

PIGCAS

Attitudes, practices and state of the art regarding piglet castration in Europe

Report of WP1: Attitudes

Identification of convergences and divergences in stakeholder attitudes

Identification of convergences and divergences in Europe

**SURVEY ON THE ATTITUDES OF STAKEHOLDERS IN
RELATION TO PIGLET CASTRATION AND ALTERNATIVES IN
DIFFERENT REGIONS OF EUROPE**

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1. Objectives of WP1

1.1 To collect and evaluate information about the attitudes of stakeholders regarding piglet castration without anaesthesia and its possible alternatives. To derive points of convergence and divergence both between and within the different categories of stakeholders. To summarise the information at an international level, derive common trends and variations between regions.

1.2 To establish contacts and facilitate the mutual knowledge of attitudes between the scientific community and the various categories of stakeholders.

2. Expected results

- Attitudes of stakeholders (consumer groups, NGOs active in the field of animal welfare, industry/chain representatives) in individual countries;
- Common trends and regional variations in the attitudes of stakeholders at the international level;
- Identification of potential clashes of interest between the various categories of stakeholders.

3. Material and Methods

3.1 Guidelines and data collection

A short explanation about the performance of the different alternatives to surgical castration without anaesthesia was given to stakeholders before being interviewed (Deliverable D1.1).

- Surgical castration with anaesthesia
- Immunocastration of male pigs
- Raising entire male pigs
- Raising only females

A questionnaire survey was designed to ascertain the attitudes of different stakeholders on surgical castration in piglets and alternatives (Annex 2: PIGCAS

Questionnaire Survey on Attitudes). Questionnaire design was previously discussed among PIGCAS core group, and once accepted, the National contact persons looked after data collection in the different countries, supervised by the regional co-ordinators for the four different regions (Annex 1: List of national contact persons and regional co-ordinators). Figure 1 shows the participant European countries and regions.

Whenever required the National Contact translated the questionnaire into his/her own language. Each National Contact also prepared a list of stakeholders to whom they distributed the questionnaire. Stakeholders were classified into 7 categories, including two groups of Pig producers/feed companies/breeders (a main stream one, and a niche group); a Slaughterhouses' category, including meat industry and wholesalers; a Consumers' category, including retailers (those who sell to consumers, e.g. supermarkets, butchers); an Animal welfare NGOs' category; a Veterinarians' category (commercial ones); and finally a Public/Government/Administration category. (Table 1)

Table 1. Stakeholder categories and number of completed questionnaires received.

Stakeholder category	Abbreviation	Number of completed questionnaires
Pig producers (main stream)+ feed companies + breeders	Pig Prod M	174
Pig producers (niche,)	Pig Prod N	15
Slaughterhouses + meat industry + wholesalers	Slaught.	72
Consumers + retailers (those who sell to consumers, e.g. supermarkets, butchers)	Consum.	69
NGOs animal welfare	Welfare	38
Veterinarians (commercial)	Vet. (com)	42
Public/Government administration	Gov./adm	62
Total		472

A total of 472 properly completed questionnaires were received. The number of respondents from individual countries varied considerably, from 6 to 46. Comparisons between countries are very difficult, because the distribution of stakeholders across the 24 study countries differs (Table 2).

3.2. Statistical analysis

For questions 3 and 8 dealing with ranking, data were analysed as means per stakeholder category. For the other questions, data were analysed as differences between stakeholder categories in the distribution of possible responses.

For all questions, data were analysed first on the whole set of data (“all cties”). Then 3 groups of countries were formed on the basis of the proportion of male piglets that are castrated (see the WP2 report on practice). The groups are:

- “Cast 0%” (UK and Ireland) where castration is very rare,
- “Cast 30%” (Cyprus, Portugal, Spain) where castration is practiced in about one third of the pigs or less
- “Cast 90%” (remaining countries) where most male piglets are castrated

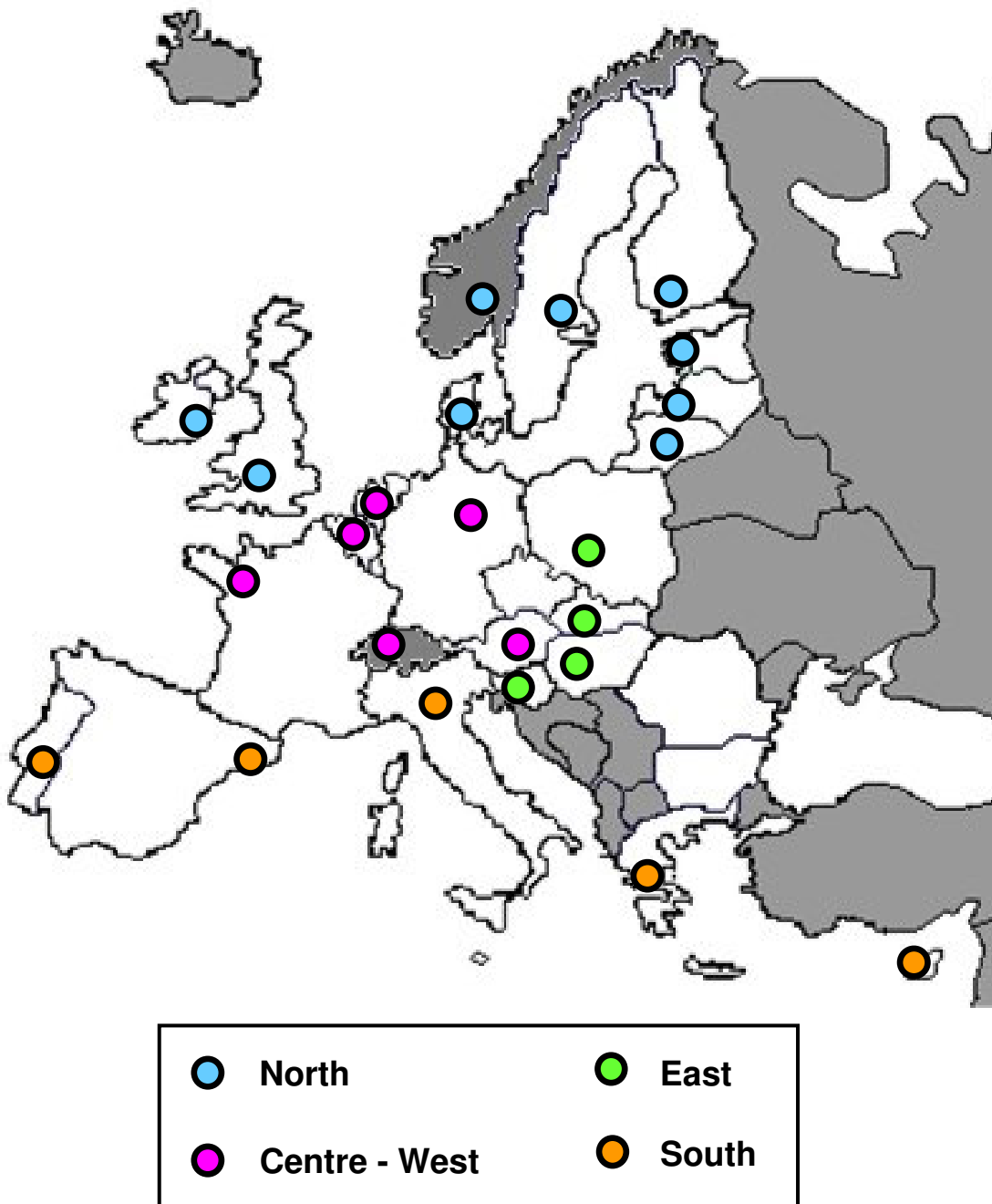
In the “Cast 0%” group, there was no response for Pig Prod N and only one response from Vet (com) and Gov/admin (Table 2). These categories were excluded in the analysis for this group.

Questions 3 and 8 are ranking questions and significant differences between means were tested by means of the Friedman’s test using Bonferroni’s test for the pairwise comparisons.

A principal component analysis was performed using the XLSTAT (XLSTAT 2006 Version 2006.3) for each group of countries. Varimax rotation was carried out to facilitate the interpretation of the plots.

The results of Pig Prod Niche are shown in the Tables and Figures, but they are not discussed because of the low number of responses from this category.

Figure 1. Participant European countries per regions.



Centre-West (CW): Germany (DE), Austria (AT), France (FR), Belgium (BE), Netherlands (NL), Switzerland (CH).

North (N): Sweden (SE), Finland (FI), Denmark (DK), Norway (NO), U. Kingdom (UK), Ireland (IE), Estonia (EE), Lithuania (LI), Latvia (LV).

East (E): Poland (PL), Hungary (HU), Slovenia (SI), Slovakia (SK).

South (S): Spain (ES), Portugal (PT), Italy (IT), Greece (GR), Cyprus (CY).

Table 2. Number of questionnaires completed per stakeholder by all participant countries and groups of countries based on the frequency of piglet castration.

	Pig Prod M	Pig Prod N	Slaught.	Consum.	Welfare	Vet. (com)	Gov./adm	Total
Austria	6	1	3	2	4	7	9	32
Belgium	7	1	6	6	2	1	2	25
Cyprus	9		1	8		3		21
Denmark	4	1	4	2	1		2	14
Estonia	3		3		2	1	3	12
Finland	1		2		1	1	3	8
France	9	4	4	4	3	1	1	26
Germany	3	2	2	2	2			11
Greece	1		1	2		1	1	6
Hungary	25			13	1	6	1	46
Ireland	1		2	1	2	1	1	8
Italy	18		1	1		1	6	27
Latvia	3	1	4	2		1	2	13
Lithuania	9		5	6		4	10	34
Netherlands	5	1	1		3	2	5	17
Norway	5		3	2	1	2	2	15
Poland	12		3	3	1	2	2	23
Portugal	7	1	1			1	2	12
Slovakia	13							13
Slovenia	10		6	5	6	1		28
Spain	13	1	7	2	2	3	4	32
Sweden	3		1	4	2	1	3	14
Switzerland	2	2	6	2	1	2	3	18
UK	5		6	2	4			17
Total	174	15	72	69	38	42	62	472
Cast 0%¹	6	0	8	3	6	1	1	25
Cast 30%²	29	2	9	10	2	7	6	65
Cast 90%³	139	13	55	56	30	34	55	382

¹UK and Ireland; ²Cyprus, Portugal and Spain; ³Remaining countries

4. Results

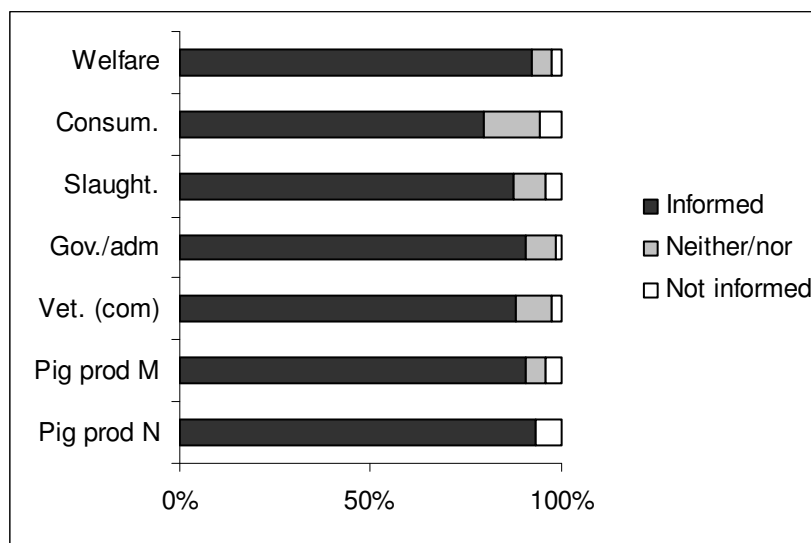
Level of information of stakeholders about pig production methods

Figure 2 illustrates the method we implemented throughout the whole survey, when the question contained at least 5 categories: the first two categories (i.e. well informed + informed) were grouped and their frequencies summed, to form a new category 'Informed'; 'uninformed + very uninformed' were grouped to form a new category 'Not informed'. In addition, we decided to eliminate the 'don't know' responses and columns, as very few people stuck on it. This general process was applied to the following questions, dealing with stakeholders' evaluation of the method of production of piglets, with their agreement or disagreement with specialised statements about surgical castration without anaesthesia, and further alternatives, including surgical castration under anaesthesia, analgesia, immunocastration, sexing spermatozoa to raise only females; it finally applies on question about trust in institutions for ensuring acceptable standards of piglet welfare.

