women, students and the age category of 18 to 24 years old. It seems coherent that the two last categories are predominant in the survey : Students are often aged around 18 to 24 years old. Moreover, we both are students and used majoritary digital platforms to convey our survey : indeed we used social media (majoritarily Facebook) and emails to reach out to people to get answers for our survey. Therefore we can say that we have a convenience sample, since we targeted persons that were at ease with digital tools, who would be likely to be able to do the survey when they had some free time (while commuting in the subway for instance) and who would be able to navigate through the survey and assimilate the

Qualtrics tool easily. Those are here indeed students that we know, have the same age as us, and that we can easily reach. The fact that we targeted students allowed us to get more answers easily but it also has some limitations since it generates a bias for the survey. Indeed if we consider all the age and professional situation categories available for the questions, the persons who are more likely to be the one in charge of the grocery shopping, to have a global picture of prices, and especially meat products are the persons who are in the "Working" category, as well as the 25-34, 35-44, 45-54 and +65 years old category. Indeed these persons are the ones who are the most likely to have an income, to be able to afford meat products and to have a realistic and pragmatic vision of prices on the market.
The fact that the majority of respondents are women, doesn't surprise us much. Indeed, according to William G. Smith in his article "Does Gender Influence Online Survey Participation?", there is a noticeable gender bias in online survey response behavior. There is a clear and significant difference in the participation of those online surveys : women tend to participate much more to them than men. We first hoped to get a parity between women and men in our pool of respondents, but in light of Smith's study we see that the repartition we get is quite normal.

Concerning the respondent's answers for the set of statements they were presented with, we can highlight the fact that in addition to having the lowest ratings, the statement about the current legislation in different countries has the highest standard deviation between the 4 statements. With a standard deviation of 2.0947, this set of data represents the one, where respondents displayed the highest dispersion between their answers. This shows that respondents tend to be unsure about their knowledge of different legislation about meat, and that between the respondents, some tend to be very aware and others rather not.

4.2 *H1*

4.2.1 H1.x Data Analysis

For the first four hypotheses *H1.1* to *H1.4*, we performed an ANOVA analysis. By comparing the variance between group results for each product and the variance within results for each product, which we can qualify as residual

variance, we then could possibly falsify the null hypothesis corresponding to each original hypothesis, noted as *H1.x*, with x taking a number from 1 to 4. Each corresponding null hypothesis was numbered as *H1.x-0*, with x taking a number from 1 to 4.

For the fifth hypothesis *H1.5*, we here ran linear regression in order to identify correlations that would help us test our hypothesis.

4.2.1.1 H1.1: The "antibiotic-free" label generates higher purchase intentions

This first statement is formulated as such : " I would be willing to buy this product". It aims to assess the respondent's global perception of the product, if he is willing to buy this item. In order to test this hypothesis, we want to falsify the null hypothesis thanks to the analysis of variance, *H1.1-0* being *: The "antibiotic-free" label does not generate higher purchase intentions.* By comparing the variance between and within Products A, B and C' groups of results, we get an F value (3.09) that is higher than the critical value for F (3.03) results. We can here conclude that F(observed) > F(critical), and therefore falsify the null hypothesis.

Table 1

Anova : Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Product A	100	1978	19,78	3,365252525
Product B	99	1948	19,67676768	3,159760874
Product C	100	2026	20,26	2,840808081

ANOVA

Source of variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	19,32136076	2	9,660680382	3,094573968	0,04676289	3,026256838
Within Groups	924,0565657	296	3,121812722			
Total	943,3779264	298				

Moreover, we can also compare the means that each Product A, B and C get for this first statement. Product C gets better ratings, with an average of 20.26,

followed by Product A with a weighted average of 19.78, and last Product B with 19.68.

In order to analyze whether these means are significantly different, we compare them two to two thanks to a Z test. The means between A and B (Z=0.412, p=0.68), and A and C (Z=1.92, p=0.054) are not significant, whereas the difference between the means of B and C (Z=2.33, p=0.019) seem to be more significative.

4.2.1.2 H1.2: The "antibiotic-free" label positively influences the product's perceived quality

The two next statements in our survey are the following ones : "This a high quality product" and "Compared to other similar products, this product is of a higher quality". Both seek to dig deeper into the respondent's point of view and assess the quality the product reflects for him. In order to test our hypothesis *H1.2*, we consider here again a null hypothesis that we aim to falsify: *H1.2-0*: *The "antibiotic-free" label does not positively influence the product's perceived quality.*

In order to test this hypothesis we used as a database the means the respondents gave to both statements concerning the quality of the product displayed. Once we run our ANOVA, we get an F value (9.28) that is higher than the critical value for F (3.0263), with a p of 0.00012296.

We can conclude that F(observed) > F(critical), and we can therefore falsify the null hypothesis, and affirm that the presence of an "antibiotic-free" label positively influences the product's perceived quality.

Table 2

Anova : Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Product A	99	1985	20,05050505	2,11477015
Product B	99	1922,5	19,41919192	2,677076891
Product C	100	2029,5	20,295	1,768156566

ANOVA

Source of variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	40,57632211	2	20,28816106	9,284140765	0,000122959	3,026361014
Within Groups	644,6485101	295	2,185249187			
Total	685,2248322	297				

Moreover, we can here again compare in detail the means attributed to each Products A, B and C for the 2 statements. For the first statement "This is a high quality product", Product C comes first with a mean of 20.23, followed by Product A with a mean of 19.96, and Product B with a mean of 19.50. By comparing two to two the significance of the difference between those means, we conclude here that the mean difference between A and C is not significant (Z=1.222, p=0.22166), but the mean difference between A and B (Z=2.066, p=0.03876) and especially B and C (Z=3.290, p=0.00099) is particularly significant. For the second statement, Product C gets a mean of 20.36, followed again by Product A with 20.14, and by Product B with 19.39. We here again compare the significance of the difference between those means, and we get the same pattern as for the previous statement. Indeed the difference between the means of A and C is not significant (Z=1.021, p=0.30723), whereas the one between A and B (Z=3.502, p=0.00046) and the one between B and C (Z=4.529, p=0.00000) is significant.

4.2.1.3 H1.3: The "antibiotic-free" label positively influences the product's perceived taste

We here have the same approach, using the two new statements in our survey : "I think this product is tasty, fresh and juicy" and "I think this product is full of

flavours". We use them in order to falsify the following null hypothesis thanks to an ANOVA: *H1.3-0: The "antibiotic-free" label does not positively influence the product's perceived taste.*

Thanks to the ANOVA performed on the mean of the ratings of both statements, we get an F value (2.958) which is lower than the critical value (3.026) with a *p* of 0.05344. We here observe in conclusion that F(observed) < F(critical), and we therefore can not falsify the null hypothesis. Our hypothesis *H1.3* is here rejected.

Table 3

Anova : Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Product A	99	1927	19,46464646	2,97577819
Product B	99	1898	19,17171717	2,868171511
Product C	100	1976	19,76	2,886262626

ANOVA

Source of variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	17,21735882	2	8,608679412	2,958319171	0,053448145	3,026361014
Within Groups	858,4470707	295	2,90999007			
Total	875,6644295	297				

Despite the fact that we could not reject the null hypothesis, we can compare the means the Product A, B and C get in each statement. For the first "I think this product is tasty, fresh and juicy" statement, Product C gets the highest ratings, with a mean of 19.90. It is then followed by Product A with a mean of 19.54, and Product B with 19.21. Comparing the means two to two, we have only the difference between the means of B and C which is significant (Z=2.801, p=0.00509), in contrary to the difference of means between A and B (Z=1.313, p=0.18899) and A and C (Z=1.491, p=0.13583), which is not relevant here. For the second statement of the taste category, the same ranking for the means is observed. Product C comes first with a mean of 19.66, followed by product A with a mean of 19.39 and Product B with a mean of 19.13. Concerning the comparison of means, we have the same pattern as before, with only the comparison of means between Products B and C (Z=2.095, p=0.03610) being

significant, in contrary to A and B (Z=1.035, p=0.30029) and A and C (Z=1.060, p=0.28911).

4.2.1.4 H1.4: The "antibiotic-free" label positively influences trust towards the product

In order to test the hypothesis *H1.4: The "antibiotic-free" label positively influences trust towards the product,* we here consider the following null hypothesis : *H1.4-0: The "antibiotic-free" does not influence positively trust towards the product.* We use here the ratings of the two following statements : " I trust this product will be good for my health and body" and "I trust this product is safe and will not do me any harm".

