Study on the improved methods for animal-friendly production, in particular on alternatives to the castration of pigs and on alternatives to the dehorning of cattle

D.1.3.3. Preliminary test report on attitudes in Europe

SP1: Alternatives to castration: To develop and promote alternatives to the surgical castration of pigs

WP1.3: Demand and acceptance of consumers

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1. **Introduction**

In WP 1.3 of the ALCASDE project the aim is to gain insight into consumer acceptance and attitude towards castration and boar taint, and the potential impact of this acceptance on the purchasing behavior of pork of the European consumer. In order to reach this objective the following research approach is chosen:

- **Pre-test** in which attitudes of pork consumption are analyzed. Moreover, consumers’ preference toward castration and boar taint are studied. To reach this objective the choice experiments and the analytical hierarchy process techniques were applied.

- **Sensory test** in which consumers have rated three types of meat: detection + (boar meat with boar taint), detection – (boar meat without boar taint) and gilt meat

- A **kitchen session** in which detection + meat is cooked

- **Post-test** in which the attitude towards castration is measured again. Before the post-test, the following information was given to consumers: ‘In the sensory test you have tried different types of meat, meat from gilts and meat from entire males. Sometimes, the meat from entire males could have an abnormal taste and odor, but only some consumers could perceive it. The capacity to perceive this abnormal odor is determined genetically’. The choice experiment technique is applied again in order to verify if preferences change after knowing some information about castration and tasting the different meat types.

This report presents the preliminary results of the pretest and post test. Further analysis will be done in the coming months. This report gives first insights in the results. Relations between consumer viewpoint and explanations of results will be presented in the end report.
The consumer research was carried out in Spain, United Kingdom, The Netherlands, France, Italy and Germany. The final number of consumers analyzed are shown in Table 1.

<table>
<thead>
<tr>
<th>Countries analyzed</th>
<th>Number of observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>144</td>
</tr>
<tr>
<td>Germany</td>
<td>132</td>
</tr>
<tr>
<td>Italy</td>
<td>140</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>124</td>
</tr>
<tr>
<td>Spain</td>
<td>138</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>147</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>825</strong></td>
</tr>
</tbody>
</table>

The objective was to interview 130 respondents in each country. Only in the Netherlands these results were not reached, because of a high number of non show ups.

This document is organized as follows. After the introduction, we describe the method and the design of the questionnaire. Section 3 provides details on the consumer sample used and its characteristics socio demographics. Results on attitude and preferences are described in section 4. In Sections 5 and 6 we present the conclusion and some recommendation for future research.

2. Method

2.1. Design of the questionnaire

As mentioned in the protocol (see D.1.3.1. and D.1.3.2.), the questionnaire was divided in the following main parts: a) pork meat consumption, b) pig welfare attitudes, c) castration and knowledge, d) pork meat and animal welfare preferences, e) socio demographic and life style variables.
Pork meat consumption is measured for several reasons:
- to get insights in whether consumers mainly eat fresh meat or mainly eat meat products
- to be able to categorize answers to frequency of fresh pork meat consumption.

The second section was meant to get insights in knowledge about pig welfare and to get insights in the perception of the current situation of pig welfare and the determinants of pig welfare.

The third section was meant to get insights in knowledge about castration and to get insights in the perception of the current situation of castration.

The fourth section was to get insights in the preferences with respect to products attributes in which gender, origin, taste and odor and price are tested. Consumers are asked to make trade-off that between the different attributes of fresh pork meat. In order to prevent social acceptable answers discrete choice modeling (Choice experiment, CE) and the Analytical Hierarchy Process (AHP) are used (See Annex 1 and 2 for methodological details of the methods).

The first step of the application of both methods is the determination of attributes and levels that consumers take into consideration, in buying fresh pork meat. The strategy employed was to identify and specify the most relevant attributes of fresh pork meat, introducing hypothetical attributes that describe pig welfare. The following attributes have been identified: gender of the pig, origin of the animal, sensorial quality and price.
In the same context, a pilot questionnaire was applied to confirm the adequacy of attributes and levels. The final attributes and levels are shown in Table 2.

Table 2: Attributes and levels of fresh pork meat preference

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Attributes symbols</th>
<th>Levels</th>
<th>Levels symbol</th>
<th>Variable symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender of the Pig</td>
<td>(A$_1$)</td>
<td>Female</td>
<td>L$_{1,1^*}$</td>
<td>CAST0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Entire male (Non-castrated)</td>
<td>L$_{1,2}$</td>
<td>CAST1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Castrated male with anesthesia</td>
<td>L$_{1,3}$</td>
<td>CAST2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Castrated male without anesthesia</td>
<td>L$_{1,4}$</td>
<td>CAST3</td>
</tr>
<tr>
<td>Taste and odor</td>
<td>(A$_2$)</td>
<td>Could be Unpleasant</td>
<td>L$_{2,1^*}$</td>
<td>TAST0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Normal</td>
<td>L$_{2,2^*}$</td>
<td>TAST1</td>
</tr>
<tr>
<td>Pig origin</td>
<td>(A$_3$)</td>
<td>Imported</td>
<td>L$_{3,1^*}$</td>
<td>ORIG0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>National</td>
<td>L$_{3,2}$</td>
<td>ORIG1</td>
</tr>
<tr>
<td>Price</td>
<td>(A$_4$)</td>
<td>6.00 €</td>
<td>L$_{4,1^*}$</td>
<td>PRICE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.00 €</td>
<td>L$_{4,2}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>8.00 €</td>
<td>L$_{4,3}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.00 €</td>
<td>L$_{4,4}$</td>
<td></td>
</tr>
</tbody>
</table>

*: Base level

2.2. The application of the Choice experiment

For the application of the choice experiment, an experimental design is applied. In our case we follow an orthogonal fractional factorial design to estimate all main effects. Thus we only select a fraction of the full factorial experiment. This statistical design enables us to reduce the number of sets in the full design to 16 choice sets. Even so, this number was still too high to be presented to the subjects. Therefore, we decided to separate them into blocks: the 16 sets were divided into two blocks of eight sets. Figure 1 shows one of these choice sets.
<table>
<thead>
<tr>
<th>ELECTION # 1</th>
<th>Alternative “A”</th>
<th>Alternative “B”</th>
<th>Opt_out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pig Origin</td>
<td>National</td>
<td>Imported</td>
<td></td>
</tr>
<tr>
<td>Gender of the animal</td>
<td>Entire male (non-castrated)</td>
<td>Castrated male with anesthesia</td>
<td>NO CHOICE</td>
</tr>
<tr>
<td>Taste and Odor</td>
<td>Normal</td>
<td>Could be unpleasant</td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>6 €/kg</td>
<td>7 €/kg</td>
<td></td>
</tr>
</tbody>
</table>

Supposing these options are the only ones available, which would you buy?

*Figure 1: Example of a choice set*

For the econometric modeling, we considered only the attributes as the only regressors of the utility function taking into consideration the objective of the study. Thus, the utility function in the basic CEmodel, as explained before, is as following.

\[ V_{jm} = ASC + \beta_{t_{1,2}} \times L_{1,2} + \beta_{t_{1,3}} \times L_{1,3} + \beta_{t_{2,2}} \times L_{2,2} + \beta_{t_{2,3}} \times L_{2,3} + \beta_{t_{3,2}} \times L_{3,2} + \beta_{t_{3,3}} \times L_{3,3} + \beta_{A_{4}} \times A_{4} \]

(See Table 1 for the explanation of variables)

### 2.3. The application of the AHP

For the application of the AHP, the same attributes were used following the proposed hierarchical structure (see Annex 2). The relative importance of attributes and levels are obtained from paired comparisons using a 1 to 9 scale. An example of the application of the AHP to our case study are shown in Table 3.
Table 3: Example of the AHP questions

<table>
<thead>
<tr>
<th>Pig Origin</th>
<th>Gender of the animal</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 8 7 6 5 4 3 2</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Price</th>
<th>Taste and Odor</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 8 7 6 5 4 3 2</td>
<td>1 2 3 4 5 6 7 8 9</td>
</tr>
</tbody>
</table>

In your opinion, what is the most important element when buying fresh pork meat? Indicate the degree of superiority of the most important element. In case of equality of items, mark the option "1".

2.4. Version design of the questionnaire

As mentioned before, we will use the CE and the AHP to analyse consumer’s preferences. Thus, to apply correctly both methodology in the same questionnaire we should take into account two type of order effect: 1) the order effect that came from the order of answering different techniques in a same questionnaire, (i. e. which method will be answered first) and 2) the order effect of presenting the different choice set, alternatives and attributes in the CE. Questions and response order effects are known to occur in survey research instruments. In CE there are three plausible order effects: choice set order, alternatives (proposed products) order within choice sets, and attribute order within alternatives. To mitigate these order effects coming from the AHP and CE, we rotated, across respondents, choice set, attribute order and techniques order to offset the order biases.