4.1. Information about Pig production Methods (Question 1)

The following interpretation is based on the analysis of the responses to the first question of the survey, regarding the information level that stakeholders had about pig production rearing systems (How informed do you think you are about the ways in which animals are reared, especially in the production of pork?).

Figure 2. Stakeholders' level of information about pig production methods.

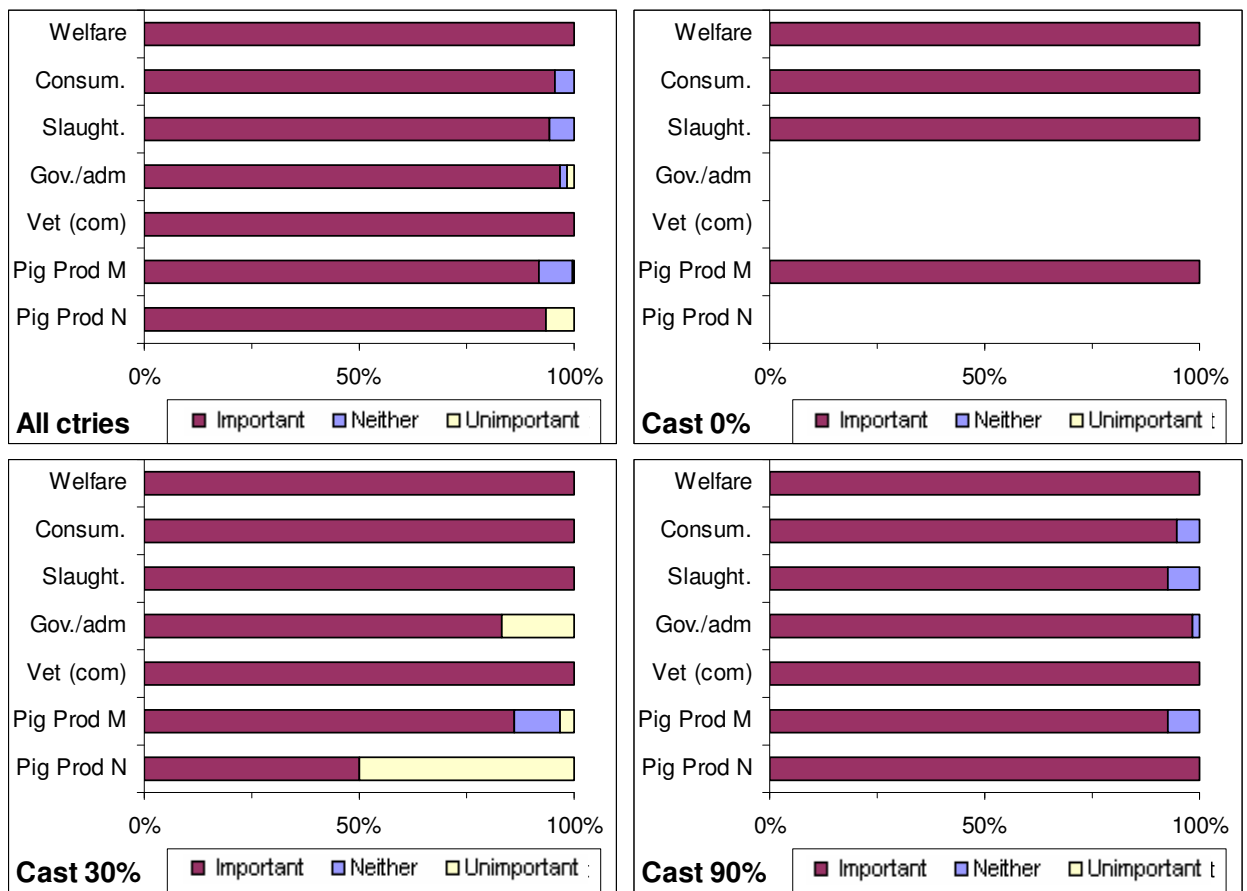


As shown in Figure 2, most stakeholders reported to be well informed about pig production methods. However 6-7% of the niche pig producers and consumers stated to be 'not informed' about pig production methods.

4.2. Evaluation of pig production and related issues (Question 2)

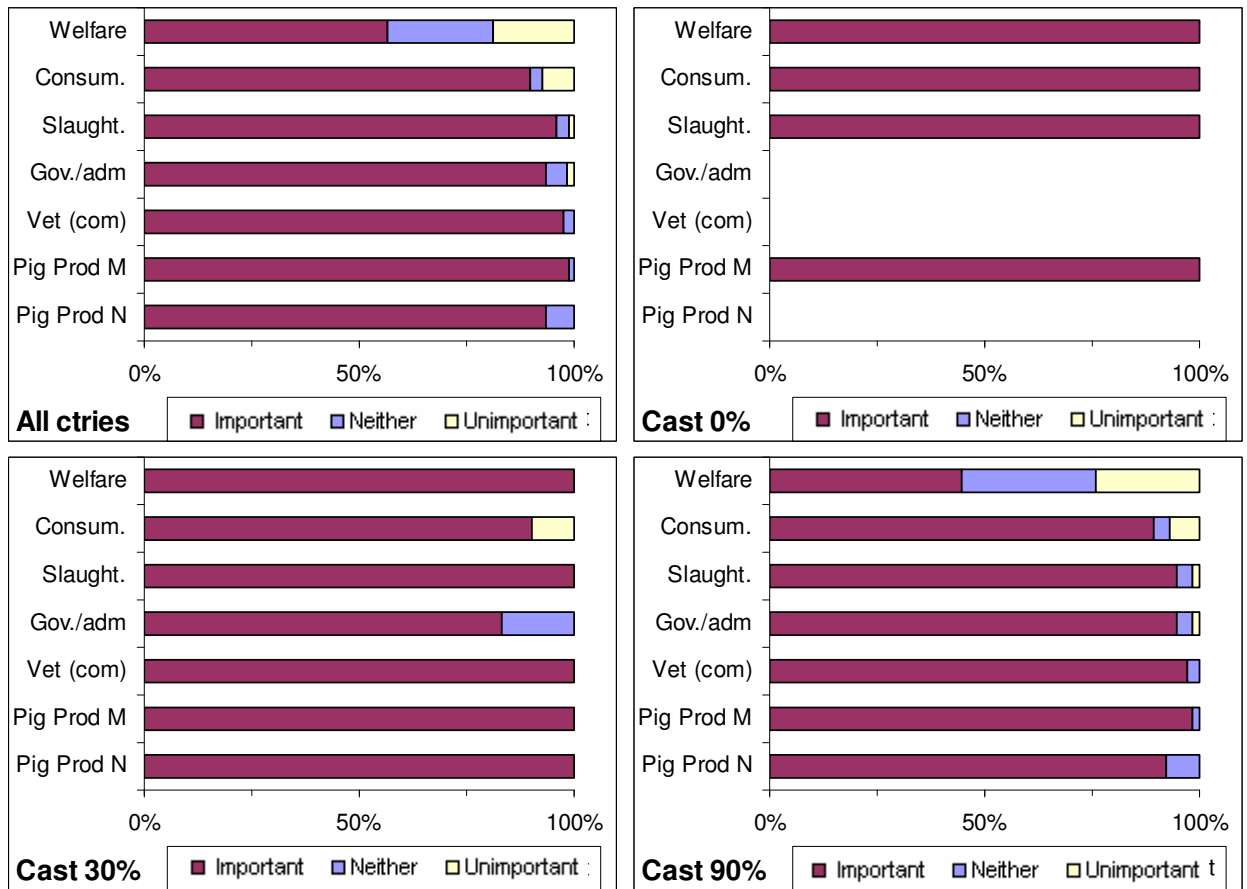
The following figures deal with the second question, of which the objective was to get information about the importance level given by the stakeholders to some pig production aspects ('When you are considering pig production in particular, how important are each of the following items?').

Figure 3. V6: Evaluation of the level of importance given by stakeholders to the welfare of pigs.



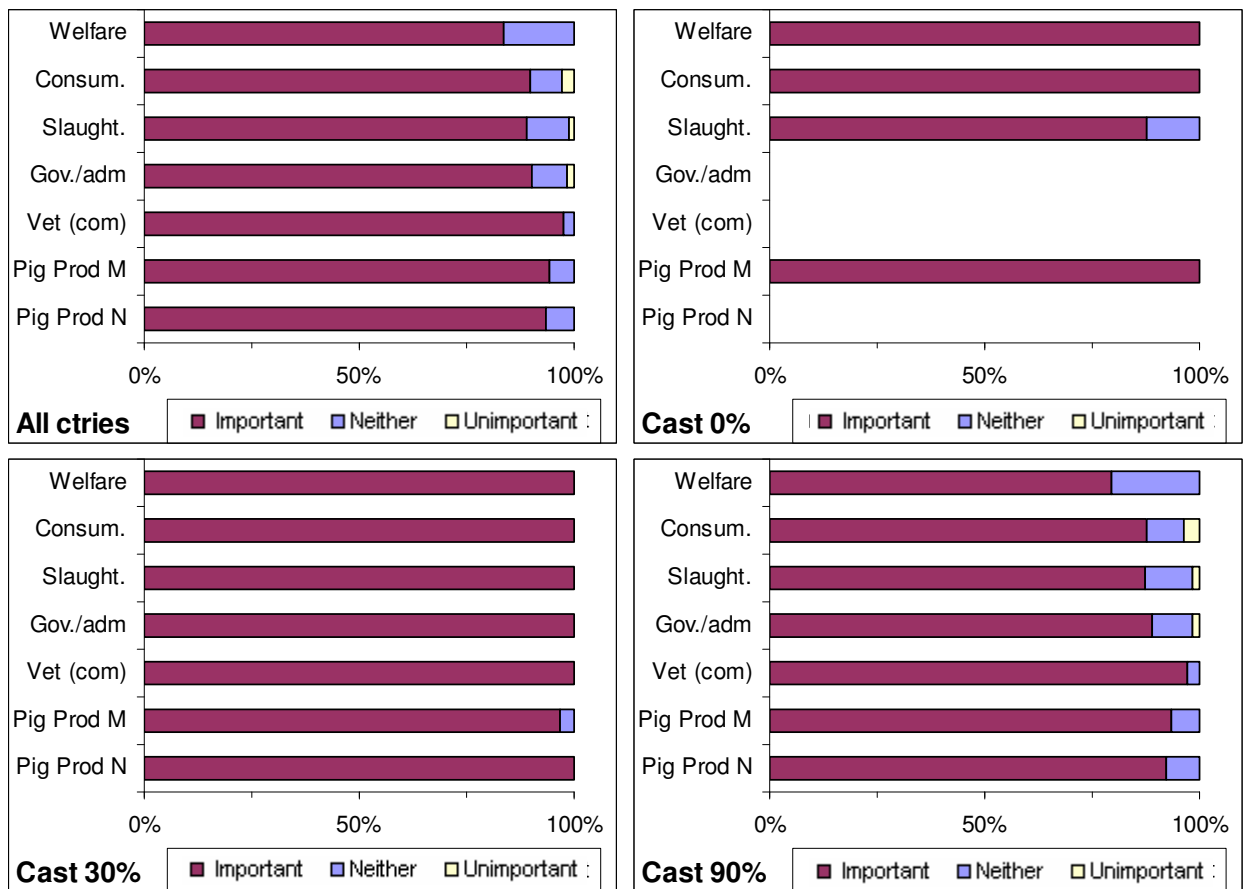
Overall, animal welfare was stated as unimportant in only 3 of the 472 responses. As expected, all stakeholders in the animal welfare NGOs category stated animal welfare as important, at the same level as the veterinarians. In the other categories, an overwhelming majority of people considered animal welfare as important.

Figure 4. V7: Evaluation of the level of importance given by stakeholders to the cost of production.