Thanks to an ANOVA, we get the following results :

Table 4

Anova : Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Product A	99	1946,5	19,6616162	3,06034838
Product B	99	1886	19,0505051	2,6708926
Product C	100	1988,5	19,885	2,88815657

ANOVA

Source of variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	37,0753134	2	18,5376567	6,45195723	0,00180927	3,02636101
Within Groups	847,589116	295	2,87318344			
Total	884,66443	297				

The F we here observe is higher than the critical value given by the ANOVA. Indeed, we here have F(observed) > F(critical) : 6.451 > 3.026, with p= 0.00180. We here can therefore falsify our null hypothesis *H1.4-0*.

We now examine the means Product A, B and C get for each statement and compare them two to two. For the first statement "I trust this product will be good for my health and body", Product C gets the best mean in the ratings with 19.67, followed by Product A with 19.42 and Product B with 18.85. The differences

between means are significant for the comparison between A and B (Z=2.275, p=0.02288) and between B and C (Z=3.245, p=0.00113). The result is not significant when comparing the differences of means between A and C (Z=0.973, p=0.33023).

When it comes to the second statement : "I trust this product is safe and will not do me any harm", we have the same ranking for the means of each Product, with Product C coming first with 20.08, followed by Product A with 19.90 and Product B with 19.25. The differences between means are here again significant only for the comparison between A and B (Z=2.580, p=0.00985), and B and C (Z=3.306, p=0.00094). The difference of means between A and C is not significant here (Z=0.725, p=0.467).

4.2.1.5 H1.5: The "antibiotic-free" label positively influences the price one is willing to pay for a product

The statement " I would be willing to pay "x" for this product" comes last in the questions asked to the respondent. First his overall assessment of the product is decomposed between 3 criterias being quality, taste and trust. The respondent is invited to really take a step back and think about how the product resonates for him. After having stimulated the respondent and in light of his answers, the final statement aims to put a number on the respondent's qualitative perception, and reflects the translation into purchase intention.

The average of the price the respondent is ready to pay for each product is close for Product C and A with an average of 7.38€ for Product C, and 7.25€ for Product A. The average price respondents are willing to pay for Product B is a little bit lower with a price of 6.58€. We notice the same pattern for the median with a median of 7 for Product C and A, and 6 for Product B.

If we compare the means two to two for each Product, we can see that none of the differences between the means of A, B and C are significant. Indeed, according to *Table 5*, none of the p-values we get for the two to two comparison between the means is inferior to the significance value 0.05.

Table 5

		Z	*p*
Means comparison	A/B	1,53174287	0,1255859
	A/C	0,2993784	0,76465134
	B/C	1,83583459	0,06638212

Therefore, we can not draw any conclusions here since our p-value is not significant.

We here also ran three linear regressions for each Product in order to see how the consumer's perception of the product affects the price the consumer is willing to pay for the product. We here try to assess to what extent those 2 variables are correlated for each Product.

If we look at Product A, we can see thanks to R square, that the variable "Willingness to buy" explains the price by around 7%. Despite this value being very close to 0, the model remains significant since we have a p-value of 0.0084, which is smaller than 0.05. We therefore have more than 95% chance to be sure that our model predicts the price of Product A. Furthermore, this linear regression tells us that for each increase of 1 point in the ratings of the product, the price the respondent is willing to pay rises by 0.39€.

Table 6

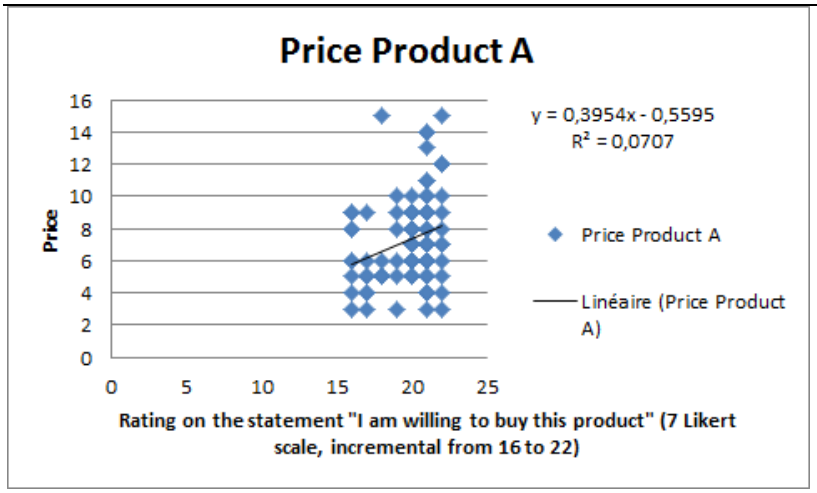
SUMMARY - PRODUCT A

Regression Statistics	
Multiple R	0,265821904
R Square	0,070661285
Adjusted R Square	0,060878772
Standard Error	2,623327367
Observations	97

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	49,70912114	49,70912114	7,223224369	0,008497665
Residual	95	653,7754149	6,881846473		
Total	96	703,4845361			

	Coefficients	*Standard error*	*F Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Constante	-0,559517635	2,928439945	-0,19106338	0,848883678	-6,373205975	5,254170705
Willingness to buy	0,395357884	0,147104125	2,687605694	0,008497665	0,103319272	0,687396495



If we now look at Product B, we see that the R square lands at 0.18, meaning that the variable "Willingness to buy" explains by 18% the price the respondent is willing to pay for Product B. Since the p-value we have here is below 0.05, we can conclude that our model is significant, and that there is a correlation between the respondents willingness to buy and the price he is willing to pay for Product B. Furthermore, for each increase of 1 point in the ratings, the respondent is willing to pay 0.75€ more for Product B.

Table 7

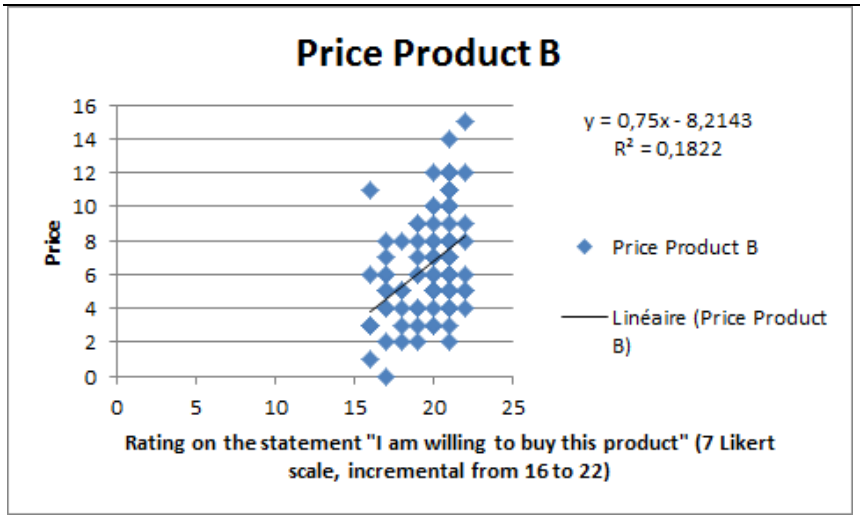
SUMMARY - PRODUCT B

Regression Statistics	
Multiple R	0,426809445
R Square	0,182166302
Adjusted R Square	0,173647201
Standard Error	2,790422608
Observations	98

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	166,5	166,5	21,38327759	1,17305E-05
Residual	96	747,5	7,786458333		
Total	97	914			

	Coefficients	*Standard error*	*F Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Constante	-8,214285714	3,209860836	-2,559078457	0,012057148	-14,58580912	-1,842762313
Willingness to buy	0,75	0,16219002	4,624205617	1,17305E-05	0,428055355	1,071944645



Looking now at Product C, we can see that R square lands at 0.205. The ratings the respondents give for the statement "I am willing to buy this product" explains by around 21% the price the respondent is willing to pay for Product C. Since the p-value we here observe is <0.05, we can say that our model is significant. Here, each increase of 1 points in the respondent's rating for the first statement, generates an increase of 0.91€ in the price the respondent is willing to pay for Product C, representing nearly 1€ more.