Applying the above-mentioned to our study, we have obtained 4 versions as can be seen in Annex 3. The difference in each version is based on the order of the CE and the AHP in each questionnaire and the order of the design within both methods.

3. Consumer sample

In this paragraph the sample will be described.
3.1 Socio-demographic variables

3.1.1. Gender

![Figure 2: Gender of the consumers by country](image)

In Figure 2, we can see that the gender distribution of samples in most countries is representative. Only in Italy the number of females exceeds the number of males. This is however no problem since women are mainly responsible for the cooking and doing the groceries and men can smell boar taint less good.
3.1.2. Age

As can be seen in Figure 3, in each country, all age categories are represented allowing for a representative samples. It is important to highlight the highest percent of the age category between 41 and 60 years.

3.1.3. Family members

As can be seen in Figure 4, the average household size of the consumers by country is as follows:

- **United Kingdom**: 2.83
- **Spain**: 3.20
- **Italy**: 3.10
- **Netherlands**: 3.10
- **France**: 2.63
- **Germany**: 2.62

*Figure 3: Age of the consumers by country*

*Figure 4: Average household size of the consumers by country*
Analyzing the family member variable, Figure 4 show that the sample household characteristics. In the United Kingdom respondent households are most numerous (3.65). Average household size in the German sample was only 2.62. The other country results show a similar number of members in the household varying between 2.83 and 3.20 members per household.

3.1.4. Income level

Our aim was to interview people in all income categories. The income results show that in most countries about 1/3 of the sample was in each group. Only in Spain and the United Kingdom the groups are not equally divided. The individual groups are however so large that they can be used for analysis.

3.1.5. Education level

As can be seen in Figure 6, all education levels are presented in the study assuring to obtain all the results that represent all consumers’ profiles.
3.2 Life style variables

3.2.1. Fruits and vegetables consumption behavior

*Agreeing degree with the following statement: ‘I eat 5 or more daily servings of fruit and vegetables’ (scale from 1 to 9, 1 = strongly disagree and 9 = strongly agree)

*Figure 7: Average fruits and vegetables consumption behavior of the consumers depending on the country.*
In Figure 7 we can see clearly the presence of difference between countries toward fruits and vegetable eating behaviour. While in United Kingdom the average value (in a scale from 1; strongly disagree to 9; strongly agree) is 6.13, Germany has the lowest value (4.22).

3.2.2. Smoking behavior

*Agreeing degree with the following statement: ’I am a smoker’ (scale from 1 to 9, 1 = strongly disagree and 9 = strongly agree)

**Figure 8**: Average smoking behavior of the consumers by country. *
Using the same scale mentioned above (1 to 9) in Figure 8 we can see that The Netherlands have the highest value (3.10) showing a more intensive smoking behaviours of their consumers compared with the other samples countries. It is worth to mention also that United Kingdom id found in the opposite side with value of 1.82.

3.2.3. Salt Control

In Figure 9 we can see that the French consumers are the most that control salt quantity in their meals (6.76), followed by United Kingdom and Spain (6.40 and 6.01 respectively).
3.2.4. Physical exercise

As can be seen in Figure 10, United Kingdom has the highest value of people doing physical exercise (7.50). In the last position we find Italy with 5.97 in the same use scale (1 to 9).
3.2.5. **Ready-to-eat meal**

*Agreeing degree with the following statement: ‘I try do not eat ready meal’ (scale from 1 to 9, 1 = strongly disagree and 9 = strongly agree)

**Figure 11**: Average consumption of ready-to-eat meals by consumers by country. *Analyzing the behavior toward ready meal preference, we can see that all analyzed consumers have a similar opinion carrying between the values 6.47 to 5.92.

3.2.6. **Alcohol consumption**

**Figure 12**: Alcohol consumption drinking of consumers by country.
Figure 12 shows the different behavior toward alcohol drinking in the samples. It is worth to mention the highest value is for United Kingdom (82.31%) and the lowest percent is for the Spain (38.41%).

3.2.7. Belonging to environmental association

![Graph showing percentage of consumers belonging to environmental associations by country.](image)

**Figure 13: Percentage of consumers that (do not) belong to an environmental association by country.**

Most of the analyzed consumers do not belong to environmental association (Figure 13). However, The Netherlands have the highest percentage with (16.94%). At the opposite side, Germany represents the lowest value (2.27%).

3.2.8. Health status checking

Analyzing if consumers periodically make a check of their health status, results shows that consumer in Italy are the most who realize this type of check with a 86.96%. The Netherlands has the lowest percent with (58.06%).
3.2.9. Label reading

Analyzing if consumers read labels before buying, results shows (Figure 15) that consumers in France are the most who read labels (95.83%). The Netherlands are in the last position with 58.06%.
3.2.10. Have living in rural environment

Figure 16: Percentage of consumers that have lived in a rural environment by country.

Figure 16 represent the percentage of consumer that has lived some time in rural environment. We can see the France is in the first position (35.42%) followed by Italy (34.29%). In the last position we find Spain with 23.19%.

As seen from the previous characterization of the sample, there is a high heterogeneity in the obtained results between and within each country. Thus, it should be important to take into consideration this heterogeneity when we analyze in further steps the preferences toward boar taint and pig welfare. All the above mentioned socio demographic and life style results are summarized in Annex 4.
4. Results

4.1 Pork meat consumption

In order to obtain information on European consumers’ behavior toward pork meat consumption we have analyzed the consumption frequency, buying behavior and attributes that individuals focus on when they decide to buy fresh meat pork. In Annex 5, we can find a summary of these results. These are presented as follow:

4.1.1. Consumption frequency different types of fresh pork meat

As can be seen in the Figure 17, the frequency of consumption of the different pork pieces is heterogeneous according to each country. Results can be compared graphically since the scale of the x Axis is the same. The cooked ham is the most consumed pork type in Spain, United Kingdom, The Netherlands and France. In Germany the most consumed are the sausage and in Italy the dried cured ham. Observing the pieces less consumed we can identify that pork ribs are the less consumed fresh pork meat. Only in Spain and Italy, ribs are consumed more. These obtained results confirm the diversity and heterogeneity of preferences for the different pork pieces.
Figure 17: Frequency of consumption of different pork pieces
4.1.2. Preference for eating the fat of the pork meat

Analyzing the behaviour of eating fat of the pork meat (Figure 18) in United Kingdom and Germany more consumers prefer eating the fat (56.46%). In the Netherlands, Italy, Spain and France consumers do not prefer the fat of the meat.

**Figure 18:** Preference for eating fat of the pork meat by consumers in country.
4.1.3. Distribution channel choice

In Figure 19 we can see that in all countries the supermarkets are the most important distribution channel for fresh pork meat. United Kingdom and Italy have the highest percentage of consumers that buy from the supermarkets with a 95.92% and 94.29% respectively. It is worth to mention that in Spain the decision of choosing the place is diversified. Thus consumers in Spain prefer the supermarkets but also some times are more prone to buy at traditional markets and at the butchers. In some countries the total is more than 100%, since more answers were possible.

4.1.4. Relevant aspects in purchasing fresh pork meat

Analyzing consumers’ attitudes towards purchasing attributes of fresh pork meat, results demonstrate the presence of heterogeneity between the different attributes analyzed. To present the results we have realized two types of figures. While in the first type (see, Figure 20) we compare the relative importance of attributes in each country, in the second type (see Figure 21) we compare the relative importance of each attributes for all the countries.
Figure 20: Attributes’ relative importance of fresh pork meat in each country
In almost all countries the most important attributes have sensorial characters such as the color, odor, freshness and shelf life. These results demonstrate the importance of food safety and “what’s in it for me” in the fresh meat buying decision. Moreover the brand and the package are one of the less valued attributes when consumers decide to buy in the analyzed countries. Origin is relatively important in some countries and relatively unimportant in others. It is however clear that physical quality elements are most important in most countries.

Moreover, analyzing the attributes of animal welfare, we can see clearly that animal welfare claims and free range attributes were not important when we compare the results to other attributes. The price attribute has an average importance in all countries. In the Netherlands it came in the fourth place, but directly after the quality attributes.

Analyzing the second type of figures (Figure 21.A, 21.B and 21.C) we can see for each attributes its value in each country obtaining information on which is the country with the highest valuation and with the lowest one. In this line it is worth to mention that animal welfare claims has its lowest value in The Netherlands (4.60) and the highest one in Spain (6.82). Germany and France give high importance to origin compared with The Netherlands. Consumers in Spain gave more importance to the package where consumers in United Kingdom did not.