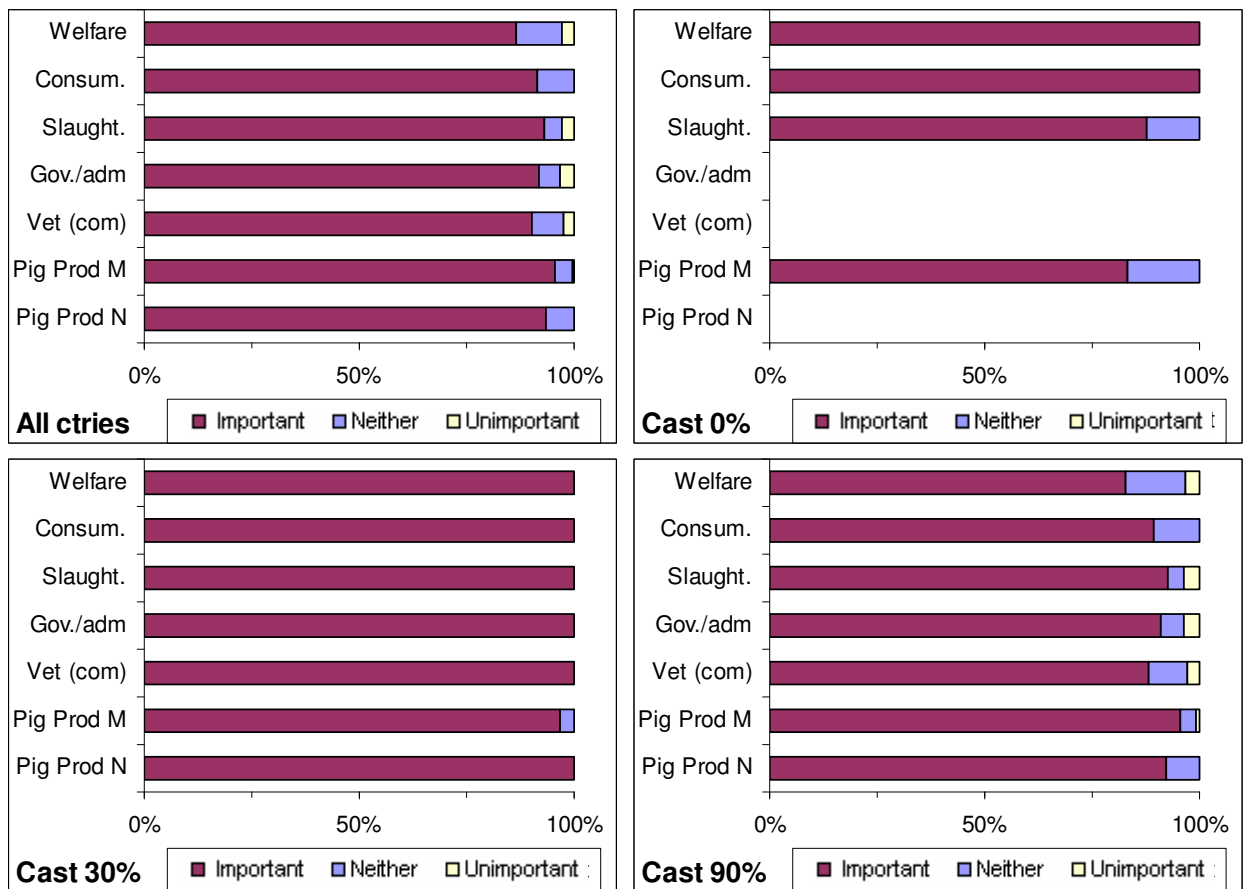
Not surprisingly, main stream pig producers are more concerned with the cost of production than with animals' welfare; on that heading, they are followed by veterinarians and slaughterhouses' categories. The issue of cost is indicative of conflicts of interests, bringing into conflict - the animal welfare NGOs with the other stakeholders.

Figure 5. V9: Evaluation of the level of importance given by stakeholders to the working conditions in pig farms.



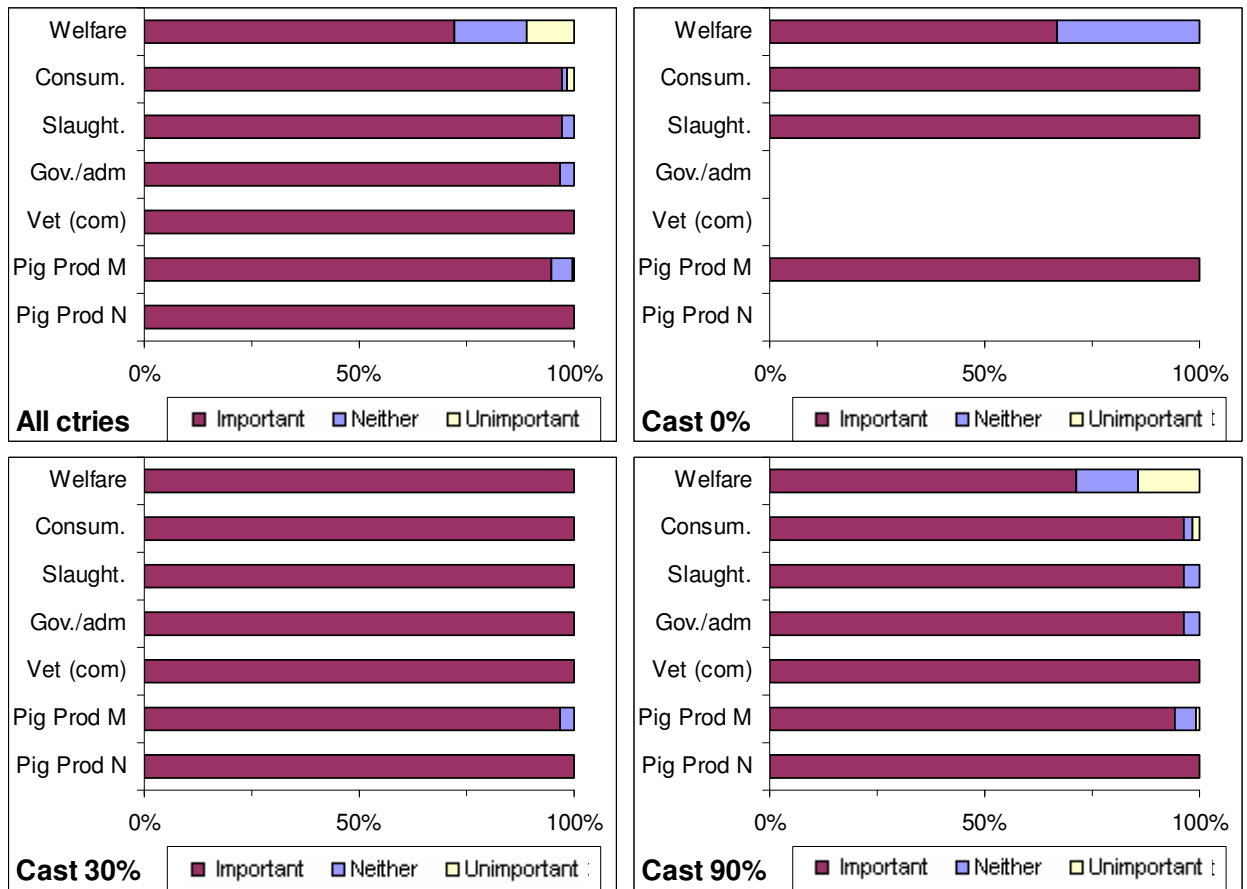
Working conditions in pig farms are of key importance for most of the stakeholders, from the veterinarians, to both, main stream and niche pig producers, Government, Consumers, and slaughterhouses; only the animal welfare NGOs give these conditions slightly less priority.

Figure 6. V10: Evaluation of the level of importance given by stakeholders to the farmer and workers' safety.



Farmer and workers' safety is of greater concern to both main stream and niche producers, while it is slightly less important for the other categories.

Figure 7. V8: Evaluation of the level of importance given by stakeholders to the eating quality of pork and derived products.



Eating quality of pork and derived products stands out from the other attributes of the pig production, gathering the largest support from most of the stakeholders, with the exception of the animal welfare NGOs. This feature shows how much the end product is at the core of the overall concerns, and, by and large, makes it explicit how embedded are pork and derived products in European cultures, much above particular moral or ethical differences.

Summary

When asked to state how important the different aspects of pig production are, stakeholders tend to rank these aspects according to their own interest, highlighting the factors having priority to them. A major distinctive feature here is that eating quality of pork and derived products win all the votes, with the exception of some of the animal welfare NGOs, showing the predominant importance of pork in national cultures. A conflict of interests appears between animal welfare NGOs and the other categories regarding the lower importance they give to the cost of production and also, to a lesser extent, to the eating quality of pork.

4.3. Ranking of aspects of pig production by stakeholders (Question 3)

Stakeholders were asked to rank aspects about pig production from 1 (high priority) to 5 (low priority). To facilitate the interpretation of results, data were reversed from 1 (low priority) to 5 (high priority).

Figure 8 shows in a spider graph the degree of concern, per stakeholder groups, for the different issues related to pig production, namely pig welfare, cost of production, eating quality of pork and pork-derived products, working conditions in the farms and the farmer's and worker's safety. The significance of differences within stakeholder category, between issues was tested for significance, using the Friedman test followed by pair-wise comparisons, using the Bonferroni test (Table 3 to Table 7). PigProd N, Pub/Gov and Vets categories for Cast 0% were excluded due to the low number of answers. The means were also presented for countries that produced mainly entières (Cast 0% and Cast 30% together) (**Table 6**).

Overall, the highest values were found for Production costs and Eating quality, so this would be the most concerning issues. The least concerning issues were the Working conditions, closely followed by the Farmers' safety, and they were far below the other three issues. Producer and Slaughterhouse representatives considered Production costs and Eating quality the most important issues. The ranking was however reversed between main stream producers who considered production cost the most important and niche producers who put more emphasis on eating quality. For animal welfare NGOs the most important issue was animal welfare, far above the values given to the other aspects.

In contrast with the other countries, Slaughterhouses and Consumers in "Cast 0%" countries ranked Welfare higher than Eating Quality.

Figure 8. Ranking of different aspects of pig production per stakeholder category (higher score indicates greater concern).

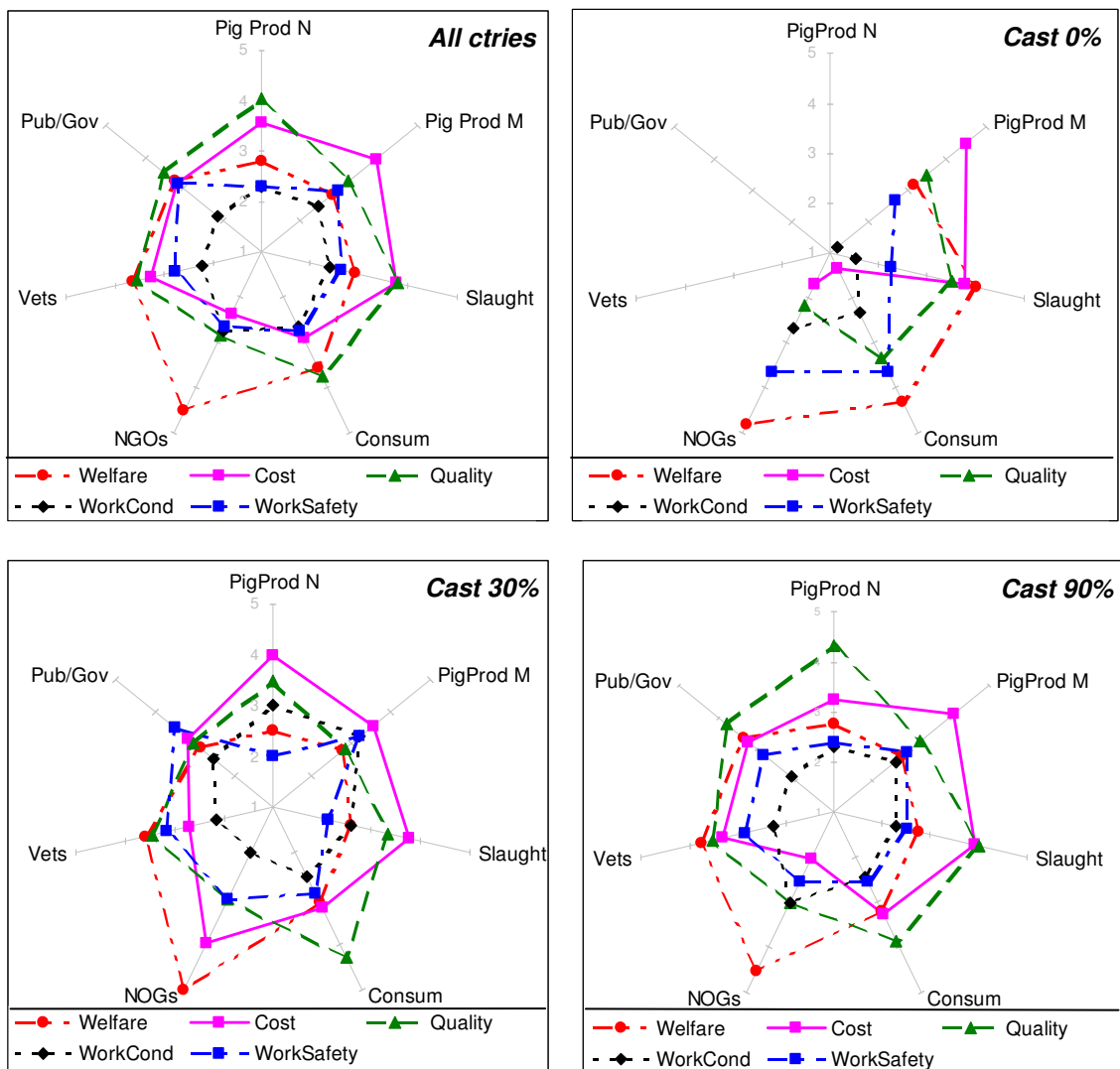


Table 3. Mean and significant differences of items from question 3 within stakeholder (all cties).