Table 8

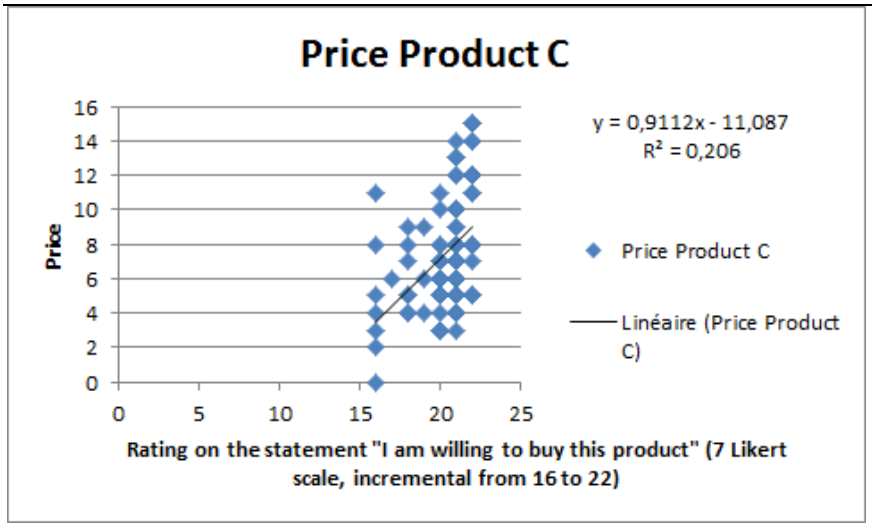
SUMMARY - PRODUCT B

Regression Statistics	
Multiple R	0,453819337
R Square	0,205951991
Adjusted R Square	0,197765929
Standard Error	2,94574117
Observations	99

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	218,313271	218,313271	25,15886054	2,38549E-06
Residual	97	841,706931	8,677391041		
Total	98	1060,020202			

	Coefficients	*Standard error*	*F Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Constante	-11,08698325	3,700386699	-2,99616882	0,003470845	-18,43122653	-3,742739971
Willingness to buy	0,911249424	0,181673584	5,015860897	2,38549E-06	0,55067765	1,271821197



In order to dig deeper into the analysis and find out which aspects (Quality, Taste, Trust) of the product most influence the price a respondent is willing to pay, we conducted a multiple regression analysis for all three products.

For Product A, which bears three labels, the analysis below shows some several relevant insights. We wanted to find out which of the factors (Quality, Taste, Trust), have the greatest impact on the price, and how much it influences it.

The R square for Product A is 0.11, which means that the three independent variables explain by only 11% of the variation in the dependent variable, which here is the willingness to pay. However, the model is still significant with a p-value that equals 0.0113 which is smaller than our alpha 0.05, meaning that we have less than 5% of chance to be mistaken when we say than our model helps to predict the willingness to pay for Product A.
However, when we take the three variables independently, we can see that the p-values for Quality and Trust are respectively 0.75 and 0.80 and their F stats are -0.31 and 0.25. For a variable to be statistically significant in the model, its p-value should be <0.05 and its F stat should be >2. For Quality and Trust in the prediction of the willingness to pay for Product A, we cannot draw any conclusions since those variables do not respect the significance criterias.

Concerning the Taste variable, it is not significant either but it is closer to the significance level with a p-value that equals 0.06 and F stat close to 2 (1.83).

When we look at its coefficient (0.54), it means that for a one unit increase in Taste ratings, the price a respondent is willing to pay goes up by 0.54€.

To sum things up, the perception of taste when the respondents look at the packaging for Product A that bears 3 labels is rather important in the determination of their willingness to pay.

Table 9

SUMMARY - PRODUCT A

Regression Statistics	
Multiple R	0,334091177
R Square	0,111616914
Adjusted R Square	0,082959396
Standard Error	2,592304083
Observations	97

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	78,52077325	26,17359108	3,894856175	0,011379087
Residual	93	624,9637628	6,720040461		
Total	96	703,4845361			

	Coefficients	*Standard error*	*F Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Constante	-2,614290662	3,639380388	-0,718333997	0,474352178	-9,84137884	4,612797516
Quality	-0,108701553	0,348789784	-0,311653488	0,756001466	-0,80132894	0,583925834
Taste	0,545023726	0,29699236	1,835143927	0,069680783	-0,044744242	1,134791694
Trust	0,073101738	0,292302083	0,250089693	0,803069606	-0,507352268	0,653555744

Product B bears no label indicating that the product doesn't contain any antibiotics. We ran a multiple regression analysis for the willingness to pay in order to assess which of the three variables (Quality, Taste, Trust) most influences it.

For this regression, we deleted the results that had standardized residuals >1.96 or <-1.96, in order to have a more relevant model. In the results, we can see that the model helps to explain by 38% the variation in the willingness to pay for Product B. The significance of F is below 0.05 which corresponds to a model that is statistically significant.

However, due to our small sample size, we cannot draw any conclusions from the variables Taste and Trust since their p-values are significantly greater than 0.05

(0.61 and 0.39 respectively) and their F stat are lower than 2 (0.51 and 0.85 respectively).

The only variable that we can draw insights from is Quality, which coefficient equals 0.84. Therefore, we can say that an increase by one point in perceived quality results in an increase of 0.84€ in the willingness to pay for Product B.

Table 10

SUMMARY - PRODUCT B

Statistics regression	
Multiple R	0,616767967
R square	0,380402725
Adjusted R square	0,359037301
Standard Error	2,367508711
Observations	91

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	299,38948	99,796495	17,804596	4,266E-09
Residuals	87	487,64348	5,6050975		
Total	90	787,03297			

	Coefficients	*SE*	*F stat*	*p-value*	*Lower 95%*	*Upper 95%*
Constante	1,251049322	0,7807694	1,6023289	0,1127077	-0,3008143	2,802913
Quality	0,848620705	0,2979162	2,8485218	0,0054807	0,2564801	1,4407613
Taste	0,139171273	0,2708828	0,5137694	0,6087157	-0,3992375	0,6775801
Trust	0,238397861	0,2795127	0,8529054	0,3960538	-0,3171638	0,7939596

Lastly, we ran a multiple regression analysis for Product C which bears one antibiotic-free label. For this regression, we deleted the results that had standardized residuals >1.96 or <-1.96 in order to have, here again, a more relevant model. This explains why we have only 93 observations.
The model explains 34% of the variation we have in the willingness to pay for this Product. The significance F is well below 0.05, therefore we can conclude that the model is statistically significant.

However, we can draw insights only from the Quality variable which is significant since its p-value is 0.04 and its F stat is 2.01. If the perception of quality increases by one unit in the ratings, the willingness to pay for Product C would increase by 0.79€.

Table 11

SUMMARY - PRODUCT C

Statistics regression	
Multiple R	0,5877029
R square	0,3453946
Adjusted R square	0,3233293
Standard Error	2,7082089
Observations	93

ANALYSE DE VARIANCE

	df	*SS*	*MS*	*F*	*Significance F*
Regression	3	344,4216	114,8072	15,65326	2,946E-08
Residuals	89	652,7612	7,3343955		
Total	92	997,1828			

	Coefficients	*SE*	*F stat*	*p-value*	*Lower 95%*	*Upper 95%*
Constante	-0,0599634	1,212487	-0,0494549	0,9606676	-2,4691493	2,3492225
Quality	0,7962979	0,3942196	2,0199347	0,0463974	0,0129919	1,5796039
Taste	0,4026027	0,3089074	1,303312	0,1958299	-0,2111897	1,016395
Trust	0,2754386	0,2721582	1,0120531	0,3142562	-0,265334	0,8162111

4.2.2. H1: Discussion

4.2.2.1 H1.1 to H1.4

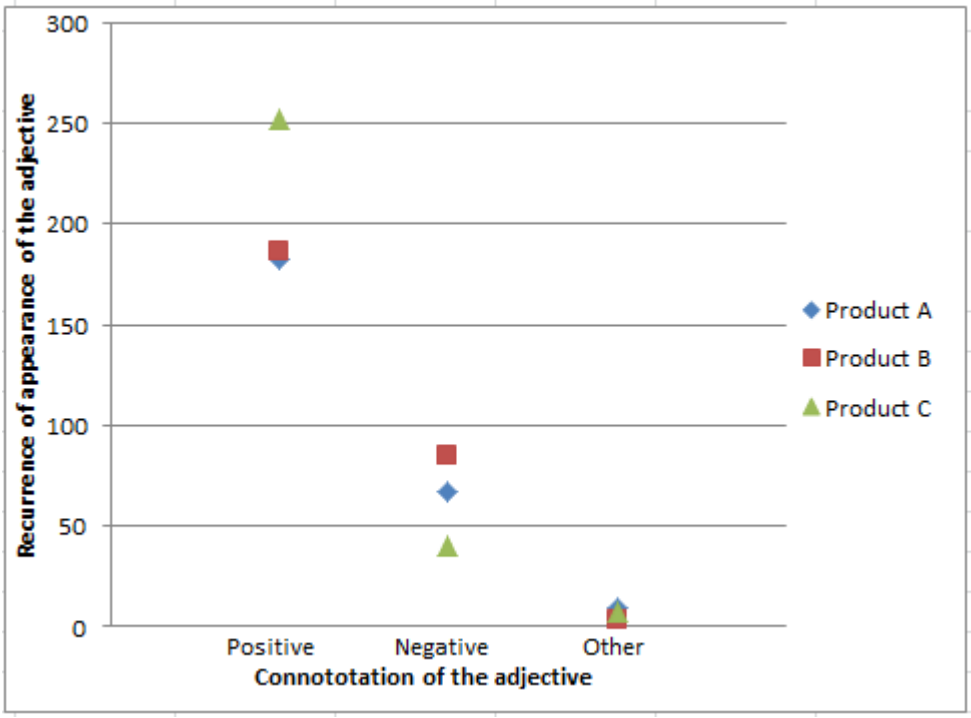
In light of the data we collected, we can here conclude that we observe the same pattern across all statements of our survey. For each statement the ranking stays consistent : Product C always gets the highest rates, followed by Product A and then Product B. The difference between the means is never significant across all statements between Product A and C, it is always significant between Product B and C, and only significant for the statements about quality and trust between Products A and B. This means that respondents tend to prefer Product C over A, and A over B for all the statements. They also tend to see Product A and C as similar products when it comes to quality and trust factors.