Analyzing the sensorial elements of fresh pork meat, in Figure 21.B we can see that all attributes have high importance in all countries. The price is more important in France and Spain and less important in Italy and The Netherlands. In the last Figure (21.C) we can see that the attribute free range is most important in France and Spain and less important in The Netherlands.
Figure 21.A: Average of the attribute's relative importance of fresh pork meat for the studied countries

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Figure 21.B: Average of the attribute’ relative importance of fresh pork meat for the studied countries.
Figure 21.C: Average of the attribute’ relative importance of fresh pork meat for the studied countries
4.2. Animal welfare attitudes

In this part we analyze animal welfare attitude and level of information that consumers have on this topic.

4.2.1. Self-reported knowledge about pig welfare

![Chart showing the level of information about pig welfare by consumers in different countries.](chart)

**Figure 22:** Information level about pig welfare by consumers depending on the country (1 = nothing informed and 9 = very informed).

Figure 22 demonstrates that consumers in general are uninformed about pig welfare, since only Germany (5.31) and the Netherlands (5.48) score on average more than 5. Consumers in Spain and France indicate to be bad informed with scores of 3.50 and 3.18 respectively.

4.2.2. Perceived level of pig welfare in each country

Asking consumers about their opinion towards the level of pig welfare and protection of pigs in their countries, results demonstrates (Figure 23) that consumers in Italy believe
the level is good (6.61), while in France and The Netherlands the perception is that the level is lower (5.20 and 5.02 respectively).

![Figure 23: Perception level of pig welfare by consumers depending on the country (1 = very poor and 9 = very good).](image)

4.2.3. More needs to be done by regulations

Asking consumers if more needs to be done by regulations (Figure 24) to ensure a better level of animal welfare, consumers in France have the highest percentage of the certainty to improve the level of animal welfare (41.67% yes certainly), while in Italy this percentage is the lowest (14.29%). Moreover, it is worth to highlight that both Spain and Italy have the highest percentage of “I do not know” (respectively 26.09% and 25.71%).
4.2.4. Importance of the different aspects in considering pig welfare

In Figure 25 we can see that all the presented aspects have received a high level of association with pig welfare. However, it is worth to highlight that the aspect “do not castrate” has relatively the lowest impact on animal welfare of all mentioned aspects. Moreover, it is important to mention as well that a lot of consumers did not answer this question, since they did not know. Italy had most missing values.

The same results from another viewpoint are presented in Figure 26.A and 26.B. In these figures each aspect is compared among countries. In these figures we mention that Spain has the highest value that associate castration with pig welfare (6.22) and Italy has the lowest value (5.51). A summary of these results can be seen in Annex 6.

**Figure 24:** Percentage of responses of the attribute ‘More needs to be done to improve pig welfare’ by consumers depending on the country.
Figure 25: Average of the relative importance of the different aspects of pig welfare by consumers in each country (1 = not important and 9 = very important).
Figure 26.A: Average of the relative importance of each aspect of pig welfare in the studied countries (1 = not important and 9 = very important).
Figure 26.B: Average of the relative importance of each aspect of pig welfare in the studied countries (1 = not important and 9 = very important).
4.3. Willingness to pay

4.3.1. Willingness to pay for respecting pig welfare

In order to analyze the willingness to pay regarding pig welfare beyond the compulsory regulations, a contingent valuation (CV) exercise was carried out. We chose a “payment card” format, as it combined both the advantages of open-ended formats (elicitation of punctual information of WTP) and of close-ended formats (ease of cognitive burden on interviewees).

Results demonstrates (Figure 27) that the highest WTP for pig welfare is for Germany (1.71 €/kg) followed by United Kingdom (1.48€/kg). In the same line, results demonstrates that Italy and The Netherlands have the lowest willingness to pay with 1.23 €/kg and 1.18€/kg respectively.

![Figure 27: WTP regarding pig welfare by country.](image-url)
In Figure 28 we can see the distribution of this willingness to pay in each interval of prices. This figure allows us also to have idea of the heterogeneity of the WTP between consumers in each country. The figure shows that consumers in the UK and Germany correspond animal welfare with a higher price and are willing to pay more for more animal welfare. In Italy and the Netherlands either this connection is not made or the willingness to pay more for animal welfare is not the case.
4.3.2. Willingness to pay for ensuring sensorial quality

Figure 29: WTP for ensuring sensorial quality of fresh pork meat by country.

Analyzing the willingness to pay for ensuring sensorial quality Germany have the highest value (1.73 €/kg) followed by France and Spain (1.47 €/kg and 1.41 €/kg respectively). In this line, consumers in The Netherlands appear to have the lowest WTP with 1.15 €/kg. Moreover, analyzing the distribution of the WTP (Figure 30) results demonstrates that The Netherlands have the highest percentage of consumers who choose their WTP in the lowest range of price (59.35%), while Germany have the highest percentage for the high and average range of prices (21.97% and 51.52% respectively).
4.4. Attitudes towards castration method

Consumers are asked which of 5 castration methods is most appropriate. This is done by asking them which is the most appropriate, the second etc. Analyzing the attitudes of consumers to castration method, in Figure 31 we can see the average rank of the different castration method for each country. As can be seen, in all countries the castration without anesthesia is the less appropriate method. The appropriate methods were both the entire pigs and female type. However, it is worth to mention that in Italy, the most appropriate method was the castration with anesthesia. In the following paragraphs, we will analyze each method separately in all countries in order to have an idea of the difference between rankings.
Figure 31: Adequacy of the different castration method by country (A rank from 1 = more appropriate to 5 = less appropriate).
4.4.1. Castration without anesthesia

Analyzing the castration without anesthesia, in Figure 32 we can see that Germany have the highest percentage of consumers (80.30%) who choose this method as the least appropriate method (rank 5), while in Spain this rank has the lowest percentage (43.41%). However, we can say that as a whole that all consumers has manifested this method as the less appropriate.

![Figure 32: Adequacy of the castration without anesthesia by country.](image)

4.4.2. Castration with anesthesia

The Castration method with anesthesia has obtained different ranking score in each country (Figure 33). We can highlight that in Italy and United Kingdom this method has received the ranking 1 as the most appropriate method. For the other countries results are heterogeneous having ranking score in the other categories.
4.4.3. Immunocastration

The Immunocastration method has the highest percentage for the middle ranking score (3 and 4), revealing that consumers have tended to choose first the less and most appropriate method and later to put this method in the middle (Figure 34). This demonstrates that they do not understand which mean this type of castration method.

Figure 33: Adequacy of the castration with anesthesia by country.

Figure 34: Adequacy of the Immunocastration by country.
4.4.4. **Entire Pigs**

As can be seen in Figure 35, the Entire pigs method has been chosen as the most appropriate method for all countries with the exception of Italy and The Netherlands.

![Figure 35: Adequacy of the entire pigs by country.](image)

4.4.5. **Females**

For the Female Type (Figure 36), this method also has received the highest percentage as the first and second most appropriate method. It is important to highlight that in Italy this type has approximately the same percentage for all the ranking scores.
4.4.6. Knowledge of the most used castration method in each country

Asking consumers about their knowledge about the most used castration method, a high percentage have stated that they do not know. However, it is worth to mention that consumers in Italy and The Netherlands obtain the highest percentage of knowledge.
4.4.7. Which castration method is the most used in each country

The people who said to have knowledge were asked what the most used method was. This question is not asked to people who did not know. The numbers in figure 38 indicate the number of answers given. In Figure 38 we can see how many consumers (observation number) know the method most used in their country. In all countries consumers have stated the castration without anaesthesia as the most used. However, in France more consumers stated the castration with anaesthesia as the most used.

![Figure 38: Observation number knowing the most used castration method by country.](image)

4.5. Relationship between castration and boar taint

4.5.1. Knowledge of the relationship between boar taint and castration

In Figure 39 we can see the knowledge of consumers about the relationship between castration and boar taint. With the exception of Italy, all consumers have stated that they do not have knowledge of this relation. However, in Italy 65.71% of the consumers have exhibit knowledge of the most used method.
4.5.2. Relationship between castration methods and pig welfare

In Figure 40 we can see the relationship between the castration method and the pig welfare. The method of castration without anesthesia has received the highest score (in a scale from 1 to 9) of the existence of a relationship with pig welfare. Moreover, United Kingdom and Italy have showed the highest values. In addition, as expected, Female have obtained the lowest value.