	Consum	Welfare	PigProd M	Pig Prod N	Pub/Gov	Slaught	Vets
PW	3.3 b	4.6 a	2.8 c	2.7 b	3.3 ab	2.9 b	3.7 a
CP	3.2 b	2.1 c	4.0 a	3.3 ab	3.2 ab	3.9 a	3.2 ab
EQ	3.9 a	2.8 b	3.2 b	4.2 a	3.7 a	3.9 a	3.5 a
CW	2.4 c	2.9 b	2.6 c	2.4 b	2.2 c	2.2 c	2.2 c
FS	2.6 c	2.8 b	2.9 bc	2.3 b	2.9 b	2.4 bc	2.9 b

Different letters within a column indicate significant differences ($P < 0.05$).

PW: the pig welfare; CP: the cost of production; EQ: the eating quality of pork and derived products; CW: the conditions of work in the farms; FS: the farmer and workers' safety.

Table 4. Mean and significant differences of items from question 3 within stakeholder (Cast 0%).

	Consum	Welfare	PigProd M	Pig Prod N	Pub/Gov	Slaught	Vets
PW		4.8 a	3.2 ab			4.0 a	
CP		1.7 c	4.5 a			3.8 a	
EQ		2.2 bc	3.5 ab			3.5 ab	
CW		2.7 bc	1.2 c			1.5 c	
FS		3.7 ab	2.7 bc			2.3 bc	

Different letters within a column indicate significant differences ($P < 0.05$).
 PW: the pig welfare; CP: the cost of production; EQ: the eating quality of pork and derived products; CW: the conditions of work in the farms; FS: the farmer and workers' safety.

Table 5. Mean and significant differences of items from question 3 within stakeholder (Cast 30%) .

	Consum	Welfare	PigProd M	Pig Prod N	Pub/Gov	Slaught	Vets
PW	3.1		2.8		2.8	2.6	3.6
CP	3.2		3.6		3.2	3.8	2.7
EQ	4.3		2.8		3.0	3.3	3.4
CW	2.5		3.2		2.5	2.6	2.1
FS	2.9		3.2		3.5	2.1	3.1

Different letters within a column indicate significant differences ($P < 0.05$).
 PW: the pig welfare; CP: the cost of production; EQ: the eating quality of pork and derived products; CW: the conditions of work in the farms; FS: the farmer and workers' safety.

Table 6. Mean and significant differences of items from question 3 within stakeholder (Cast 0% + Cast 30%) .

	Consum	Welfare	PigProd M	Pig Prod N	Pub/Gov	Slaught	Vets
PW	3.4	4.9 a	2.8		3.1	3.2 a	3.8
CP	2.8	2.3 b	3.7		3.3	3.8 a	2.8
EQ	4.1	2.4 b	2.9		2.7	3.4 a	3.5
CW	2.5	2.5 b	2.9		2.6	2.1 b	2.1
FS	3.1	3.5 b	3.1		3.3	2.2 b	2.9

Different letters within a column indicate significant differences (P<0.05).

PW: the pig welfare; CP: the cost of production; EQ: the eating quality of pork and derived products; CW: the conditions of work in the farms; FS: the farmer and workers' safety.

Table 7. Mean and significant differences of items from question 3 within stakeholder (Cast 90%) .

	Consum	Welfare	PigProd M	Pig Prod N	Pub/Gov	Slaught	Vets
PW	3.2 b	4.5 a	2.8 c	2.8 b	3.3 ab	2.8 b	3.7 a
CP	3.3 b	2.0 c	4.1 a	3.2 ab	3.2 ab	3.9 a	3.3 ab
EQ	3.9 a	3.0 b	3.2 b	4.3 a	3.8 a	4.0 a	3.5 ab
CW	2.4 c	3.0 b	2.6 c	2.3 b	2.1 c	2.3 b	2.2 c
FS	2.5 c	2.6 bc	2.9 bc	2.4 b	2.8 b	2.5 b	2.9 bc

Different letters within a column indicate significant differences (P<0.05).

PW: the pig welfare; CP: the cost of production; EQ: the eating quality of pork and derived products; CW: the conditions of work in the farms; FS: the farmer and workers' safety.

Summary

Once again, there was a conflict of interest between animal welfare NGOs and the other stakeholder categories. Animal NGOs may be characterised by their higher emphasis on animal welfare and lower interest in productions costs and eating quality.

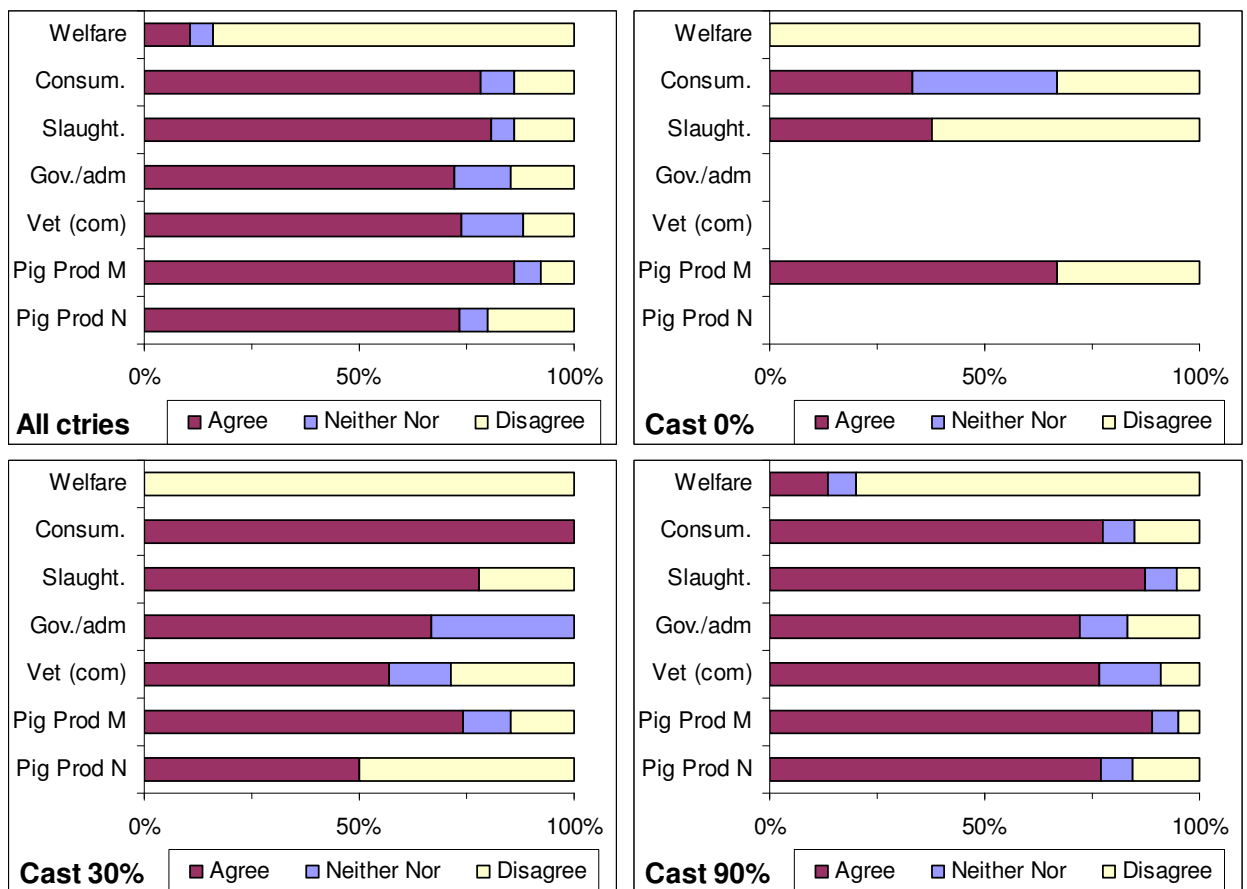
In the countries where castration is a rare practice (UK and Ireland), the slaughterhouses category are more concerned with welfare than with eating quality, in contrast with the other countries. We can not say the same from consumer category because of the low number of representatives (n=3) in the group of Cast 0%.

4.4. Results of the attitudes of the different stakeholders in relation to surgical castration without anaesthesia and the alternatives proposed

4.4.1. Acceptability of Surgical castration without anaesthesia (Question 4)

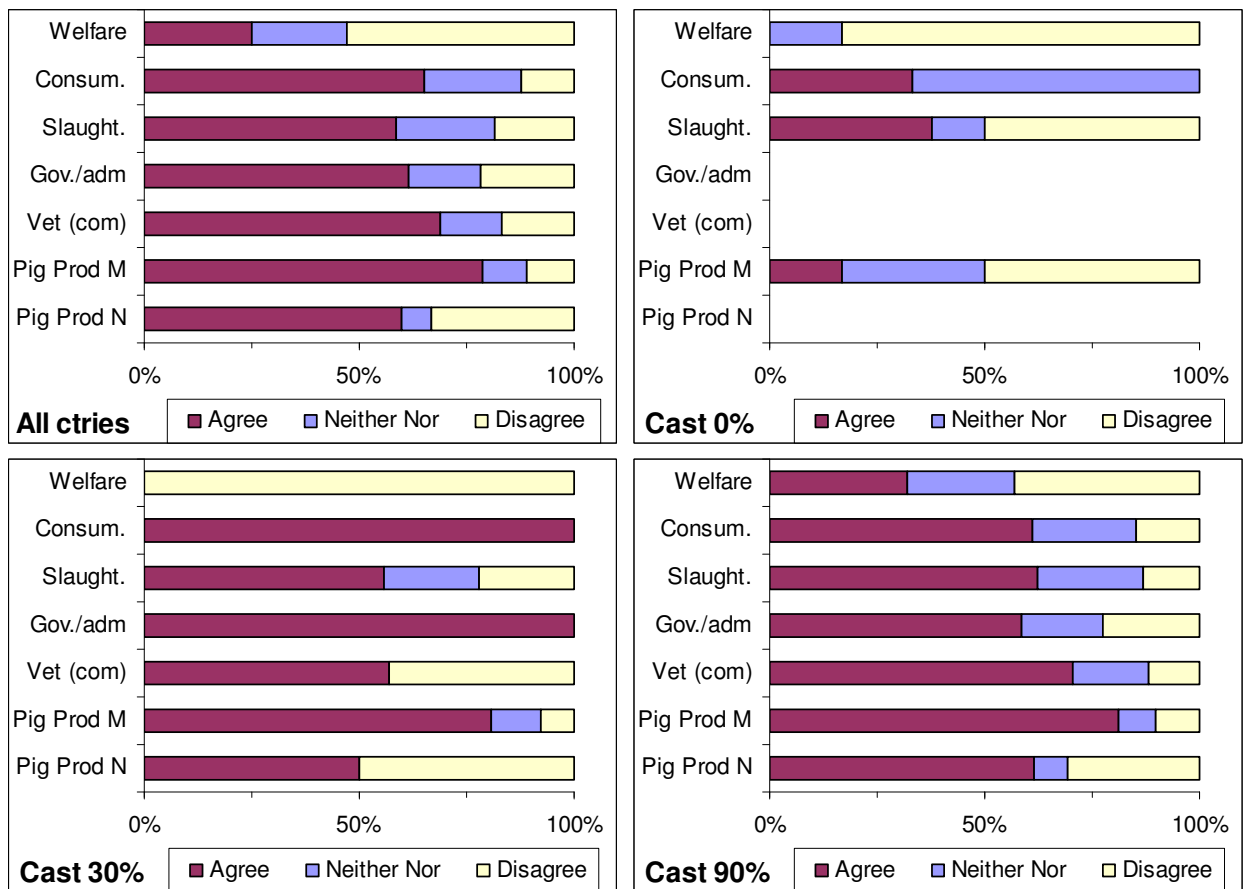
Stakeholders were invited to indicate the degree to which they agree or disagree with each of the following statements about piglet castration (v16 to v23).