Thanks to the multiple ANOVA analysis we ran, we have tested our hypothesis and can say that indeed, the "antibiotic-free" label generates higher purchase intentions (*H1.1*), positively influences the product's perceived quality (*H1.2*) and that it positively influences the respondent's trust towards the product (*H1.4*). We however have to reject the hypothesis *H1.3*, whereby the "antibiotic-free" label

positively influences the product's perceived taste, since we couldn't falsify the corresponding null hypothesis.

We can here also comment shortly on the results given by the fourth part of our survey. Indeed, we asked the respondent to select which adjectives they would associate to each Product A, B and C. As mentioned in the Methodology part, each adjective can be assimilated to either an adjective with a positive connotation or an adjective with a negative connotation. We can see in the graphic below, that Product C is associated much more with positively connoted adjectives than Product B or Product A. When it comes to negatively connoted adjectives, Product B is getting more associated with those adjectives, than Product A and than Product C. The adjectives that are chosen the most often by respondents for Product A are "fresh product", for Product B "esthetic product" and for Product C "clear product".

These observations seem to be in line with the general findings we already had : People tend to prefer Product C over Product A, and Product A over Product B.



4.2.2.3 H1.5

Concerning the *H1.5* hypothesis, we could conclude that respondents are willing to pay a higher price for Product C, than for Product A, and they are willing to pay even less for Product B. Thanks to the linear regression we have run, we could see

that there is a correlation between how the respondents rate the statement "I am willing to buy this product" and the price they are willing to pay for it. The correlation is at its highest for Product C, since respondents are willing to pay almost 1€ more for the Product C (0.91€), as the rating they give (for the willingness to buy) increases by 1 point. However, we expected the correlation coefficient to be higher for Product A than for Product B, since the respondent's ratings for the statement "I am willing to buy this product" were higher for Product A and then for Product B.

Furthermore, after running the multiple regression analysis in order to determine which factors between quality, taste and trust most influenced the willingness to pay, we can conclude that for Product A, the perception of taste when looking at a product plays a rather significant role in the determination of the respondents' willingness to pay since for one unit increase for the Taste variable, there is a 0.54€ in the amount the respondents are willing to pay for the product. If the product looks tasty, it would increase their will to buy the product for a higher price.

For Product B, and Product C, the Quality variable is significant with coefficients of 0.84 and 0.79 respectively, meaning that an increase in the perception of quality will lead to a higher purchase intention for Product B than for Product C. We can translate this result by saying that because Product B does not bear any "antibiotic-free" label, then consequently, in the consumer's mind, there is no point of reassurance when buying this product. As a matter of fact, an increased perception of quality would be even more important than Product C, because it would reassure consumers on the safety of the product. Moreover, Product C already bears a label that reassures the consumer on the safety of the product. An increase in Product C's perceived quality would then lead to an increase in willingness to pay, but this amount would be less important than for Product B since the consumer is already reassured on the safety thanks to the label affixed on the packaging of Product C. It is here a matter of relatedness, when the improvement is made from scratch, it will be perceived as greater than when it is made from stage 1 because the efforts put in place are seen as more demanding.

To sum things up, we accept the hypothesis that an "antibiotic-free" label positively influences the price one is willing to pay for a product (*H1.5*).

We can also put things into perspective and comment on the level of the price respondents are willing to pay for the different Products, may it be A, B or C. Indeed, we expected respondents to be willing to pay higher prices for the presented packaged rumsteak. When looking at how rumsteak is priced in retail, we can see that the price for one kilo varies from 30€ to 40€. The price range for such a package of 280g of rumsteak would then lay between 9€ and 12€. However, when considering results, respondents seem to be ready to pay prices closer to 7€.

This could be explained by several phenomena. Indeed, approximately 60% of our respondents are students. Students are more likely to have a smaller grocery budget, and therefore cut the meat out of their shopping. Consequently they have an approximative vision of the price of meat, since they tend to be less confronted with the prices of these products. Furthermore, the actual dietary trend than can be observed praised a flexitarian nutrition, composed less and less of meat. This choice to eat less meat and more and more focus on plant based nutrition, can be motivated by environmental, health or social factors. Since the inconvenients of eating meat are becoming more and more exposed, people, and especially young people who are at the center of these trends, tend to be willing to put less and less money in the consumption of meat.

4.3 *H2: The more knowledge people have about antibiotics, the more they are willing to buy a product bearing an "antibiotic-free"label.*

In order to test this hypothesis, we inserted a quiz in the questionnaire with technical questions about the use of antibiotics overall and in the food industry. The answers given by the respondents helped us design a score to assess their knowledge in that field. To be more specific, eight questions have been asked (the correct answer(s) are highlighted in green below) to the respondents:

1. Antibiotics are used and effective in order to fight:
    A. Bacterias
    B. Viruses

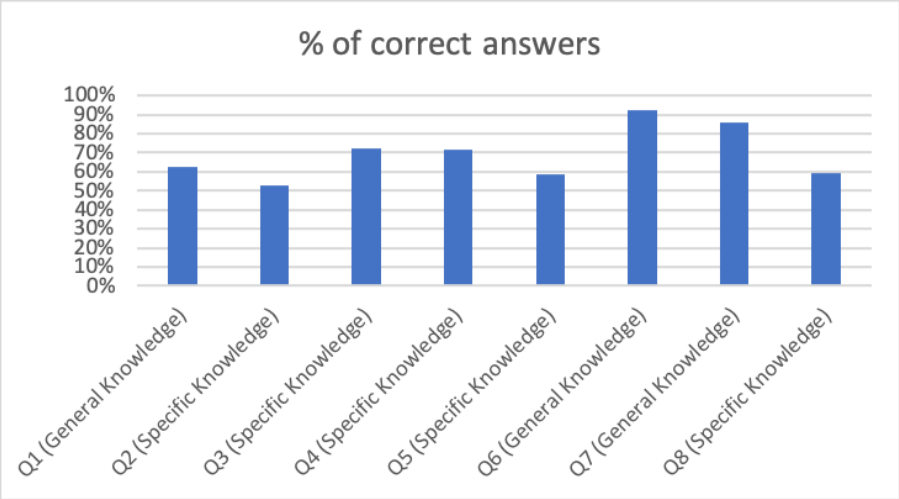
C. All pathogens

2. In 2013, according to the WHO, how many percents of antibiotics were intended for animals (and therefore used in farming)?
   A. 25%
   B. 40%
   C. At least 50%
3. In farming, antibiotics can be used:
   A. in order to cure sick animals
   B. in order to prevent diseases in a systematic way, even before animals get sick
   C. as "growth stimulators", to increase the profitability of farming
   D. all of the above
4. In farming, a double dose administered compared to the prescription makes it possible to cure the animal:
   A. Twice as fast
   B. Not faster
   C. Slower
5. In farming, antibiotics administered as growth accelerators are:
   A. Banned in both Canada and Europe
   B. Banned in Europe, and this since 1996
   C. Banned in Canada, and this since 1996
6. What is antibiotic resistance?
   A. An invention of the doctors
   B. A farmer's refusal to use antibiotics
   C. The emergence of bacteria that are resistant to antibiotics to which they are usually sensitive
7. The appearance of antibiotic resistance is:
   A. Observed only in a special geographic areas
   B. Due to chance
   C. Worsened by misuse of antibiotics
8. In farming, using antibiotics can allow to lower the costs?
   A. Yes
   B. Yes, on a short term basis
   C. No

Each correct answer gives the respondent 1 point. At the end, he receives a score between 0 and 8, from scoring poor in knowledge about antibiotics use to being highly knowledgeable.