This question was however difficult to answer since a lot of consumers found it very difficult to make link between castration and animal welfare. Further analysis has to indicate whether this information is valuable.
Figure 40: Relationship between castration and pig welfare by country
4.5.3. Relationship between castration methods and boar taint presence

As commented before, we have asked consumers about their opinion on the relationship between Castration methods and the boar taint presence. In Figure 41 we can see as expected that the entire pigs (non castrated pigs) have the highest relationship with boar taint presence. Especially in Spain and Italy whose score has exhibit the highest values. Moreover, as we expect, Female have obtained the lowest value of this relationship confirming some knowledge of consumers. It is worth to mention that these question were realized after the sensorial and kitchen session assuming that consumers have obtained some information.

This question was however difficult to answer since a lot of consumers found it very difficult to make link between castration and boar taint presence. Further analysis has to indicate whether this information is valuable.
Figure 41: Relationship between castration and boar taint by country
4.6. Pre and Post animal welfare attitudes

In our analysis we have asked consumers a series of question before (pre questions) and after (post questions) the sensorial and kitchen test. We expect that consumers change their opinion after receiving some information about castration and boar taint presence. Before the post-test, the following information was given to consumers: ‘In the sensory test you have tried different types of meat, meat from gilts and meat from entire males. Sometimes, the meat from entire males could have an abnormal taste and odor, but only some consumers could perceive it. The capacity to perceive this abnormal odor is determined genetically’.

4.6.1. Pre and post acceptance of meat from non castrated pig to be more expensive

As can be seen in Figure 42, asking consumers that the meat from non castrated pig should be more expensive, consumers in Germany, United Kingdom, The Netherlands and France have show higher acceptance after doing the sensorial test. However, the opposite is the case in Spain and Italy, where the results show less acceptability for a higher price.

![Figure 42: Pre and post acceptance of meat from non castrated pig to be more expensive by country (1 = strongly disagree and 9 = strongly agree).](image-url)
4.6.2. Pre and post opinion to see meat from non castrated pig labelled

In Figure 43, we can see that after the sensorial test, more consumers would like to see the meat of non castrated pig to be labelled. An exception is the Spanish case where the acceptance before the sensorial test was slightly higher.

Figure 43: Pre and post opinion to see meat from non castrated pig labeled by country (1 = strongly disagree and 9 = strongly agree).
4.6.3. Pre and post opinion that castration improves sensorial quality of pork meat

Consumers are asked whether castration is justified because it improves sensorial quality. Respondents in France and United Kingdom, think before and after the sensorial test that this is not justified. In all the other countries consumers think (slightly) that castration is justified for sensorial quality. In all countries the opinion about castration is relation to sensorial quality gets stronger after the sensorial test. In the countries where consumers do not think it is justified they do not change their opinion or get more strong in their opinion. And in countries where people think it is justified the opposite is the case.

Figure 44: Pre and post opinion that castration improve sensorial quality of the meat by country (1 = strongly disagree and 9 = strongly agree).
4.6.4. *Pre and post opinion that castration should not be done because it is painful*

In most countries consumers on average think that castration is too painful that it shouldn’t be done. Only the Italian consumers slightly tend to not agreeing. In most countries, tasting the meat has the effect that they are more negative about castration. Only in Italy and the Netherlands, the scores get lower after the sensorial test.

**Figure 45**: *Pre and post opinion that castration should not be done because it is painful by country (1 = strongly disagree and 9 = strongly agree).*
4.6.5. Pre and post opinion that we should not change the state of the animal

The last statement about consumer’s opinion was whether they think that pig males should not be castrated. Results (Figure 46) demonstrate that presence of a division of opinion after the sensorial test. While Spain, France and United Kingdom increase their agreement on this statement, agreement level in Germany, The Netherlands and Italy have decreased.

Figure 46: Pre and post opinion that we should not change the state of the animal by country (1 = strongly disagree and 9 = strongly agree).
4.7. Consumers’ preferences toward castration and boar taint: AHP Results

For analyzing consumers’ preferences we will analyze only the AHP results, the CE results will be commented in the further report.

As noted above, the AHP allows obtaining the weights assigned by each individual to the attributes and their levels using the geometric mean criteria. The results of the aggregation of the weights for the attributes across subjects could be seen in Annex (9). For a better understanding of the results we have built a hierarchy structure for each country where we can see the resulting weight for each attribute in buying fresh pork meat.
4.7.1. Results of the AHP: United Kingdom

As can be seen in Figure 47, taste and odour attribute have received the highest weight, followed by price, origin and gender of the pig. Analyzing with more details the weights of attributes’ levels, we can in gender attributes, the most important was the female, followed by the entire male, castrated with anaesthesia and in the less importance is for castration without anaesthesia. Moreover, as expected the highest value is for the normal taste and for the national origin of the meat.

**UNITED KINGDOM**

![Figure 47: Attributes and levels’ weights: United Kingdom](image-url)
4.7.2. Results of the AHP: Spain

The AHP results for Spain (Figure 48) show the same importance as in United Kingdom but with different intensity of importance. They give less importance to origin and gender but more importance for taste and odor. It is worth to mention here the lowest value that consumers gave to the gender attribute. The relative importance of levels follows the same importance as in United Kingdom results with the exception that female and entire male have received the same values.

**SPAIN**

![Figure 48: Attributes and levels’ weights: Spain](image)

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4.7.3. Results of the AHP: The Netherlands

Analyzing results in The Netherlands (Figure 49), we can see that the price attribute have received the highest relative importance, followed by taste and odor, origin and gender of the pig. It is worth to mention that the gender seem to be an important attributes within their decision making, in case information is given. For levels importance, they follow approximately the same importance as the previous case with the exception that the entire male has received the highest relative importance score.

THE NETHERLANDS

Figure 49: Attributes and levels’ weights: The Netherlands
4.7.4. Results of the AHP: Germany

In the Germany case, we can see in Figure 50 that consumers had revealed a similar preference as the other countries. It is interesting to mention that the gender has a higher importance than the Spanish case. Price attribute seem also to be very important and came before the origin of the meat.

**GERMANY**

![Product attributes diagram]

*Figure 50: Attributes and levels’ weights: Germany*
4.7.5. Results of the AHP: France

For French consumers, results (Figure 51) show a low relative importance of gender in relation to Spain. It is important to mention that the origin attribute has received one of the highest value comparing with all the other countries and it has a value similar to the relative importance of price. The level importance results, show a similar structure of preference highlighting a low relative importance for castration without anaesthesia.

**FRANCE**

*Figure 51: Attributes and levels’ weights: France*
4.7.6. Results of the AHP: Italy

Italian results (Figure 52) show that gender attributes have received a higher value compared with Spain, Germany and France. However, it is worth to mention that the origin attribute is one of the most important attributes and it received the highest value compared to the results of the other countries. For level importance, in the gender attributes female seem to be the most important compared with the other levels. The price attribute has obtained one of the lowest relative importance compared with other countries results.

**ITALY**

![Figure 52: Attributes and levels’ weights: Italy](image)

To have an whole view of the relative importance f attributes and levels for all countries see Annex 9
5. Preliminary conclusions

A harmonized protocol for attitudes towards castration and boar taint was developed (appendix 1). The protocol was carried out in six different countries (Spain, United Kingdom, The Netherlands, France, Italy and Germany). In total 825 consumers participated. Enclosed you find the preliminary results on consumers’ attitudes (appendix 2).

The main results on consumers’ attitudes are:

- Sensory traits (colour and odour), freshness and shelf life are the most important aspects on which consumers focus in purchasing fresh pork meat (from 6.22 to 8.69, in a 9-point scale). Animal welfare claims, were considered less important (from 4.60 to 6.82, in a 9-point scale).

- By AHP (= Analytical Hierarchy Process) analysis, relative weights (from 0 to 1) of different purchasing attributes (‘Gender of the pig’, ‘Origin’, ‘Price’ and, ‘Taste and odour’) are obtained. The results show that the relative weight of each attribute is different among countries. ‘Taste and odour’ are however the attributes with the highest weight (from 0.332 to 0.568) in all the countries, followed by ‘Origin’ (from 0.164 to 0.305) or ‘Price’ (from 0.184 to 0.333) depending on the country. ‘Gender of the pig’ is the attribute with the lowest weight (from 0.059 to 0.117).

- In general, consumers considered themselves not well informed about pig welfare (from 3.18 to 5.48, in a 9-point scale). Most consumers (from 73% to 95%) did not know either what castration technique is most used in their country.