Figure 9. V16. I would rather have males castrated than have a 10% increase in the incidence of 'off flavour' when eating pork.



Main stream pig producers agree rather strongly with this statement as well as, although to a lesser extent, other stakeholder categories with the exception of NGOs who are firmly opposed and disagree with it. Disagreement with this statement is however lower in those countries where entire male pig production is common (Cast 0% and Cast 30%). The response of consumers (n=3) and Slaughterhouses category differs however between Cast 0% countries who are overall pretty undecided and in Cast 30% countries where they unanimously prefer castrating than having 10% of tainted meat.

Figure 10. V17. I would rather have males castrated than a high level of aggression and mounting behaviour in pigs.

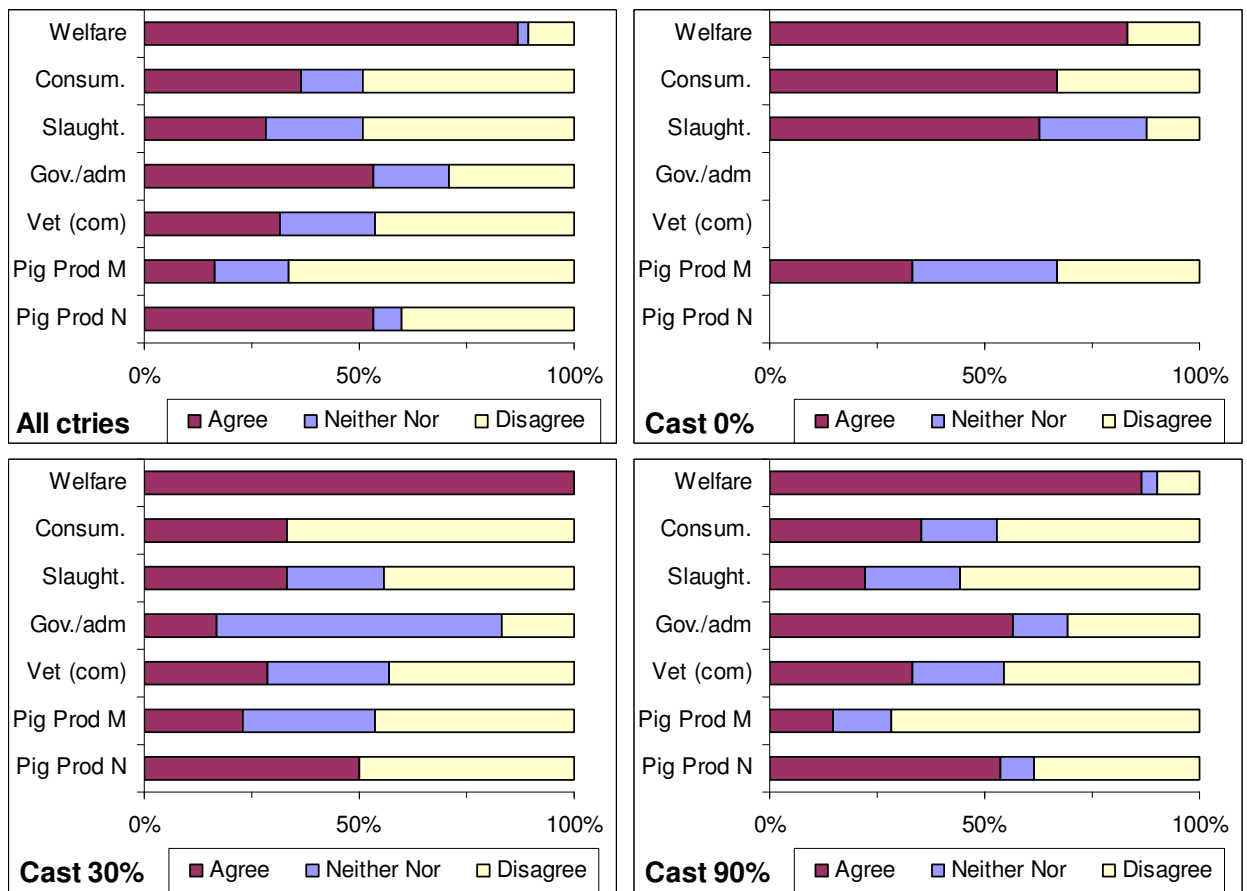


Main stream pig producers outclass the other stakeholders on the agreement scale:

Pig producers in countries where castration is not practised (Cast 0%) have however a different position. Interestingly, pig producers in the “Cast 30%” countries have the same position as those in the countries where castration is more common.

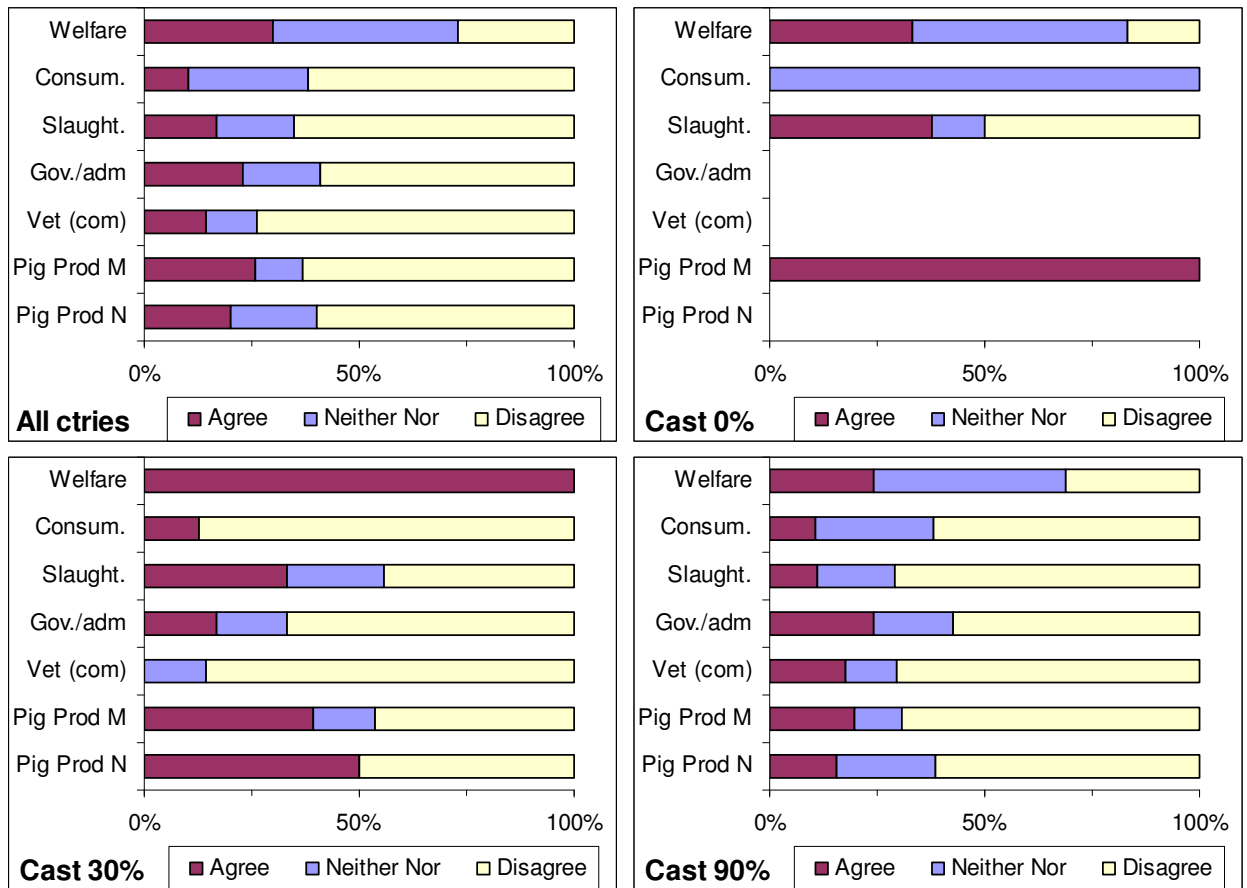
Animal welfare NGOs mostly disagree with this statement, although about 30 % of NGO’s from countries 90% castration agree with the statement that castration is preferred to avoid high levels of aggression during the production of the animals.

Figure 11. V18. Castration of male pig is so painful that I think it should be avoided.



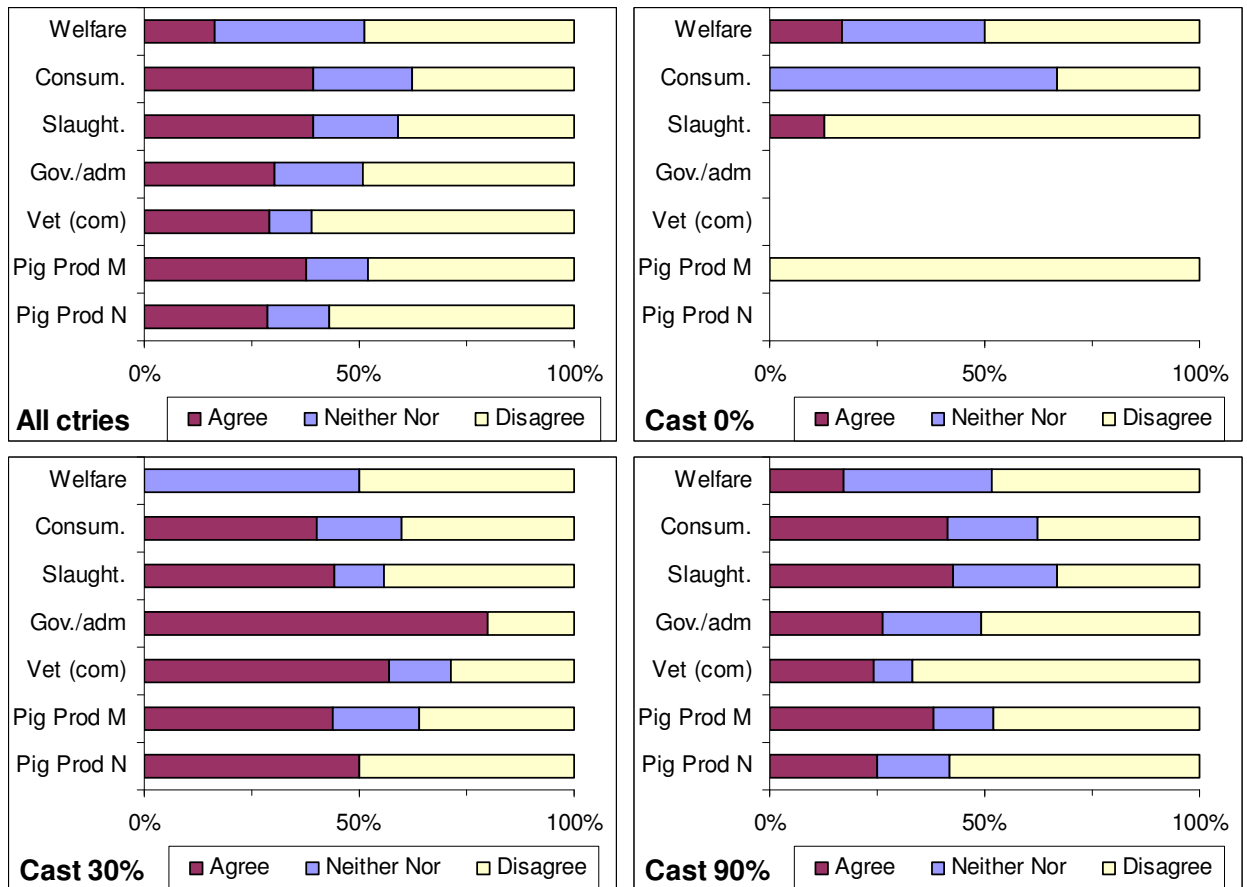
Pain evocation highlights the ethical issues bound to castration and stages animal welfare NGOs. Unlike them, the main stream pig producers, followed by the veterinarians, the slaughterhouses, mostly disagree with the statement on pain entailed by castration without anaesthesia.