We took into account respondents' answers if they answered all eight questions and if they gave their willingness to pay for each of the three products we presented. For information, the mean average is 5.41 with a minimum of 2 and a maximum of 8.

Furthermore, we have the following amount of correct answers (in %) for each question of our quiz:



Q1, Q6 and Q7 can be qualified as being questions of general knowledge, and Q2, Q3, Q4, Q5 and Q8 focus more on specific knowledge about antibiotics.

Our hypothesis assumes that the higher the respondents are knowledgeable, the higher their willingness to pay for a product that bears the "antibiotic-free" label (opposed to a product that does not bear one) will be, because they know what is at stake. To answer this question, we assume the following:

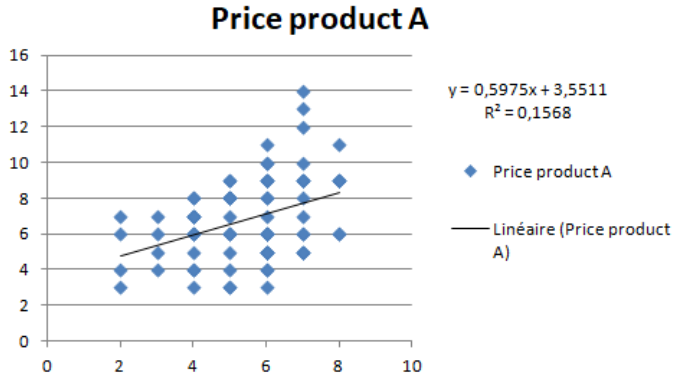
- ***H2.1****: The higher the knowledge score is, the higher is the willingness to pay for Product A (3 labels)*
- ***H2.2****: The higher the knowledge score is, the higher is the willingness to pay for Product C (1 label)*
- ***H2.3****: The higher the knowledge score is, the smaller is the willingness to pay for Product B (no label)*
- ***H2.4****: The correlation between knowledge and willingness to pay is stronger for the product bearing more labels (A) than for the product bearing few labels (C).*

4.3.1 Data Analysis

4.3.1.1 H2.1

To test this hypothesis, we used the Pearson r correlation that measures the degree of the linear relationship between two variables. These two variables are here: the respondent's knowledge score and the willingness to pay for Product A (Product bearing three "antibiotic-free" labels).

The correlation coefficient between respondent's knowledge score and the price they are willing to pay for Product A is 0.396. For the coefficient, the closer it is to 1, the stronger is the positive linear relationship between the two variables. See the chart below:



Unfortunately, the correlation analysis doesn't tell us if the correlation is statistically significant or not. In order to investigate this question, we run a regression analysis. We chose alpha to be 0.05.

Table 12

Regression Statistics	
Multiple R	0,3959377
R square	0,1567667
Adjusted R square	0,1467282
Standard Error	2,1247399
Observations	86

ANOVA

	df	SS	MS	F	F crit
Régression	1	70,501266	70,501266	15,616559	0,000161
Résidus	84	379,21966	4,5145198		
Total	85	449,72093			

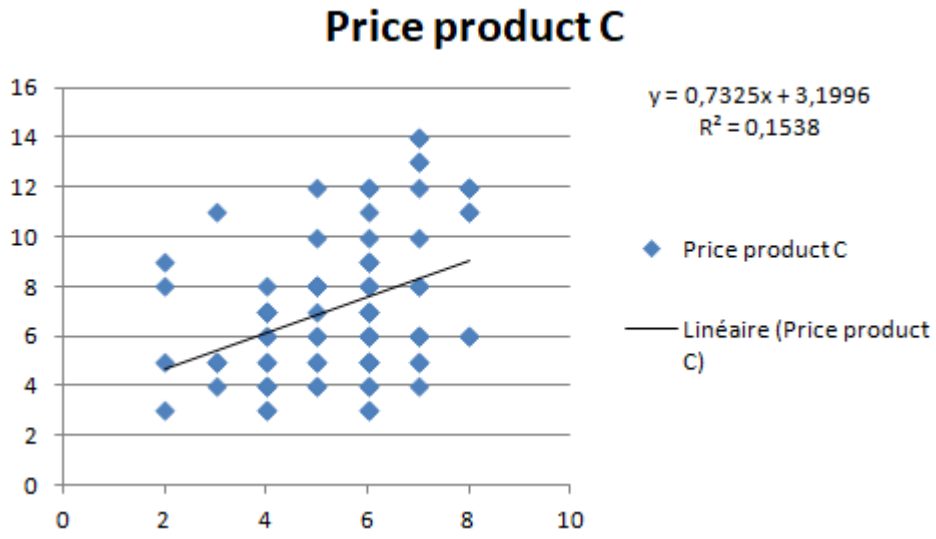
	Coefficients	tandard erro	t stat	p value	lower 95%	upper 95%
Constante	3,5511334	0,8625305	4,1171105	8,931E-05	1,8358969	5,2663698
Score knowledge	0,5974684	0,1511897	3,9517792	0,000161	0,296811	0,8981257

About 15% of the variability of Product A's willingness to pay is explained by the model (R square = 0.15). Moreover, the p-value equals 0.000161, which is smaller than 0.05. We can therefore say that the correlation is statistically significant. Moreover, there is a positive significant relationship between the respondent's knowledge score and the price they are willing to pay to acquire Product A, which bears 3 labels. We here have $r(84) = 0.396$ and $p < 0.05$.

In our model, if we increase by 1 point the knowledge score, we would have an increase of 0.59€ in the willingness to pay for the Product A.

4.3.1.2 H2.2

The correlation coefficient between respondent's knowledge score and the price they are willing to pay for Product C is 0.392. For the coefficient, the closer it is to 1, the stronger is the positive linear relationship between the two variables. See the chart below:



Unfortunately, the correlation analysis doesn't tell us if the correlation is statistically significant or not. For that, we then ran a regression analysis. We chose alpha to be 0.05.

Table 13

Regression Statistics	
Multiple R	0,3921848
R square	0,1538089
Adjusted R square	0,1437352
Standard Error	2,6460268
Observations	86

ANOVA

	df	*SS*	*MS*	*F*	*F crit*
Regression	1	106,90079	106,90079	15,268362	0,0001881
Residuals	84	588,12246	7,0014579		
Total	85	695,02326			

	Coefficients	*tandard erro*	*t stat*	*p value*	*lower 95%*	*upper 95%*
Constant	3,1996264	1,0593524	3,0203606	0,0033443	1,092988	5,3062649
Score knowledge	0,7325473	0,1874733	3,9074752	0,0001881	0,3597361	1,1053585

About 15% of the variability of Product C's willingness to pay is explained by the model (R square = 0.15). Concerning the p-value, it here equals 0.0001881, which is smaller than 0.05. We can then say that the correlation is statistically significant. Therefore, there is a positive significant relationship between the respondent's knowledge score and the price he is willing to pay to buy Product C, which bears 1 label. We here have $r(84) = 0.392$ and $p < 0.05$.

In our model, if the respondent increased by 1 point his score on the antibiotic quiz, we would observe an increase of 0.73€ in his willingness to pay for Product C.

4.3.1.3 H2.3

The correlation coefficient between respondent's knowledge score and the price they are willing to pay in order to acquire Product B is 0.121. The closest the coefficient is to 1, the stronger is the positive linear relationship between the two variables. In the same approach, the closest it is to 0, the weaker the correlation is. See the chart below:

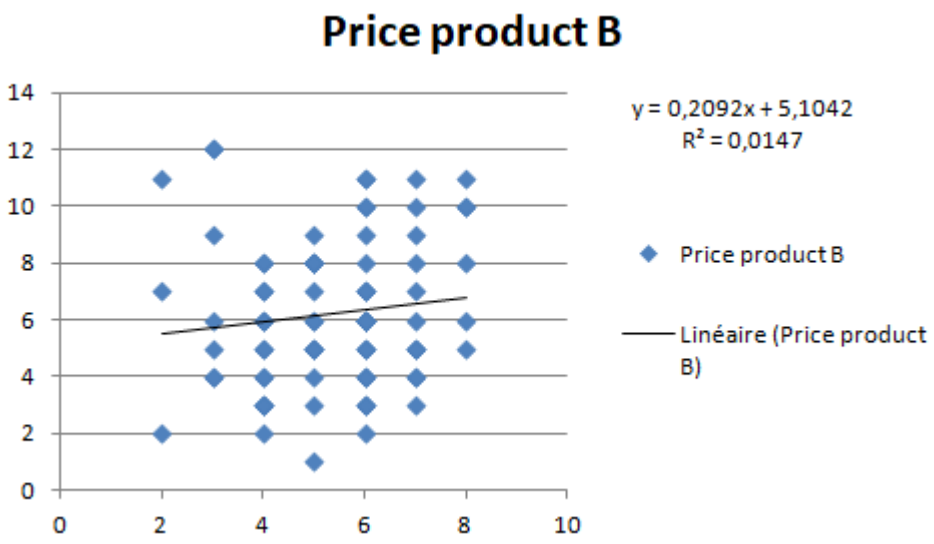


Table 14

Regression Statistics	
Multiple R	0,1211116
R square	0,014668
Adjusted R square	0,0029379
Standard Error	2,5739487
Observations	86