- When consumers were asked about the relative importance of different production aspects related to pig welfare (feed quality, healthy, space, housing...), the ‘do not castrate/entire males’ choice obtained the lowest score in all countries. However a lot of consumers could not answer this question for castration.
In all countries ‘castration without anaesthesia’ is the less appropriate technique to apply. In general, the most appropriate technique was ‘production of entire males’ and ‘production of females’, except for Italian consumers. The Italian consumers prefer ‘castration with anaesthesia’.
Annex 1: The Choice Experiment (CE) methodology

The CE is based on the characterization of the analyzed product through a series of attributes that can be combined to create hypothetical scenarios that will be evaluated by the subject. The number of scenarios shown to the interviewee is usually three and one of the scenarios is a fixed comparator. The fixed comparator is usually named “no election” option. This alternative may have also other labels as “null-option” or “opt-out option”. The conceptual foundations of CE rely on two main theories a) Lancaster’s Theory of Value, which proposes that utilities for goods can be decomposed into separable utilities for their characteristics or attributes, and b) Random Utility Theory, which explains the dominance judgments made between pairs of offerings. Based on this theoretical framework, subjects choose among alternatives according to a utility function with two components: a systematic (i.e. observable) component plus a random term (non-observable by the researcher). Mathematically:

\[ U_{in} = V_{in}(Z_i, S_n) + \varepsilon_{in} \]  

(1)

where \( U_{in} \) is the utility provided by alternative \( i \) to subject \( n \), \( V_{in} \) is the systematic component of the utility, \( Z_i \) is the vector of attributes of alternative \( i \), \( S_n \) is the vector of socio-economic characteristics of the respondent \( n \), and \( \varepsilon_{in} \) is the random term.

Among the probabilistic choice models, the conditional logit (CL) model is the most employed model for dealing with CE-sampled data. Under this specification, the condition of independent and identically distributed (IID) error must be met according to a Gumbel (or Weibull) distribution. According to the CL model, the probability that an individual \( n \) will choose alternative \( i \) (\( P_{in} \)) among other alternatives (\( i = 1 \) to \( I \)) of a set \( C_n \) is formulated as follows (McFadden, 1974):

\[ P_{in} = \frac{e^{\mu V_{in}}}{\sum_{i=1}^{I} e^{\mu V_{in}}} \quad \forall i \in C_n \]  

(2)
where $V_i$ is the systematic component of the utility provided by alternative $i$, and $\mu$ is a scale parameter which is inversely proportional to the standard deviation of the error terms and is usually assumed to be equal to one.

Equation 2 enables the probability of choice of an alternative to be linked to its utility. To determine the relative importance of the attributes within the alternatives, the functional form of $V_i$ must be defined. The most common assumption of this function is that it is separable, additive and linear following this expression:

$$V_i = ASC + \sum_k \beta_k X_{ki}$$

(3)

Where:

$ASC =$ Alternative Specific Constant, representing the utility of the fixed comparator $i = 1...I$, representing the selected alternative $i$ within the set of alternatives ($C_i$);

$k = 1...K$, representing the attributes which characterize alternative $j$;

$\beta_k =$ model parameter of attribute $k$;

$X_{ki} =$ value of attribute $k$ in alternative $i$;

From (3) the basic CL model is given by:

$$P_{in} = \frac{e^{ASC + \sum_k \beta_k X_{ki}}}{\sum_{i=1}^{I} e^{ASC + \sum_k \beta_k X_{ki}}}$$

(4)

By estimating the basic CL model (4), implicit prices (IP) can be obtained for each attributes and levels (5). These average values for the individuals in the sample can be set in ranking structure determining the preferences of attributes and levels.

$$IP_{Product\_attribute} = \frac{\beta_{Product\_attribute}}{\beta_{monetary\_attribute}}$$

(5)
Annex 2: The Analytical Hierarchy Process (AHP) methodology

The AHP methodology in our case aims to cope with individuals’ preference in order to measures and determines the relative importance or weights of products’ attributes and levels. The AHP is a technique to support multicriteria decision-making in discrete environments. AHP allows eliciting weights for each attributes and levels taking them into consideration to explain individuals’ behaviour in choosing their preferred product. In order to implement the AHP, one needs to carry out a survey where individuals are asked to value different attributes that follow a hierarchical structure (Figure 14).

![Hierarchical structure used to value product attributes and levels.](image)

Figure 14: Hierarchical structure used to value product attributes and levels.

The relative importance or weights (\(w\)) of attributes (\(A_n\)) and levels (\(L_{n,p}\)), where; \(n\) (1, ..., \(N\)) is the number of attributes and \(p\) (=1, ..., \(P\)) is the number of levels, are obtained from a pair-wise comparisons. In order to make these comparisons and determine the intensity of preferences for each option, Saaty (1980) proposed and justified the use of 9 points scale. The relative importance of each attributes is obtained by comparing this attribute with all other attributes. From the answers provided, a matrix with the following structure is generated for each individual \(k\) (1, ..., \(K\)) known as Saaty matrix. In the case of attributes pair-wise comparison the matrix is:

\[
S_k = \begin{bmatrix}
    a_{11k} & a_{12k} & \ldots & a_{1jk} \\
    a_{21k} & a_{22k} & \ldots & a_{2jk} \\
    \vdots & \vdots & \ddots & \vdots \\
    a_{nk} & a_{2nk} & \ldots & a_{NNk}
\end{bmatrix}
\]

where \(a_{ijk}\) represents the value obtained from the comparison between attribute/level \(i\) (\(i\in N / i\in P\)) and attribute/level \(j\); \(j\in N / j\in P\) for each individual \(k\). This square matrix
has two fundamental properties: (a) all elements of its main diagonal take a value of one 
\( a_{iik} = 1 \quad \forall \ i \), and (b) all other elements maintain that pair-wise comparisons are reciprocal (if \( a_{ijk} = x \) then \( a_{jik} = 1/x \)). If perfect consistency in preferences holds for each decision-maker, it should also hold that \( a_{ihk} \times a_{hjk} = a_{ijk} \) for all \( i, j \) and \( h \) (\( h \in N / h \in P \)).

This condition implies that values given for pair-wise comparisons represent weights given to each objective by a perfectly rational decision-maker \( a_{ijk} = w_{ik}/w_{jk} \) for all \( i \) and \( j \).

Therefore, the Saaty matrix can also be expressed as follows:

\[
S_k = \begin{bmatrix}
    w_{1k} & w_{1k} & \cdots & w_{1k} \\
    w_{1k} & w_{2k} & \cdots & w_{2k} \\
    w_{2k} & w_{2k} & \cdots & w_{2k} \\
    \cdots & \cdots & \cdots & \cdots \\
    w_{Nk} & w_{Nk} & \cdots & w_{Nk} \\
    w_{1k} & w_{2k} & \cdots & w_{Nk}
\end{bmatrix}
\]  

(7)

Under such circumstances, \( K \) weights \( (w_{Nk}) \) for each attributes and \( K \) weights \( (w_{Pk}) \) for each levels can be easily determined from the \( N(N-1)/2 \) values and \( P(P-1)/2 \) values for \( a_{ijk} \) respectively. However, perfect consistency is seldom present in reality, where personal subjectivity plays an important role in doing the pair-wise comparison. In Saaty matrixes \( (S_k = a_{ijk}) \) in which some degree of inconsistency is present, alternative approaches have been proposed to estimate the weight vector that better is able to represent the decision-maker’s real weight vector. Saaty proposed two options as the best estimate of real weights: the geometric mean and the main eigenvector. Other authors have proposed alternatives based on regression analysis or goal programming.

No consensus has been reached regarding what alternative outperforms the others. As all criteria meet the requirements to estimate the above-mentioned weights, we choose the geometric mean. Using this approach, weights assigned by subject to each attribute and levels are obtained using the following expression:

\[
w_{ik} = \frac{N, P}{\prod_{i,j=1}^{i=N, j=P} a_{ijk}} \quad \forall \ i, k
\]

(8)
AHP was originally conceived for individual decision-making, but it was rapidly extended as a valid technique for the analysis of group decisions. Thus, in order to compare attributes weights between AHP and CE results, group preferences must be considered. Therefore, we need to aggregate the corresponding individual weights ($w_{ik}$) across subjects to obtain a synthesis of weights for each attributes and levels ($w_i$). The aggregation process should be carried out considering that the most suitable method for aggregating individual weights ($w_{ik}$) in a social collective decision-making context is that of the geometric mean:

$$w_i = \sqrt[k]{\prod_{k=1}^{K} w_{ik}} \quad \forall \ i \quad (9)$$

In the same context, with the aim to obtain weights’ order for levels of each attributes we need to calculate a global weight for each levels ($W_{G_{-}L_{n,p}}$). This global levels’ weight is obtained by multiplying aggregated levels’ weights ($w_i$ for each levels $L_{n,p}$) with its corresponding weight ($w_{i}$) of attribute ($A_n$):

$$W_{G_{-}L_{n,p}} = W_{An} \times W_{L_{n,p}} \quad (10)$$

Where, $\sum W_{G_{-}L_{n,p}} = 1$, for all levels.
Annex 3: Versions design of the questionnaires