Figure 12. V19. I think that male pigs should not be castrated because castrates need more resources to be raised and thereby they cost more to be produced.



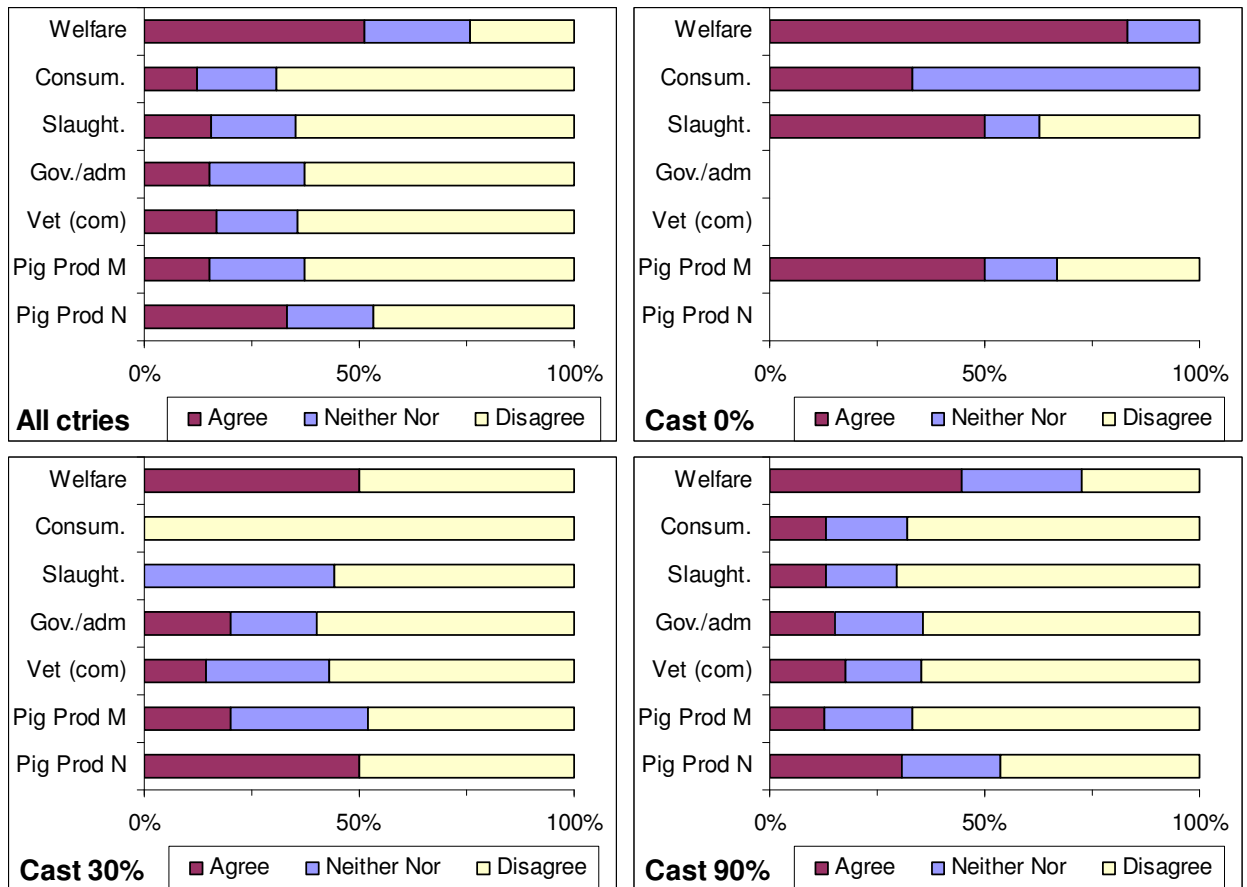
Overall Level of agreement with this statement is low. The high level of disagreement in all stakeholder categories, except for animal welfare NGOs (in the group of 30 %), and for pig producers mean stream category. (Cast 0% countries).

Figure 13. V20. It is fair to sell pork from entire males at a lower price than pork from castrates because of the possibility that it is tainted.



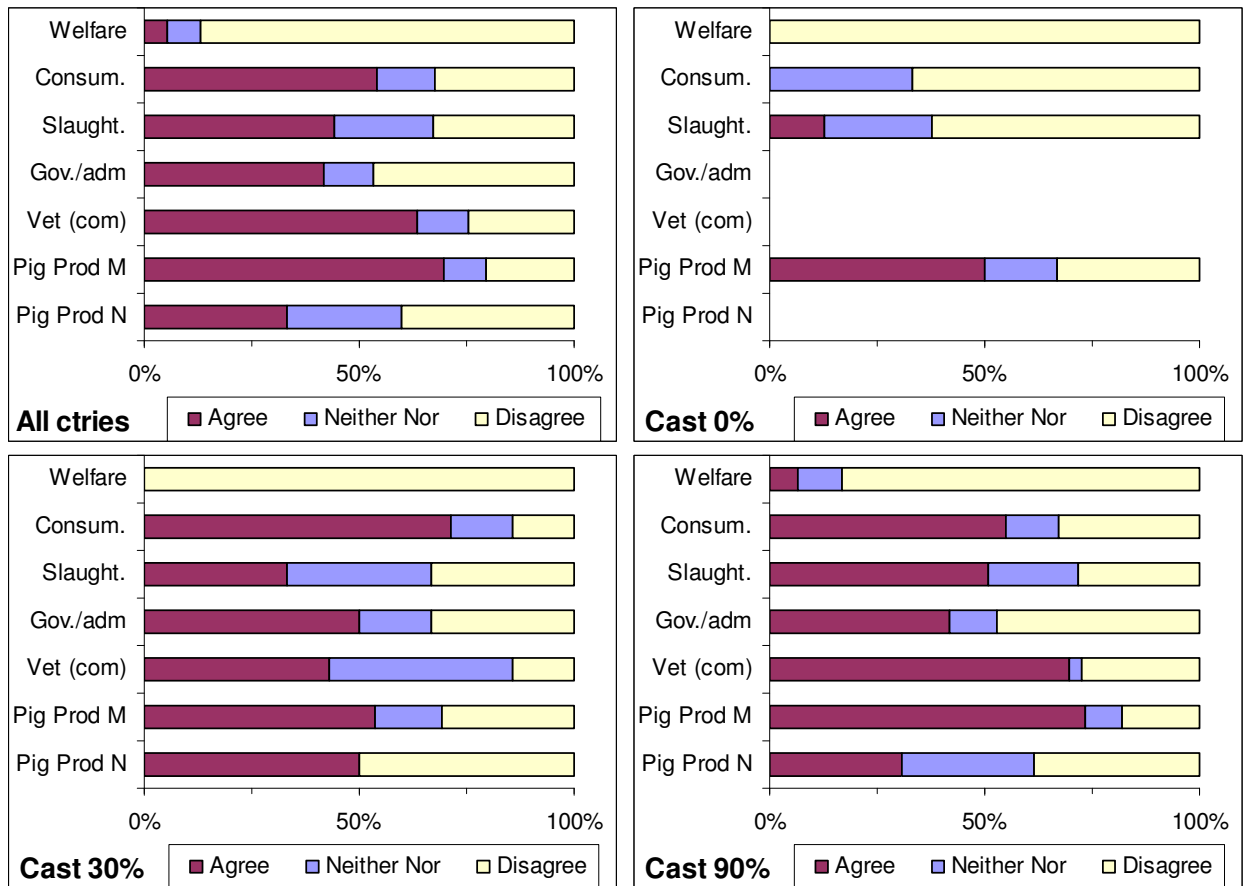
Whatever the category, a majority of stakeholders do not agree to sell pork from entire males at a lower price, although this meat can have off flavour. There is however, within each category, a strong minority which does agree with this statement, with the exception of “Cast 0% countries” where the stakeholders disagree on the statement more or less unanimously. Consumers and slaughterhouses from countries 30% and 90% castrates agree in a 50% with this statement.

Figure 14. V21. It is fair to sell pork from entire males at a higher price than pork from castrates because avoiding castration is good for the animal's welfare.



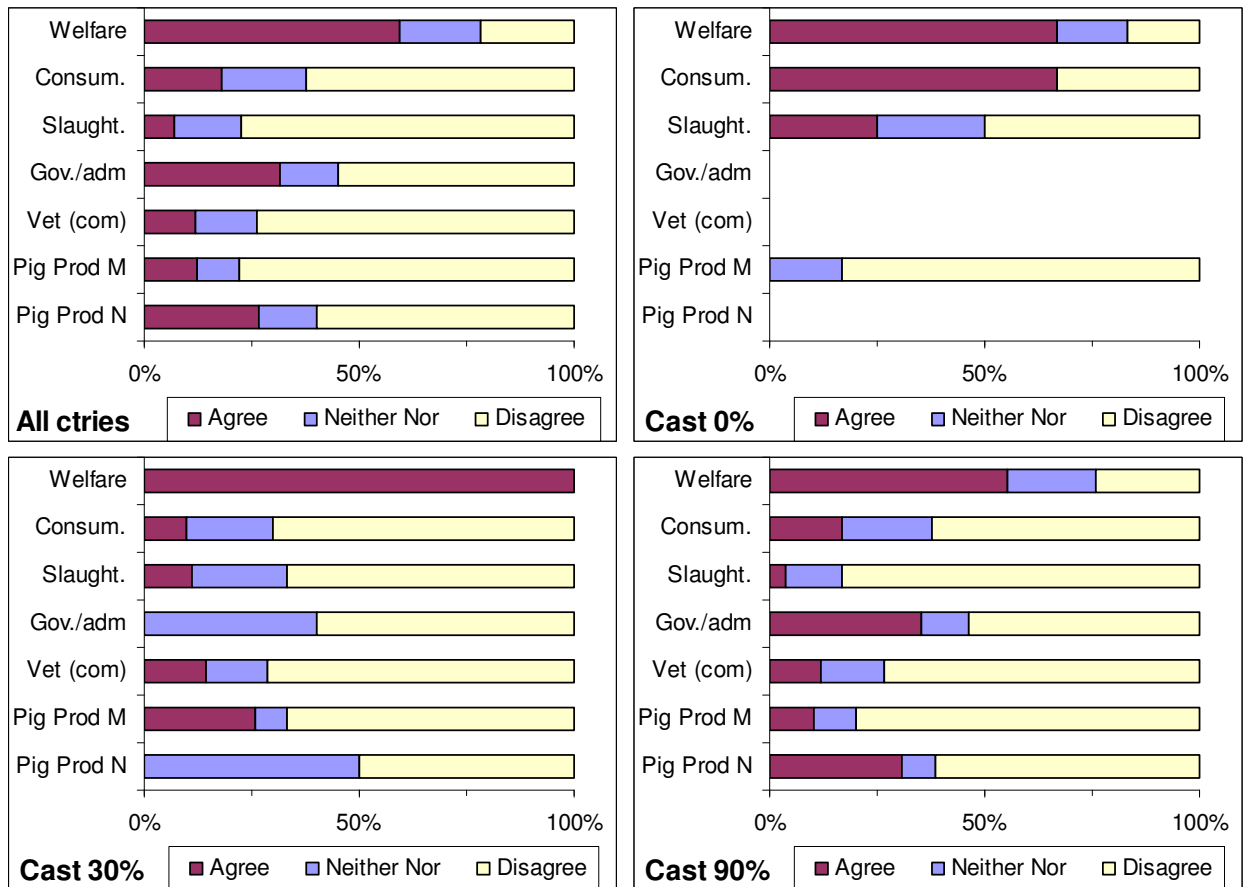
High levels of disagreement were observed with this statement. As was expected animal welfare NGOs show more agreement (50-75 %) in the sense that they consider animal's welfare as an acceptable criteria for increasing pork meat prices. Contrary to the other countries, half of the main stream producers in "Cast 0%" countries do agree with the statement. Consumers together with slaughterhouses in countries Cast 30% do not want to pay more for entire males even if it is because of better animal welfare.

Figure 15. V22. Castration of pigs is a very old practice which is well endured by the animals.