ANOVA

	df	*SS*	*MS*	*F*	*F crit*
Regression	1	8,2845354	8,2845354	1,2504559	0,2666533
Residuals	84	556,51779	6,6252118		
Total	85	564,80233			

	Coefficients	*tandard erro*	*t stat*	*p value*	*lower 95%*
Constante	5,1041603	1,0365393	4,9242323	4,182E-06	3,0428883
Score knowledge	0,2092423	0,1871179	1,1182379	0,2666533	-0,1628621

In the case of Product B, we can observe in *Table 14*, that our p-value equals 0.2666. This value is greater than 0.05. We are here forced to say that the correlation is not statistically significant. Therefore, we cannot draw conclusions from this model.

4.3.1.4 H2.4

The correlation coefficient for Product A that bears 3 labels is 0.396 whereas for Product C is 0.392. Therefore, there is a slight difference between both of them but they are still very close. We cannot conclude that the positive correlation is stronger for Product A. Moreover, the coefficients for the variable knowledge score for product A is 0.59 and 0.73 for Product C. We conclude that the more knowledgeable is the individual, the more it would be increasing his willingness to pay for both products. However, the relationship is stronger for Product C that bears only one label, thus we reject our initial hypothesis.

4.3.2 H2: Discussion

As a reminder, the hypothesis we wanted to test was: "*The more knowledge people have about antibiotics, the more they are willing to buy a product bearing an "antibiotic-free"label".* To answer this, we splitted the hypothesis in 4 sub hypotheses, as explained above. The results showed that there was a positive significant correlation between the knowledge respondents had about the antibiotics issue and the price they were willing to pay for products that were bearing "antibiotic-free" labels (1 or 3). For instance, a person that is highly knowledgeable about this issue is more likely to be ready to pay a higher price for products that bear an "antibiotic-free" label. The label would reassure the consumer about the fact that the product does not contain any trace of antibiotics that he knows - thanks to his knowledge about this subject - would be a potential threat to his health due to the consequences of antibiotic use in food production (antibioresistance for instance). Therefore, the reason why a consumer would be willing to pay more for a product bearing an "antibiotic-free" label, would be that the person is aware that the use of antibiotics in meat production might have damaging effects on his health if he consumes that type of food and would rather pay a higher price in order not to jeopardize his well-being.

However, we cannot draw any conclusions from the correlation analysis we ran for product B since the results are not statistically significant and the model we used only explains 1% of the variations. We were expecting to have as a result, that a person who is highly knowledgeable would pay significantly less for

products that might contain antibiotics (and so that does not bear any labels) because he is aware of their dangerous effects.

Furthermore, there is no significant difference in the price respondents are willing to pay, between products that bear one (Product C) and products that bear multiple "antibiotic-free" labels (Product A). But as we can see in the analysis, the coefficient is stronger for Product C than for Product A, the willingness to pay for a higher price is greater when the knowledge increases for Product C than for Product A.

Here we can conclude that knowledgeable respondents tend to have a higher willingness to pay for products that bear an "antibiotic-free" label (Product C and Product A), and that the willingness to pay increases more strongly when the knowledge score increases for a product that bears one label, opposed to the product that bears three labels.

In a more broad perspective, we can see that the respondents have a basic knowledge of antibiotics. We have a solid base of 92% and 86% of correct answers for questions about the general use of antibiotics (Q6 and Q7). This high rate of correct answers could be explained by a public utility and awareness campaign, carried out in France, since 2002. Based on the observation that France was one of the leading countries among Europe for the prescription of antibiotics, the public french authorities and the National Health Insurance Fund (CNAM) decided to create an information campaign in order to educate the citizens. This campaign called "Les antibiotiques, c'est pas automatique" ("Antibiotics are not automatic") aimed to inform about the use of antibiotics, emphasizing the fact that this type of medication was ineffective against viral infections (which represent most of the medical consultation in winter), was not trivial and that treatments had to be observed scrupulously at the dose and the duration prescribed even if the person was feeling better and showed fewer symptoms. This campaign was also raising awareness about the fact that antibiotics were not to be taken as soon as one feels sick and not to cure mild infections. So each winter, the French public could see, thanks to TV ads, that antibiotics were dangerous and could become ineffective if used wrongly repeatedly, therefore reducing the consumption of antibiotics, and educating the public about antibiotic resistance. However, the effectiveness of this campaign can be shaded a little bit. Indeed it seems that in light of the lower correct answers rate for the question about the definition of

antibiotics (Q1), French citizens have kept in mind the catchy tagline “Les antibiotiques c’est pas automatique” rather than the scientific definition of antibiotics and their perimeter of efficiency.

Campaign “Les antibiotiques c’est pas automatique”, carried out by public french authorities and the CNAM (Caisse nationale d’assurance maladie)

Overall, we seem to observe a split between the success rate for the questions about the general use of antibiotics and the ones with a focus on farming. If we look at the means for both types of questions, we get a superior success rate of 80% for the general questions, and a rate of 63% for the specific questions. The French public does not seem to be very well educated when it comes to the use of antibiotics in farming. Furthermore, one of the questions that was key in our investigation was Q5, focusing on the knowledge of respondents about the regulation in place to control the use of antibiotics administered as growth accelerators in farming. Apart from the 58% of respondents who chose the correct answer, the pool of wrong answers is equally splitted between the two remaining options : 21% of respondents chose “Banned in both Canada and Europe”, and 21% “Banned in Canada, and this since 1996”. It here seems that when we go deeper into the specific possible use of antibiotics and their difference between countries, the awareness of respondents decreases.

The question that had the worst rate of correct answers is Q2, about the percentage of antibiotics intended for animals, with a success rate of 52%. Here we can see that the knowledge about the use of antibiotics in farming is rather low and could be linked to a poor communication in the media about this issue, compared to the

importance of the campaign “Les antibiotiques c’est pas automatique” about the use of antibiotics in community medicine.

It is important to mention the fact that there could be a potential bias for the data we collected in this question. Indeed, since respondents were answering the quiz on their personal laptop at home, we didn’t have the possibility to exert any surveillance over them. Some of them could have looked up answers on the internet for the quiz, bringing the success rate upwards for the quiz scores.

5. Conclusion

Our study aimed to answer the research question : How do consumers react to products labelled as “antibiotic-free”?. The current context of the controversial ratification of the CETA underlines the importance of public knowledge about the antibiotic issue, and the complexity of the applicable legislations according to different countries concerning antibiotics and their use in farming. We can here mention the fact that Canada and Europe have very different rules concerning farming, Canada allowing the use of antibiotics as growth accelerators, and Europe banning it. Consequently, in light of the fact that those Canadian meat products could be commercialized in Europe and end up on the shelves of French supermarkets, our aim was to assess whether consumers would react positively to products labelled as “antibiotic-free”. We wanted to test whether French consumers would feel reassured by an “antibiotic-free” label. Thanks to the different analysis we carried out, we could conclude that for our respondents, the presence of an “antibiotic-free” label generates higher purchase intentions, positively influences the product’s perceived quality, and positively influences trust towards the product. Despite these findings, we could not conclude on the fact that respondents prefer a product bearing one or multiple “antibiotic-free” labels compared to one bearing none, when it comes to the perceived taste. It could be possible that since the product presented is a supermarket product, people tend to assume that its taste ranks lower than a product coming from a butcher’s shop for instance.

Thanks to our study and the data collected, we could also conclude that indeed the presence of an “antibiotic-free” label positively influences the price one is willing to pay for a product. The highest price respondents are willing to pay is to acquire Product C, and the linear regressions shows the existence of a correlation between respondent’s willingness to buy a product and the price they are willing to pay. The factors that were tested to be the most influential in the willingness to pay for each product were Trust, Quality and Taste. Despite the fact that no insight could have been drawn for the analysis of Product A, we can say that an increase in Product B’s perceived quality leads to a higher increase than for Product C, in the price respondents are willing to pay for the product. This can be explained by the

fact that there is a "longer way to go" for Product B, and that since respondents are already in a position of trust towards Product C, a small increase in the perceived quality of Product B directly leads to a significant increase in price.