CE: Choice experiments
AHP: Analytic Hierarchy Process
Block 1: from 1 to 8 “choice sets”
Block 2: from 9 to 16 “choice sets”
### Annex 4: Socio demographic and life style variables

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<td>Q25_1</td>
<td>Not completed primary studies</td>
<td>2.92%</td>
<td>0.00%</td>
<td>2.90%</td>
<td>0.80%</td>
<td>0.00%</td>
<td>13.60%</td>
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<tr>
<td>Q25_2</td>
<td>Primary studies</td>
<td>12.41%</td>
<td>4.76%</td>
<td>25.00%</td>
<td>2.40%</td>
<td>52.30%</td>
<td>3.60%</td>
</tr>
<tr>
<td>Q25_3</td>
<td>Secondary studies</td>
<td>54.74%</td>
<td>61.90%</td>
<td>29.40%</td>
<td>62.10%</td>
<td>24.20%</td>
<td>45.00%</td>
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<td>Q25_4</td>
<td>University studies</td>
<td>29.93%</td>
<td>33.33%</td>
<td>42.60%</td>
<td>34.70%</td>
<td>23.50%</td>
<td>37.90%</td>
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<tr>
<td>Q26_1</td>
<td>Less than the average (Low income)</td>
<td>46.62%</td>
<td>27.78%</td>
<td>34.30%</td>
<td>30.40</td>
<td>37.90</td>
<td>34.50%</td>
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<tr>
<td>Q26_2</td>
<td>Average (Average income)</td>
<td>33.08%</td>
<td>28.70%</td>
<td>27.10%</td>
<td>34.30</td>
<td>30.30</td>
<td>31.70%</td>
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<tr>
<td>Q26_3</td>
<td>More than average (High income)</td>
<td>20.30%</td>
<td>43.52%</td>
<td>38.60%</td>
<td>35.30</td>
<td>31.80</td>
<td>33.80%</td>
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<tr>
<td>Q19_1</td>
<td>I eat 5 or more daily servings of fruit and vegetables</td>
<td>4.96</td>
<td>2.908</td>
<td>6.13</td>
<td>2.503</td>
<td>4.57</td>
<td>2.96</td>
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<tr>
<td>Q19_2</td>
<td>I am a smoker</td>
<td>2.72</td>
<td>3.032</td>
<td>1.82</td>
<td>2.154</td>
<td>2.13</td>
<td>2.59</td>
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<tr>
<td>Q19_3</td>
<td>I control the salt quantity in my diet</td>
<td>6.01</td>
<td>3.024</td>
<td>6.40</td>
<td>2.558</td>
<td>5.89</td>
<td>3.06</td>
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<tr>
<td>Q19_4</td>
<td>I practice physical exercise at least one time a week</td>
<td>6.58</td>
<td>3.008</td>
<td>7.50</td>
<td>2.143</td>
<td>5.97</td>
<td>3.30</td>
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<tr>
<td>Q19_5</td>
<td>I try do not eat ready meal</td>
<td>6.40</td>
<td>2.791</td>
<td>6.41</td>
<td>2.381</td>
<td>6.27</td>
<td>2.88</td>
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<tr>
<td>Q19_6</td>
<td>I drink alcohol (yes=1)</td>
<td>38.41%</td>
<td>82.31%</td>
<td>50.72%</td>
<td>66.9%</td>
<td>50.72%</td>
<td>54.17%</td>
</tr>
<tr>
<td>Q19_7</td>
<td>I belong to an environmental association (yes=1)</td>
<td>5.11%</td>
<td>4.76%</td>
<td>5.80%</td>
<td>16.9%</td>
<td>5.80%</td>
<td>4.17%</td>
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<tr>
<td>Q19_8</td>
<td>I check my health status periodically (yes=1)</td>
<td>81.16%</td>
<td>61.22%</td>
<td>86.96%</td>
<td>58.1%</td>
<td>86.96%</td>
<td>78.47%</td>
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<tr>
<td>Q19_9</td>
<td>I read carefully products labels (yes=1)</td>
<td>65.94%</td>
<td>59.86%</td>
<td>82.61%</td>
<td>58.1%</td>
<td>82.61%</td>
<td>95.83%</td>
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<tr>
<td>Q21</td>
<td>Have you lived in an rural environment (yes=1)</td>
<td>23.19%</td>
<td>30.61%</td>
<td>50.72%</td>
<td>66.9%</td>
<td>50.72%</td>
<td>54.17%</td>
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### Annex 5: Pork meat consumption

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<th>Italy</th>
<th>Netherland</th>
<th>Germany</th>
<th>France</th>
</tr>
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<tbody>
<tr>
<td><strong>Q2</strong></td>
<td>How many times a month do you eat fresh pork meat</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Q5</td>
<td>I eat the pork meat with the fat</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Q6_1</td>
<td>Times a month: Pork Chops</td>
<td>1.917</td>
<td>1.844</td>
<td>2.02</td>
<td>2.44</td>
<td>2.34</td>
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<tr>
<td>Q6_2</td>
<td>Times a month: Bacon (sliced)</td>
<td>1.980</td>
<td>3.480</td>
<td>1.07</td>
<td>2.56</td>
<td>1.93</td>
<td>1.92</td>
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<tr>
<td>Q6_3</td>
<td>Times a month: Minced</td>
<td>2.380</td>
<td>1.010</td>
<td>1.58</td>
<td>3.84</td>
<td>3.41</td>
<td>1.70</td>
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<tr>
<td>Q6_4</td>
<td>Times a month: Dried cured ham</td>
<td>6.530</td>
<td>3.620</td>
<td>5.92</td>
<td>2.72</td>
<td>3.64</td>
<td>3.99</td>
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<tr>
<td>Q6_5</td>
<td>Times a month: Sausage</td>
<td>3.210</td>
<td>3.360</td>
<td>3.09</td>
<td>3.20</td>
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<td>Q6_6</td>
<td>Times a month: Pork loin</td>
<td>4.230</td>
<td>1.340</td>
<td>2.34</td>
<td>1.66</td>
<td>2.70</td>
<td>2.82</td>
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<tr>
<td>Q6_7</td>
<td>Times a month: Ribs</td>
<td>1.950</td>
<td>0.610</td>
<td>1.27</td>
<td>1.96</td>
<td>2.01</td>
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<tr>
<td>Q6_8</td>
<td>Times a month: Cooked ham</td>
<td>6.850</td>
<td>3.650</td>
<td>3.81</td>
<td>3.14</td>
<td>4.21</td>
<td>5.03</td>
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<tr>
<td>Q7_1</td>
<td>I buy the fresh pork meat at the butcher</td>
<td>58.0% 0.49</td>
<td>21.8% 0.41</td>
<td>.16</td>
<td>.15</td>
<td>.00</td>
<td>.00</td>
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<tr>
<td>Q7_2</td>
<td>I buy the fresh pork meat at the supermarket</td>
<td>73.2% 0.44</td>
<td>4.8% 0.21</td>
<td>.94</td>
<td>.86</td>
<td>.00</td>
<td>.00</td>
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<tr>
<td>Q7_3</td>
<td>I buy the fresh pork meat at the traditional market</td>
<td>41.3% 0.49</td>
<td>95.9% 0.19</td>
<td>.01</td>
<td>.00</td>
<td>.00</td>
<td>.00</td>
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<tr>
<td>Q7_4</td>
<td>I buy the fresh pork meat at other places</td>
<td>5.8% 0.23</td>
<td>2.7% 0.16</td>
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<td>.01</td>
<td>.00</td>
<td>.00</td>
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<td>Convenience</td>
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<td>6.08</td>
<td>5.05</td>
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<td>Brand</td>
<td>5.18</td>
<td>5.20</td>
<td>5.00</td>
<td>4.29</td>
<td>4.91</td>
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<td>Q8_3</td>
<td>Animal welfare claims</td>
<td>6.82</td>
<td>5.35</td>
<td>6.25</td>
<td>4.60</td>
<td>6.26</td>
<td>5.70</td>
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<td>Package type</td>
<td>6.52</td>
<td>4.31</td>
<td>6.09</td>
<td>4.51</td>
<td>6.01</td>
<td>5.59</td>
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<td>Q8_5</td>
<td>Origin</td>
<td>6.38</td>
<td>6.01</td>
<td>7.78</td>
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<td>7.15</td>
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<td>Freshness</td>
<td>8.36</td>
<td>8.45</td>
<td>8.46</td>
<td>8.09</td>
<td>8.69</td>
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<td>Shelf life</td>
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<td>7.67</td>
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<td>Odor</td>
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<td>7.08</td>
<td>8.02</td>
<td>6.62</td>
<td>8.29</td>
<td>7.82</td>
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<td>Q8_9</td>
<td>Color</td>
<td>8.09</td>
<td>7.22</td>
<td>8.00</td>
<td>7.60</td>
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<td>Fat content</td>
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<td>7.12</td>
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<td>Q8_11</td>
<td>Price</td>
<td>7.35</td>
<td>7.10</td>
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<td>6.77</td>
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<td>Free range</td>
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## Annex 6: Animal welfare attitudes