The rejection of this statement by the NGOs comes to no surprise. The high level of agreement with this statement from main stream pig producers, followed by veterinarians and consumers, could be interpreted as an indicator of their resistance to change and innovation; however, more data and in-depth interviews are needed to interpret these results correctly.

Figure 16. V23. I think males should not be castrated, because I believe that we should not change the natural state of the animal.



With the exception of animal welfare NGOs, most of the stakeholders, including the consumers' category disagree with the naturalness argument.

Summary

When faced with an inventory of the different aspects of castration without anaesthesia, including advantages and disadvantages, benefits and costs, stakeholders exhibit very heterogeneous opinions, which reflect both ethical and economical concerns entailed by castration. One important result here was that stakeholders (with the exception of half of the animal welfare NGOs) do not consider animal welfare per se as sufficient criterion for increasing pork meat price. Most of the answers indicate that the stakeholders, (with the exception of animal welfare NGOs) would accept castration without anaesthesia (except NGOs) even that it could be painful.

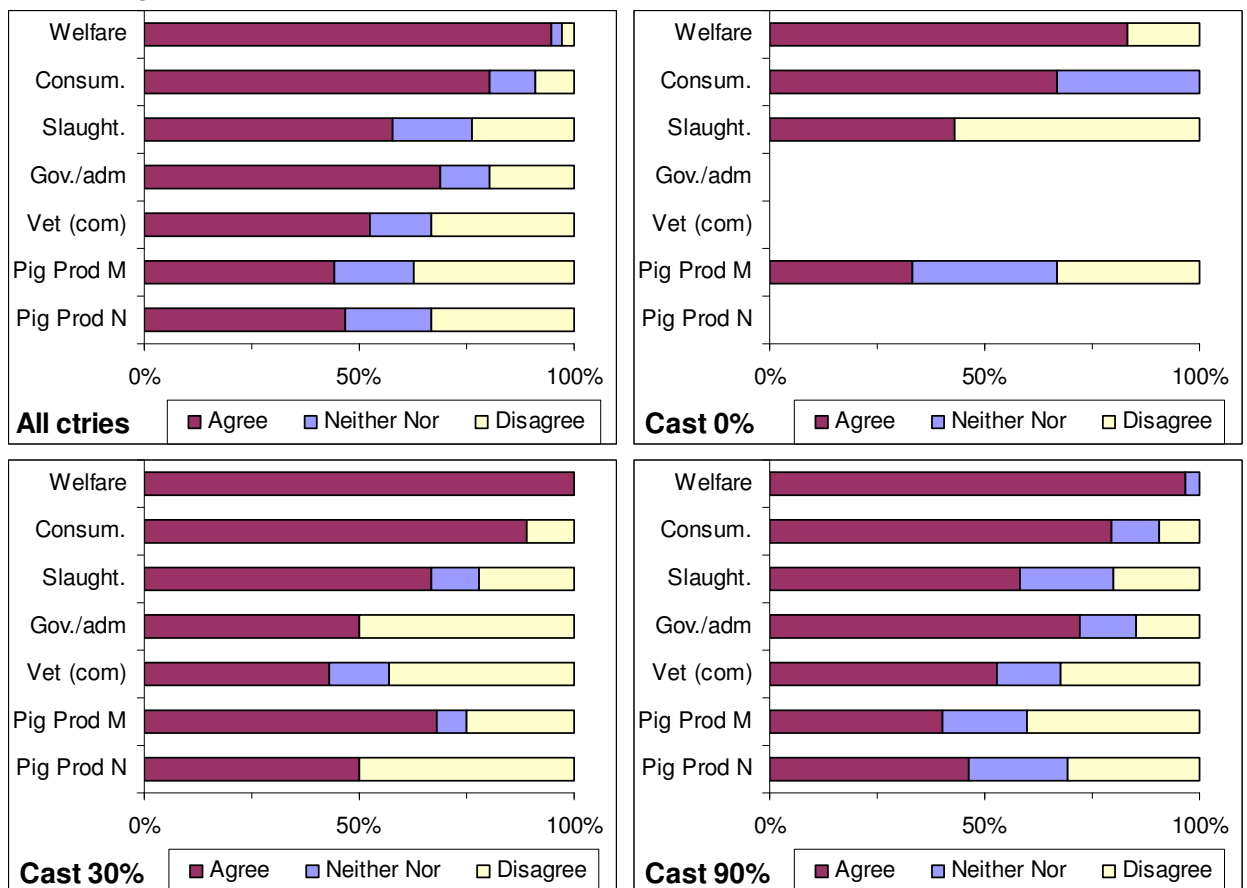
Conflicts of interests clearly emerge between animal welfare NGOs (who would not accept castration without anaesthesia at any rate) and the other stakeholders. Conflicts of interest are also apparent between countries where castration is rare (UK and

Ireland) where the attitudes of producers, slaughterhouses and consumers towards castration without anaesthesia are more driven by cost efficiency and animal welfare issues and less driven by eating quality as compared with the remaining countries, including those where about 30 % of pigs are castrated (Cast 30%).

4.4.2. Acceptability of castration under anaesthesia and/or analgesia (Question 5)

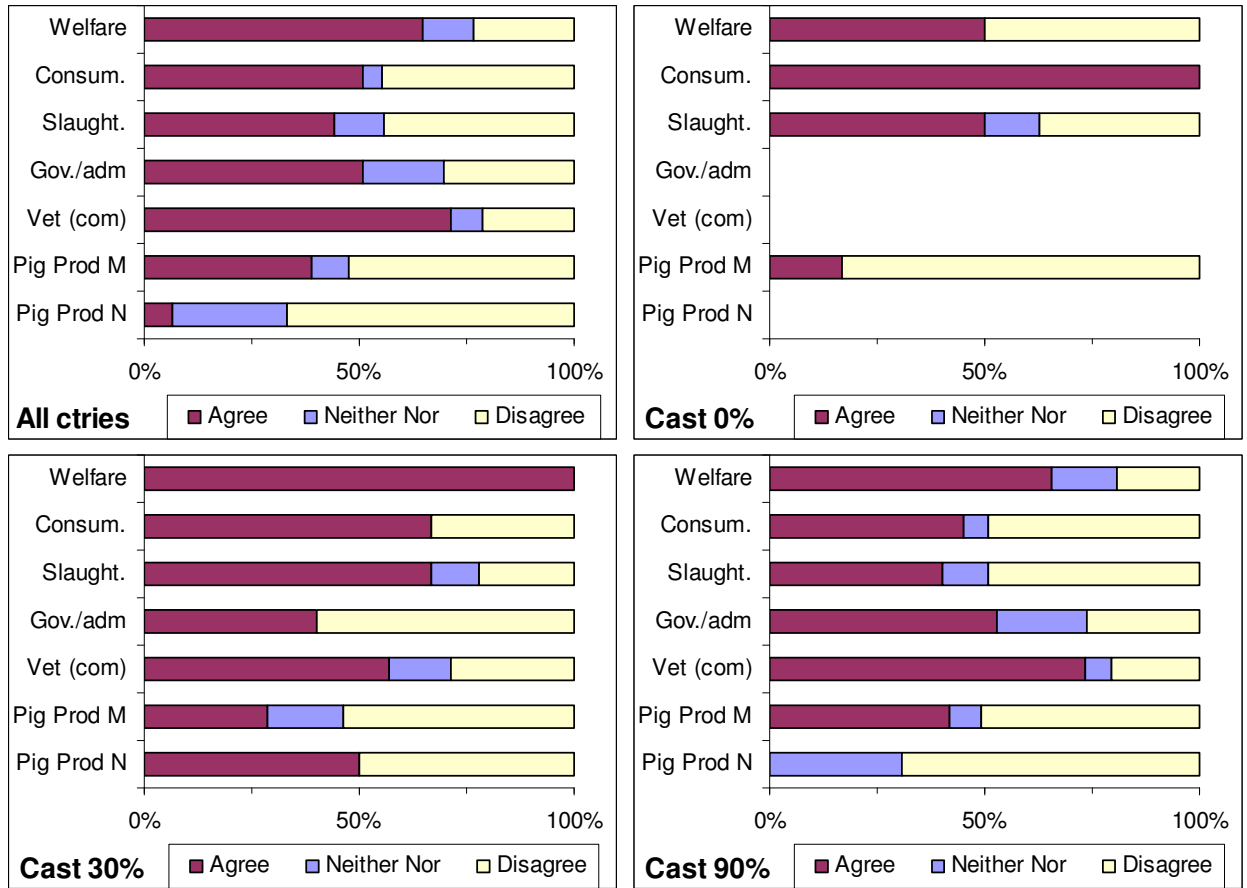
Stakeholders were invited to indicate whether they agree or disagree with each of the following statements about piglet castration under anaesthesia and/or analgesia.

Figure 17. V24. I think the extra work needed to anaesthetise pigs before castration is worth doing.



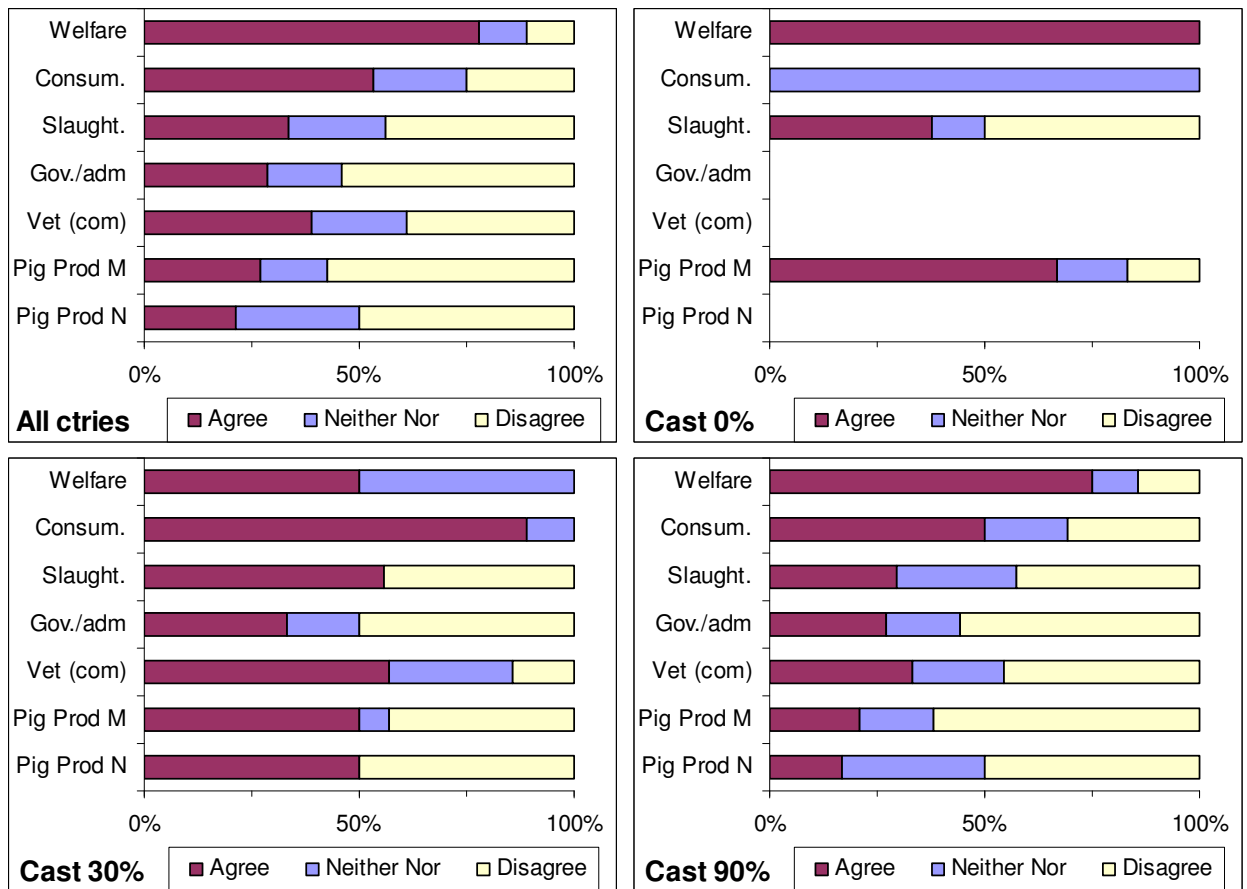
Animal welfare NGOs, followed by consumers categories agree most strongly with the statement that extra work needed to anaesthetise pigs before castration is worth doing.