From our study, we could also conclude on the existence of a correlation between the knowledge one has about the use of antibiotics overall and in farming, and the price he is willing to pay for a Product bearing one, three or no "antibiotic-free" label at all. As we expected, the more knowledge the respondent has about antibiotics, the more he is willing to pay for a product bearing an "antibiotic-free" label. Knowledgeable respondents show the same willingness to pay for a product bearing an "antibiotic-free" label, regardless of the amount. We can here mention that the knowledgeable respondents show no suspicion towards a product that bears an important amount of labels, giving the same information. However, the data we collected did not allow us to state the fact that knowledgeable respondents are willing to pay significantly less for a product bearing no "antibiotic-free" label at all. To sum things up, knowledgeable respondents are willing to pay more for products bearing one or multiple "antibiotic-free" labels, but do not show a will to pay significantly less for a product bearing none.

Despite the fact that the data does not give us the clear-cut results that we were expecting, it still shows us that there is a pool of people that have a knowledge of the antibiotic issue, and that are willing to pay more for those products. This pool of people could be an opportunity for European meat producers to expand their customer base, by labelling their products with an official "antibiotic-free" label.
Moreover, the fact that the more knowledge a person has, the more he is willing to pay for a product, shows us that in parallel to affixing "antibiotic-free" labels to products, the public has to be educated about the antibiotic issue. We mentioned before that the French government was carrying out a campaign each year about the antibiotic being "not automatic", in order to raise awareness. But the French public knowledge about antibiotics remains superficial. The public needs to be educated about the specific use of antibiotics, and the difference between the legislations of the countries, in order to acquire a more thorough knowledge. This way consumers will be able to apprehend to the full extent "antibiotic-free" labels, resulting in a higher willingness to buy and willingness to pay. Affixed

"antibiotic-free" labels will have an even greater impact and generate more sales for European and French meat producers.

6. Limitations

6.1 General comments about the nature of the survey

Following feedback respondents gave us after completing the survey, it is important to make a few comments about our data collection.

First of all, we encountered some problems at the beginning when sharing the survey. Indeed, we noticed that a lot of participants "dropped out" after answering the first question of the survey. Some of the respondents came back to us telling us that the survey "wasn't working" and that they were asked the same question every time. This brought to light the fact that respondent's concentration level maybe wasn't high enough or that our products weren't triggering enough, and that respondents didn't notice the difference between the labels that the different packages bore. In light of those comments, we modified our survey: we chose to add an extra comment on the questions of the first part in order to make respondents aware that while the questions seemed to be alike, they weren't : "This is one question out of 3 with 3 different products". This could be an explanation for people dropping out of our survey.

Another explanation for this bad ratio could also be that even if the survey is not very long, the same questions are asked twice for 3 different products. It is possible that the respondent becomes quite bored as he completes the survey. This boredness could be caused by a lack of interest concerning the antibiotic issue, or it could also be caused by a lack of concern about the choices made while grocery shopping. The fact that respondents drop out of our survey could also be due to the layout of our questions. Indeed the ratings on a 7 Likert scale are not optimal layouts for respondents answering the survey on their phone. A lot of participants use their time commuting in order to answer those surveys, if they don't feel at ease on the platform, it might be enough for them to drop out of the survey.

6.2 The influence of an unprecedented context : a sanitary crisis

Furthermore, it is possible that the current sanitary conditions influenced consumer's general perception of products and the attention they pay to labels, as well as their shopping experience. Meat has been quite at the center of previous sanitary crises and therefore became a product that can be easily "suspected" of

being at risk. Fontes, Giraud & Seabra mentioned in their article Consumers' behaviour towards food safety: A literature review (2013), "It is clear that immediate health risk more easily causes a consumer rejection rather than risk distributed over time.". It has not been proven yet that the current Covid-19 virus affects edible products. But overall the Covid-19 sanitary crisis set up a climate of apprehension and anxiety towards products and their ability to transmit a virus. This climate also has repercussions on consumers shopping behaviors. People tend to go less often in the stores and their average basket is bigger, more expensive and composed of non-perishable products. Therefore people tend to buy less fresh products that they consider as being risky, and when they do, they tend to buy local products. According to a Kantar study (2020) shared by TNS Sofres 75% of people in France tried to favour local products as much as possible, and 53% preferred shopping directly from the producers during the months of lockdown. In addition, the Covid-19 crisis was also covered extensively by the media, and according to Fontes, Giraud & Seabra "elements such as social amplification of the risk or media coverage can greatly influence the purchase of food products". Since health and hygiene preventive measures are at the center of all the discussions, news and politics, it seems normal that people tend to shop products that they see as entail as little risk as possible for their health. Therefore we can assume that the sanitary crisis influenced and modified people's perception of products as well as their purchase intentions.

6.3 The influence of the brand "Picard"

Additionally, we shared the subject of our thesis with some of the participants after they answered the survey and some of them mentioned the fact that choosing the brand "Picard" for the packaging of the different products, influenced their answers when completing the survey and rating the different products. Indeed, "Picard" is a well known brand in France and was for example number 3 in OC&C's ranking of the "most popular shops in France" in 2018 (OC&C Insight, 2018). Therefore, respondents were put in an atmosphere of trust towards the product, its quality and taste. This could explain why when looking at the adjectives respondents attribute to the different products, tha attributes that rank first for each Product A, B and C have a positive connotation (respectively "Fresh product", "Esthetic product", "Clear product"). If we would have chosen a brand

which had been at the center of a sanitary crises, like Findus for instance with the horse meat, then we can imagine that the answers collected would have been different.

We think that we unconsciously choose Picard to showcase our products, because it is a brand we trust as well, and that pops up directly in our minds when thinking about good quality products.

7. Reference List

Aguiar Fontes M., Giraud-Héraud E., Seabra Pinto A., (2013), Consumers' behaviour towards food safety: A literature review :https://hal.archives-ouvertes.fr/hal-00912476/document

Akerlof G.A.(1970), The Market for 'Lemons': Qualitative Uncertainty and the Market Mechanism, Quarterly Journal of Economics, 84 , 488-500.

Andrews,, J.C. Netemeyer, R.G., Burton, S. (1998), Consumer Generalization of Nutrient Content Claims in Advertising, Journal of Marketing, Vol. 62, No. 4 (Oct., 1998), pp. 62-75

Bandara, B.E.S., De Silva, D.A.M., Maduwanthi, B.C.H., Warunasinghe, W.A.A.I. (2015), Impact of Food Labeling on Consumer Purchasing Decision with special reference to faculty of agricultural sciences, International Conference of Sabaragamuwa University of Sri Lanka 2015 (ICSUSL 2015)

Carr C (2017), "Misleading claims of "Hormone free" or "antibiotic free", sourced from: https://meatscience.org/TheMeatWeEat/topics/meat-labels/article/2017/06/08/misleading-claims-of-hormone-free-or-antibiotic-free

Commission Européenne (2005), Interdiction des antibiotiques comme facteurs de croissance dans les aliments pour animaux, sourced from: https://ec.europa.eu/commission/presscorner/detail/fr/IP_05_1687

Dowling R. and R. Staelin (1994), A model of perceived risk and intended risk-handling activity, Journal of Consumer Research, 21, 1, 119-135.

Dupichot, I. (2018), "Sans sucres, sans gluten... La tendance du « sans » : mode ou secteur d'avenir ?": sourced from https://www.welcometothejungle.com/fr/articles/tendance-food-sans-free-from

Erdem T. and Swait J. (1998), Brand equity as a signaling phenomenon, Journal of Consumer
Psychology, 7, 2, 131-157.

Eurobaromètre 74 (November 2010), L'Opinion Publique dans l'Union Européenne, sourced from:
http://ec.europa.eu/public_opinion/archives/eb/eb74/eb74_anx_full_fr.pdf

Eurobaromètre 91 (Juin 2019), L'Opinion Publique dans l'Union Européenne, sourced from:
Eurobaromètre Standard 91 Printemps 2019 L'opinion
...https://ec.europa.eu › download › DocumentKy

Fischler C. and Masson E. (2008), Manger, Français, Européens et Américains face à l'alimentation,
Editions Odile Jacob, 336 p.

Gallen, C. (2001), Le besoin de réassurance en consommation alimentaire, Revue Française de
Marketing, 183-184, 3-4, 67-86

Giraud, G. (2001), Entre marques et labels, comment s'oriente le choix des consommateurs?, Revue
française du marketing, 183-184, 169-179.