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<tr>
<th>Variable</th>
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<th>Spain Mean / %</th>
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<th>United Kingdom Mean / %</th>
<th>United Kingdom St. Dev</th>
<th>Italy Mean / %</th>
<th>Italy St. Dev</th>
<th>Netherland Mean / %</th>
<th>Netherland St. Dev</th>
<th>Germany Mean / %</th>
<th>Germany St. Dev</th>
<th>France Mean / %</th>
<th>France St. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q9</td>
<td>How informed are you about pig welfare</td>
<td>3.50</td>
<td>2.47</td>
<td>4.11</td>
<td>2.34</td>
<td>3.81</td>
<td>2.30</td>
<td>5.48</td>
<td>2.24</td>
<td>5.31</td>
<td>2.10</td>
<td>3.18</td>
<td>1.98</td>
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<td>Q10</td>
<td>Level of animal welfare and protection of pigs</td>
<td>5.26</td>
<td>2.18</td>
<td>6.02</td>
<td>1.84</td>
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<td>1.65</td>
<td>5.20</td>
<td>1.90</td>
<td>5.50</td>
<td>1.83</td>
<td>5.02</td>
<td>2.02</td>
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<tr>
<td>Q11_1</td>
<td>More needs to be done by regulations, yes, certainly</td>
<td>29.71%</td>
<td>20.41%</td>
<td>14.29%</td>
<td>31.45%</td>
<td>25.00%</td>
<td>41.67%</td>
<td>14.29%</td>
<td>20.41%</td>
<td>50.00%</td>
<td>40.97%</td>
<td>21.21%</td>
<td>3.47%</td>
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<tr>
<td>Q11_2</td>
<td>More needs to be done by regulations, yes, probably</td>
<td>39.13%</td>
<td>47.62%</td>
<td>54.29%</td>
<td>58.06%</td>
<td>50.00%</td>
<td>40.97%</td>
<td>54.29%</td>
<td>47.62%</td>
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<td>3.47%</td>
<td>50.00%</td>
<td>40.97%</td>
</tr>
<tr>
<td>Q11_3</td>
<td>More needs to be done by regulations, No, Probably No</td>
<td>3.62%</td>
<td>11.56%</td>
<td>5.71%</td>
<td>2.42%</td>
<td>21.21%</td>
<td>3.47%</td>
<td>5.71%</td>
<td>2.42%</td>
<td>21.21%</td>
<td>3.47%</td>
<td>21.21%</td>
<td>3.47%</td>
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<tr>
<td>Q11_4</td>
<td>More needs to be done by regulations, No, certainly No</td>
<td>1.45%</td>
<td>0.68%</td>
<td>0.00%</td>
<td>4.03%</td>
<td>0.76%</td>
<td>0.00%</td>
<td>0.00%</td>
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<td>0.76%</td>
<td>0.00%</td>
<td>0.00%</td>
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<td>Q11_5</td>
<td>I don't know</td>
<td>26.09%</td>
<td>19.73%</td>
<td>25.71%</td>
<td>4.03%</td>
<td>3.03%</td>
<td>13.89%</td>
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<tr>
<td>Q12_1</td>
<td>Housing/living conditions</td>
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<td>1.35</td>
<td>7.82</td>
<td>1.45</td>
<td>7.81</td>
<td>1.29</td>
<td>7.17</td>
<td>1.80</td>
<td>8.35</td>
<td>1.03</td>
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<td>Medical treatment</td>
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<td>1.22</td>
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<td>1.30</td>
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<td>6.91</td>
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<td>6.36</td>
<td>2.03</td>
<td>7.97</td>
<td>1.51</td>
<td>6.79</td>
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<td>Do not castrate/entire male</td>
<td>6.22</td>
<td>2.15</td>
<td>5.85</td>
<td>2.22</td>
<td>5.51</td>
<td>2.44</td>
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<td>2.41</td>
<td>5.75</td>
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<td>Slaughtering</td>
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<td>1.82</td>
<td>7.91</td>
<td>1.41</td>
<td>6.40</td>
<td>2.16</td>
<td>7.61</td>
<td>1.84</td>
<td>7.56</td>
<td>1.67</td>
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<td>Feed quality</td>
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<td>1.32</td>
<td>8.00</td>
<td>1.16</td>
<td>8.51</td>
<td>0.85</td>
<td>7.61</td>
<td>1.68</td>
<td>8.52</td>
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### Annex 7: Attitudes towards pig castration

<table>
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<th>United Kingdom</th>
<th>Italy</th>
<th>Netherland</th>
<th>Germany</th>
<th>France</th>
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<tr>
<td></td>
<td></td>
<td>Mean / %</td>
<td>St. Dev</td>
<td>Mean / %</td>
<td>St. Dev</td>
<td>Mean / %</td>
<td>St. Dev</td>
</tr>
<tr>
<td>Q29_1</td>
<td>Castration without anesthesia (%)</td>
<td>4.12</td>
<td>0.98</td>
<td>4.24</td>
<td>1.23</td>
<td>4.07</td>
<td>1.38</td>
</tr>
<tr>
<td>Q29_2</td>
<td>Castration with anesthesia (%)</td>
<td>2.71</td>
<td>1.23</td>
<td>2.46</td>
<td>1.24</td>
<td>2.46</td>
<td>1.31</td>
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<tr>
<td>Q30_1</td>
<td>Knowing most used method (yes)</td>
<td>6.52% (N=9)</td>
<td></td>
<td>4.76% (N=7)</td>
<td></td>
<td>27.14% (N=38)</td>
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</tr>
<tr>
<td>Q30_2</td>
<td>Which method is most used (%)**</td>
<td>77.8</td>
<td>11.1</td>
<td>11.1</td>
<td>0.0</td>
<td>66.7</td>
<td>33.3</td>
</tr>
<tr>
<td>Q31</td>
<td>Castration versus boar taint (%:Yes)</td>
<td>8.0%</td>
<td>1.4%</td>
<td>65.7%</td>
<td>4.2%</td>
<td>73.3%</td>
<td>26.6%</td>
</tr>
<tr>
<td>Q32_1A</td>
<td>Castration without anesthesia &amp; AW</td>
<td>6.19</td>
<td>3.30</td>
<td>7.04</td>
<td>2.090</td>
<td>6.91</td>
<td>2.85</td>
</tr>
<tr>
<td>Q32_2A</td>
<td>Castration with anesthesia &amp; AW</td>
<td>5.74</td>
<td>2.86</td>
<td>5.51</td>
<td>2.022</td>
<td>6.18</td>
<td>2.47</td>
</tr>
<tr>
<td>Q32_3A</td>
<td>Immunocastration &amp; AW</td>
<td>5.64</td>
<td>2.58</td>
<td>5.03</td>
<td>1.942</td>
<td>5.17</td>
<td>2.74</td>
</tr>
<tr>
<td>Q32_4A</td>
<td>Entire pigs &amp; AW</td>
<td>5.34</td>
<td>3.64</td>
<td>5.56</td>
<td>3.209</td>
<td>6.24</td>
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<tr>
<td>Q32_5A</td>
<td>Females &amp; AW</td>
<td>4.84</td>
<td>3.59</td>
<td>5.33</td>
<td>2.388</td>
<td>4.89</td>
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<tr>
<td>Q32_1B</td>
<td>Castration without anesthesia &amp; BT</td>
<td>5.26</td>
<td>2.96</td>
<td>6.29</td>
<td>2.249</td>
<td>5.21</td>
<td>3.32</td>
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<tr>
<td>Q32_2B</td>
<td>Castration with anesthesia &amp; BT</td>
<td>5.63</td>
<td>2.82</td>
<td>5.24</td>
<td>1.818</td>
<td>4.89</td>
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<td>Q32_3B</td>
<td>Immunocastration &amp; BT</td>
<td>5.11</td>
<td>2.65</td>
<td>5.07</td>
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<td>2.023</td>
<td>6.98</td>
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<td>Q32_5B</td>
<td>Females &amp; BT</td>
<td>4.86</td>
<td>3.25</td>
<td>5.01</td>
<td>2.244</td>
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<td>3.27</td>
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<tr>
<td>Q33</td>
<td>Buying in same place with BT</td>
<td>28.8%</td>
<td>32.0%</td>
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**: percent calculated using the observation number in Q30_1.
## Annex 8: post and Pre attitudes towards animal welfare