Giraud, G. and Trabelsi Trigui I. (2010), Analyse de l'effet de la marque, du label et de la région
d'origine sur les préférences des consommateurs à l'égard des produits alimentaires

Goddard, E., Hartmann, M., Klink-Lehmann, J. (2017), Public Acceptance of Antibiotic Use in
Livestock Production Canada and Germany, International Journal on food system dynamics

Golan, E., Kuchler, F., Mitchell, L (2000), Economics of Food Labeling, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 793.

Grunert K.G., Larsen H.H., Madsen T.K. et A. Baadsgaard (1996), Market Orientation in Food and Agriculture, Norwell, Massachusetts: Kluwer academic Publisher.

Grunert K. G., Juhl H. J. et Poulsen C. S. (2001), Perception de la qualité en alimentaire et rôle des labels, Revue Française du Marketing, 183/184, 3/4, 181-198

Guest, G., Bunce, A., Johnson, L. (2006), How many interviews are enough?, Field Methods 18 (1): 59-82

Godart N. (2020), Ce qui va changer dans nos habitude de consommation après la crise du coronavirus, sourced from BFMTV: https://www.bfmtv.com/economie/consommation/ce-qui-va-changer-dans-nos-habitudes-de-consommation-apres-la-crise-du-coronavirus_AV-202004220020.html

Hair, J., Anderson, R.E., Tatham, R.L., Black, W.C. (1992), Multivariate Data Analysis with Readings, 3rd ed., Maxwell Macmillan Publishing, Singapore.

Institut National de l'Origine et de la Qualité (INAO) (2018), Les produits sous signe d'identification de la qualité et de l'origine, sourced from: LES PRODUITS SOUS SIGNE D'IDENTIFICATION DE ... - Inao https://www.inao.gouv.fr › INAO_CH_CLE_2019_BD

Jacoby, J., Chestnut, R.W., Silberman, W. Consumer Use and Comprehension of Nutrient Information, Journal f Consumer Research 4(2):119-28 · February 1977

Kantar (2020), Baromètre COVID-19 : l'étude mondiale sur les attitudes des consommateurs, les habitudes et attentes médias en période de pandémie, sourced from: https://www.tns-sofres.com/communiques-de-presse/barometre-covid-19-letude-mondiale-sur-les-attitudes-des-consommateurs-les-habitudes-et-attentes-medias-en-periode-de-pandemie

Karavolias, J., Salois, M.J., Baker, K.T., Watkins, K. (2018), Raised without antibiotics: impact on
animal welfare and implications for food policy, Translational Animal Science, Volume 2, Issue 4, October 2018, Pages 337–348,

Keller K. L. (1993), Conceptualizing, measuring, and managing customer-based brand equity, Journal of marketing 57, 1, 1-22

Larceneux F. (2004), Impacts des stratégies de labellisation sur le processus de décision des consommateurs : le cas du label biologique, Actes du XXe Congrès AFM – 6 & 7 mai 2004, St Malo

Larceneux F., Rieunier S. et Fady A. (2007), Effet de l'hyperchoix sur le consommateur et effet modérateur de la marque : une application au cas de l'horlogerie bijouterie, Recherche et Applications en Marketing, 22, 4, 43-57.

Locander, W. B., & Hermann, P. W. (1979). The effect of self-confidence and anxiety on information seeking in consumer risk reduction. *Journal of Marketing Research, 16*(2), 268–274.

Loisel J. and Couvreur A. (2001), Les Français, la qualité et l'information, Note de synthèse, CREDOC, Paris

Lopez P. (2019), Farines animales, boeuf aux antibiotiques... Quels sont les points controversés du Ceta ?, sourced from L'Express: https://www.lexpress.fr/actualite/societe/farines-animales-boeuf-aux-antibiotiques-quels-sont-les-points-controverses-du-ceta_2091245.html

Mieux Manger (2019), “Les labels alimentaires peuvent-ils être trompeurs pour le consommateur?”, sourced from: https://siga.care/blog/labels-alimentaires-trompeurs/

Michail N. (2015), “Antibiotic-free, is this the next ethical food”, sourced from: https://www.foodnavigator.com/Article/2015/06/24/Antibiotic-free-Is-this-the-next-ethical-food-label

Ministère de l’Agriculture et de l’Alimentation (2018), Infographie - Ecoantibio: réduire l’utilisation des antibiotiques vétérinaires, sourced from: https://agriculture.gouv.fr/infographie-ecoantibio-reduire-lutilisation-des-antibiotiques-veterinaires-0

Ministère de l’Agriculture et de l’Alimentation (2019), Antibiorésistance: Tout savoir sur le plan Ecoantibio, sourced from: https://agriculture.gouv.fr/ecoantibio

Ministère des Solidarités et de la Santé (2020), Coup d’envoi du programme prioritaire de recherche sur l’antibiorésistance, sourced from : https://solidarites-sante.gouv.fr/actualites/presse/communiques-de-presse/article/coup-d-envoi-du-programme-prioritaire-de-recherche-sur-l-antibioresistance-429001

Mr Mondialisation (2018), “9 scandales de l’industrie alimentaire qu’on ferait bien de ne pas oublier!” sourced from: https://mrmondialisation.org/8-scandales-de-lindustrie-alimentaire/

Mundy, P. (2015), “Antibiotic-free’: Is it worth the label?” sourced from : https://www.resilience.org/stories/2015-04-02/antibiotic-free-is-it-worth-the-label/

Nicot M., (2018), “Nutrition : le consommateur en quête de preuves”, sourced from: https://www.lsa-conso.fr/nutrition-le-consommateur-en-quete-de-preuves,284741

OC&C Insight Classement OC&C des enseignes (2018), sourced from: https://www.occstrategy.com/media/1751/classement-occ-des-enseignes-2017.pdf

Roux, D. (2007), La résistance du consommateur: proposition d'un cadre d'analyse, Recherche et Applications en Marketing, vol. 22,n°4/2007

Roy C. Docteur (2016), Antibiotiques critiques : quelles conséquences pour l'élevage aujourd'hui?, sourced from: http://gds19.org/Docs/PDF/UP/2016/UP-2016-06-08.pdf

Santé Publique France (2018), "Nutri-Score® : 33 entreprises de l'agro alimentaire et de la grande distribution s'engagent à apposer le logo sur leurs produits", sourced from: https://www.santepubliquefrance.fr/les-actualites/2018/nutri-score-R-33-entreprises-de-l-agro-alimentaire-et-de-la-grande-distribution-s-engagent-a-apposer-le-logo-sur-leurs-produits

Simonin, B. L., & Ruth, J. A. (1998). Is a company known by the company it keeps? Assessing the spillover effects of brand alliances on consumer brand attitudes. *Journal of Marketing Research, 35*(1), 30–42.

Siriex L. et P.L. Dubois (1999), Vers un modèle qualité-satisfaction intégrant la confiance ?, Recherche et Applications en Marketing, 14, 3, 1-22.

Smith W. G., (2008), Does Gender Influence Online Survey Participation?: A Record-linkage Analysis of University Faculty Online Survey Response Behavior

Stone, R. and Grønhaug, K. (1993), "Perceived Risk: Further Considerations for the Marketing Discipline", European Journal of Marketing, Vol. 27 No. 3, pp.

Tavoularis G., Recours F. et Hebel P. (2007), Perception de la qualité et des

signes officiels de qualité dans le secteur alimentaire, Cahier de recherche n°236, CREDOC, Paris.

TNS Sofres (Novembre 2011), Baromètre des préoccupations des Français

Toute l'Europe (2019), Qu'est ce que le CETA?, sourced from: https://www.touteleurope.eu/actualite/qu-est-ce-que-le-ceta.html

Vaudano M. (2019), CETA : farines animales, antibiotiques... la confusion du gouvernement sur les conséquences en France, sourced from Le Monde: https://www.lemonde.fr/les-decodeurs/article/2019/07/15/farines-animales-antibiotiques-la-grande-confusion-de-la-majorite-sur-le-ceta_5489659_4355770.html

Wilde, G.J.S. (1982), The Theory of Risk Homeostasis: Implications for Safety and Health, Risk Analysis, 2, 209-225

Zagdoun B. (2019), Le Ceta va-t-il faire débarquer de la viande aux farines animales, aux hormones et aux antibiotiques dans nos assiettes ?, sourced from FranceInfo: https://www.francetvinfo.fr/economie/emploi/metiers/agriculture/le-ceta-va-t-il-faire-debarquer-de-la-viande-aux-farines-animales-aux-hormones-et-aux-antibiotiques-dans-nos-assiettes_3538389.html