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Spain Mean / St. Dev</th>
<th>United Kingdom Mean / St. Dev</th>
<th>Italy Mean / St. Dev</th>
<th>Netherlands Mean / St. Dev</th>
<th>Germany Mean / St. Dev</th>
<th>France Mean / St. Dev</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td>Mean / %</td>
<td>Mean / %</td>
<td>Mean / %</td>
<td>Mean / %</td>
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<td>St. Dev</td>
<td>St. Dev</td>
<td>St. Dev</td>
<td>St. Dev</td>
<td>St. Dev</td>
<td>St. Dev</td>
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<tr>
<td><strong>Animal welfare attitudes Pre-Test</strong></td>
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</tr>
<tr>
<td>Q13_1</td>
<td>Transportation is justified; it improves sensory quality</td>
<td>3.84 / 2.97</td>
<td>4.72 / 2.39</td>
<td>6.00 / 11.09</td>
<td>5.61 / 2.32</td>
<td>6.51 / 2.37</td>
<td>4.93 / 2.22</td>
</tr>
<tr>
<td>Q13_2</td>
<td>I like to see that meat from castrated pigs is labeled</td>
<td>8.09 / 8.49</td>
<td>6.38 / 2.07</td>
<td>6.85 / 2.34</td>
<td>5.60 / 2.65</td>
<td>6.33 / 2.63</td>
<td>5.74 / 2.55</td>
</tr>
<tr>
<td>Q13_3</td>
<td>Feed quality of male piglets is justified</td>
<td>8.40 / 1.12</td>
<td>7.00 / 1.92</td>
<td>7.61 / 1.56</td>
<td>7.40 / 1.85</td>
<td>7.37 / 1.91</td>
<td>6.80 / 1.76</td>
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<tr>
<td>Q13_4</td>
<td>It is acceptable that non-castrated meat is expensive</td>
<td>5.09 / 2.82</td>
<td>5.06 / 2.12</td>
<td>5.16 / 2.42</td>
<td>4.99 / 2.62</td>
<td>5.26 / 2.71</td>
<td>3.76 / 2.36</td>
</tr>
<tr>
<td>Q13_5</td>
<td>Castration of male piglets is justified</td>
<td>5.58 / 2.85</td>
<td>4.64 / 2.11</td>
<td>6.59 / 2.38</td>
<td>5.31 / 2.44</td>
<td>5.55 / 2.60</td>
<td>4.73 / 2.15</td>
</tr>
<tr>
<td>Q13_6</td>
<td>Pig males should not be castrated</td>
<td>6.57 / 2.65</td>
<td>6.01 / 2.15</td>
<td>5.54 / 2.82</td>
<td>5.12 / 2.44</td>
<td>5.85 / 2.74</td>
<td>6.34 / 2.36</td>
</tr>
<tr>
<td>Q13_7</td>
<td>Castration of male pig is so painful; it shouldn’t be done</td>
<td>6.32 / 2.75</td>
<td>6.13 / 2.28</td>
<td>4.71 / 3.00</td>
<td>5.60 / 2.72</td>
<td>5.54 / 2.94</td>
<td>6.46 / 2.43</td>
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<tr>
<td><strong>Animal welfare attitudes Post-Test</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q28_1</td>
<td>Transportation is justified; it improves sensory quality</td>
<td>4.12 / 3.15</td>
<td>4.60 / 2.27</td>
<td>4.02 / 2.79</td>
<td>5.63 / 2.31</td>
<td>7.01 / 2.07</td>
<td>4.23 / 2.24</td>
</tr>
<tr>
<td>Q28_2</td>
<td>I like to see that meat from castrated pigs is labeled</td>
<td>7.47 / 2.17</td>
<td>6.55 / 2.30</td>
<td>7.80 / 1.80</td>
<td>6.36 / 2.41</td>
<td>7.37 / 2.17</td>
<td>6.11 / 2.51</td>
</tr>
<tr>
<td>Q28_3</td>
<td>Feed quality of male piglets is justified</td>
<td>8.46 / 1.06</td>
<td>6.87 / 2.10</td>
<td>7.58 / 1.57</td>
<td>7.48 / 1.65</td>
<td>7.92 / 1.62</td>
<td>6.90 / 1.96</td>
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<tr>
<td>Q28_4</td>
<td>It is acceptable that non-castrated meat is expensive</td>
<td>4.74 / 3.10</td>
<td>5.19 / 2.45</td>
<td>4.38 / 2.79</td>
<td>5.06 / 2.67</td>
<td>5.85 / 2.72</td>
<td>3.91 / 2.49</td>
</tr>
<tr>
<td>Q28_5</td>
<td>Castration of male piglets is justified</td>
<td>5.43 / 2.98</td>
<td>4.52 / 2.53</td>
<td>6.43 / 2.48</td>
<td>5.68 / 2.38</td>
<td>5.64 / 2.68</td>
<td>4.68 / 2.43</td>
</tr>
<tr>
<td>Q28_6</td>
<td>Pig males should not be castrated</td>
<td>6.74 / 2.76</td>
<td>6.33 / 2.28</td>
<td>4.62 / 2.91</td>
<td>5.00 / 2.57</td>
<td>5.61 / 2.95</td>
<td>6.56 / 2.40</td>
</tr>
<tr>
<td>Q28_7</td>
<td>Castration of male pig is so painful; it shouldn’t be done</td>
<td>6.79 / 2.84</td>
<td>6.82 / 2.28</td>
<td>4.93 / 2.80</td>
<td>5.46 / 2.69</td>
<td>5.88 / 2.85</td>
<td>6.82 / 2.47</td>
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</table>
Annex 9: Aggregated weights for Attributes and levels (variance)

<table>
<thead>
<tr>
<th>Attributes and level</th>
<th>Spain</th>
<th>United Kingdom</th>
<th>Italy</th>
<th>France</th>
<th>Netherland</th>
<th>Germany</th>
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<tbody>
<tr>
<td><strong>Gender of the animal</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Entire male (Non-castrated)</td>
<td>32.48% (3.03)</td>
<td>27.83% (1.83)</td>
<td>29.83 (2.71)</td>
<td>33.90 (3.19)</td>
<td>33.23% (3.01)</td>
<td>30.08% (2.51)</td>
</tr>
<tr>
<td>Castrated male with anesthesia</td>
<td>21.16% (2.76)</td>
<td>25.00% (1.91)</td>
<td>21.88 (1.76)</td>
<td>23.92 (2.62)</td>
<td>22.61% (3.18)</td>
<td>27.42% (2.00)</td>
</tr>
<tr>
<td>Castrated male without anesthesia</td>
<td>5.90% (0.56)</td>
<td>13.67% (1.83)</td>
<td>8.02% (1.04)</td>
<td>5.92% (0.35)</td>
<td>11.75% (0.93)</td>
<td>7.06% (0.74)</td>
</tr>
<tr>
<td>Female</td>
<td>32.49% (2.72)</td>
<td>32.36% (2.40)</td>
<td>30.58 (2.21)</td>
<td>31.13 (2.50)</td>
<td>22.67% (2.08)</td>
<td>33.31% (2.35)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
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<tr>
<td><strong>Taste and odor</strong></td>
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<tr>
<td>Normal</td>
<td>86.45% (2.74)</td>
<td>79.51% (5.22)</td>
<td>86.12 (1.18)</td>
<td>86.28 (2.58)</td>
<td>79.08% (3.93)</td>
<td>85.40% (2.47)</td>
</tr>
<tr>
<td>Could be Unpleasant</td>
<td>56.76% (3.16)</td>
<td>42.86% (3.49)</td>
<td>43.14% (4.07)</td>
<td>39.49% (4.30)</td>
<td>33.27% (2.99)</td>
<td>41.86% (3.84)</td>
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<td><strong>TOTAL</strong></td>
<td>100.00</td>
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<td>100.00</td>
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<tr>
<td><strong>Pig origin</strong></td>
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<tr>
<td>National</td>
<td>82.25% (3.22)</td>
<td>74.40% (5.39)</td>
<td>83.44 (3.31)</td>
<td>83.95 (3.12)</td>
<td>79.64% (3.01)</td>
<td>80.64% (3.15)</td>
</tr>
<tr>
<td>Imported</td>
<td>16.38% (2.80)</td>
<td>20.02% (2.65)</td>
<td>30.46% (4.56)</td>
<td>27.40% (4.64)</td>
<td>21.22% (2.23)</td>
<td>24.52% (2.19)</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>100.00</td>
<td>100.00</td>
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<tr>
<td>20.96% (2.04)</td>
<td>26.69% (3.07)</td>
<td>18.38% (2.01)</td>
<td>27.19% (2.97)</td>
<td>33.31% (2.65)</td>
<td>26.39% (2.52)</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td>100.00</td>
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<td>100.00</td>
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