Figure 18. V25. I think only veterinarians should be allowed to apply anaesthetics prior to castration.



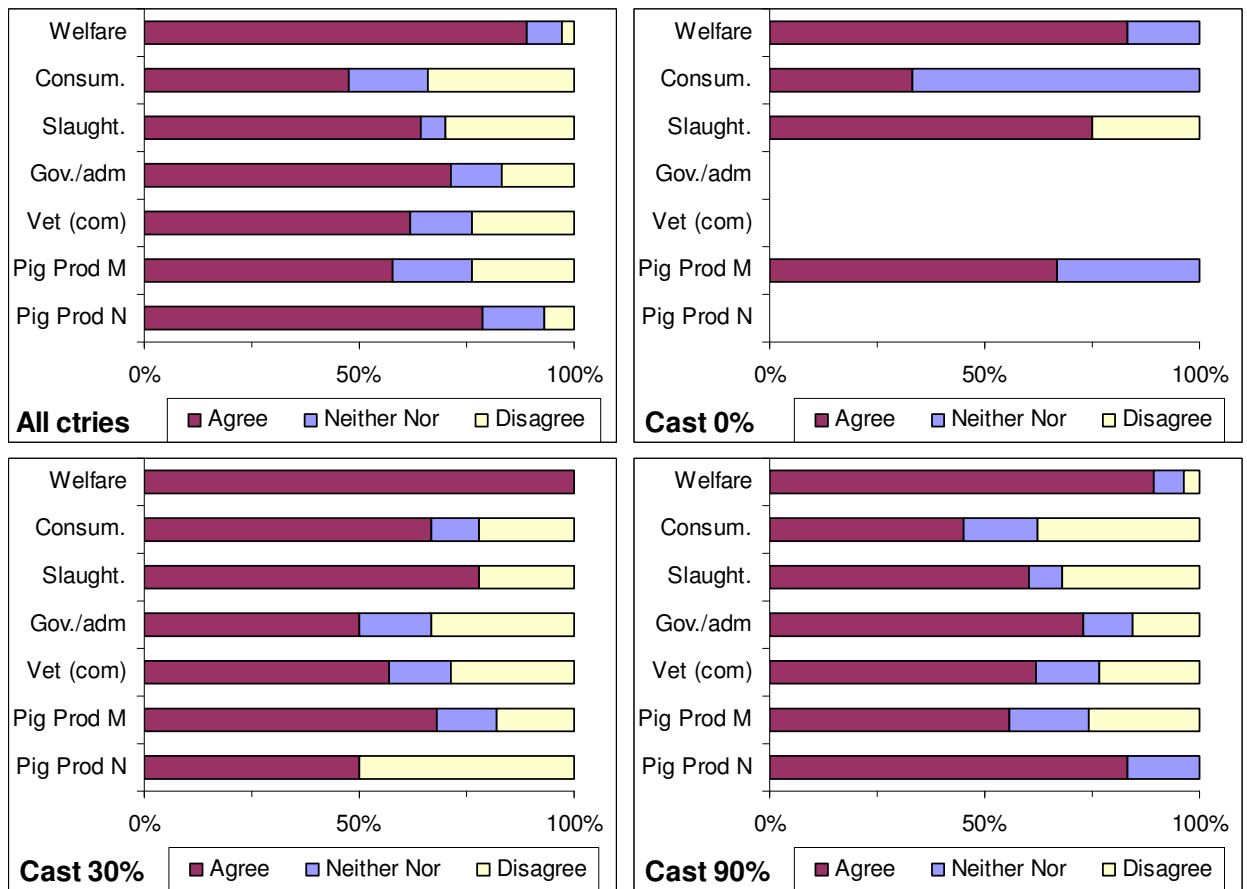
Main stream pig producers disagree with the idea that only veterinarians should perform anaesthesia prior to castration. A majority of the veterinarians consider the statement as appropriate. A majority of welfare NGOs also approve the statement

Figure 19. V26. Though pain prevention in castrating the animals entails extra production cost, I think this extra is worth paying by the farmer.



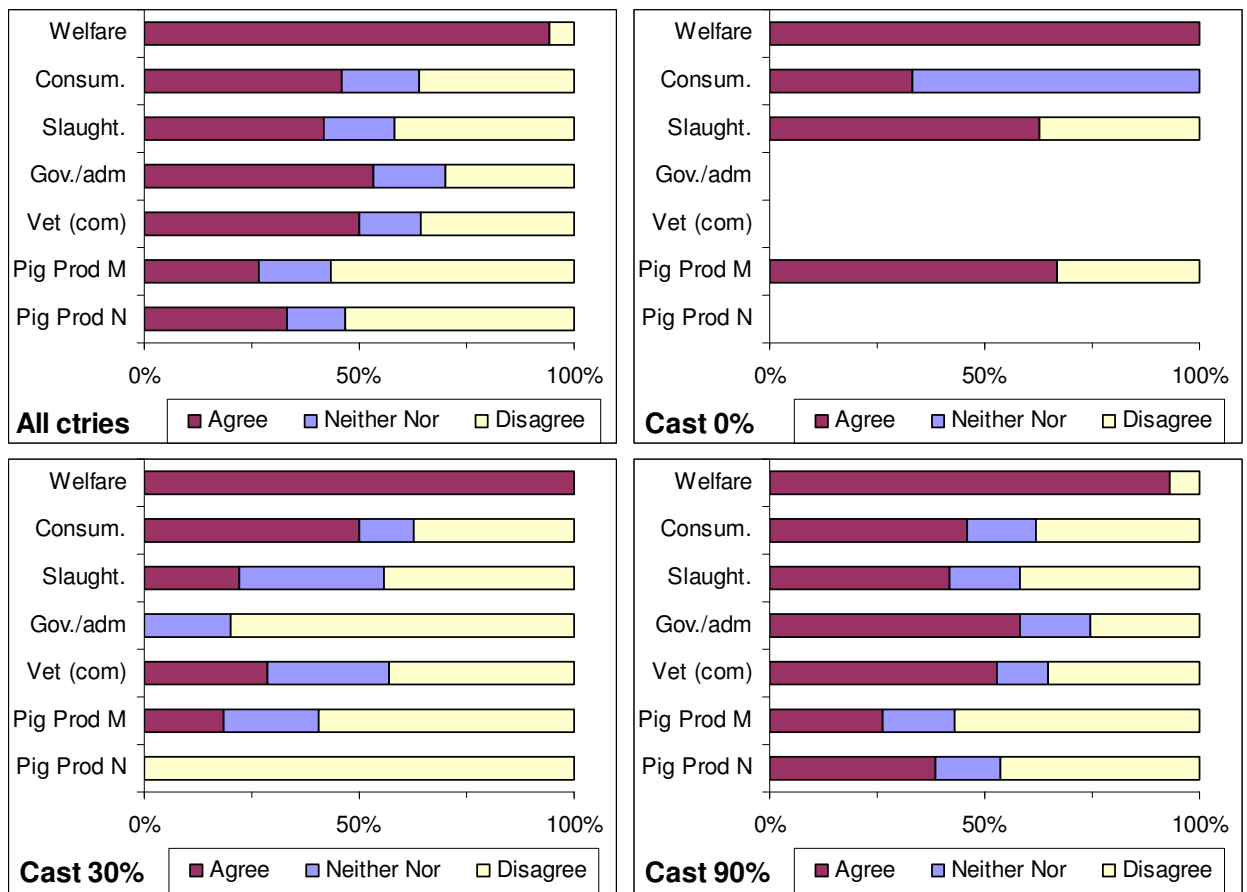
Producers, followed by Government, slaughterhouses and veterinarians disagree with the idea that producers should pay for extra-cost entailed by anaesthesia. However, animal welfare NGOs stand out with their strong agreement with it, and the consumers do not actually know (or do not mind) who should pay for it.

Figure 20. V27. Pain prevention in castrating the animals will certainly increase the production cost; however, I think the extra cost is worth paying by the consumer.



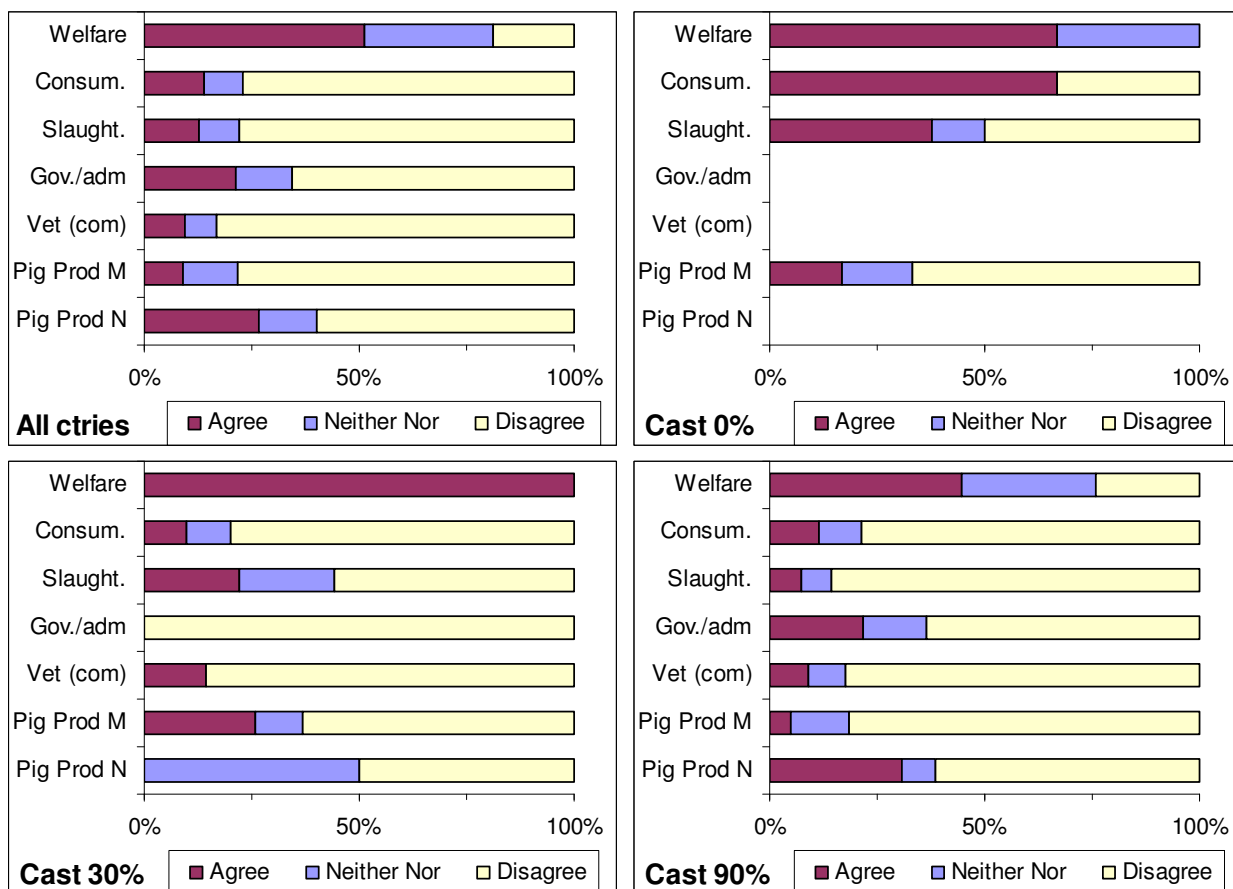
Levels of agreement with the statement that consumers should pay for anaesthesia are higher than with the previous one stating that producers should pay for it. Here again, animal welfare stand out with their strong agreement, followed by niche producers, Government, slaughterhouses, and veterinarians. All chain actors are more willing to have the consumer, rather than the producer, pay for the cost of preventing castration associated pain.

Figure 21. V28. I am less concerned with the risk of residues in pig meat when castrated with anaesthesia, than with the idea that the animal has been castrated without anaesthesia.



Animal welfare NGOs fully agree with this statement. On the opposite, a clear majority of pig producers (with the exception of those in “Cast 0%” countries where welfare is a greater general concern disagree with this statement, showing their concern about consumer’s safety. Consumer representatives have more mixed feelings. With the exception of those in the “Cast 0%” countries, a minority disagrees with the statement, showing that feel more concerned by their safety than by castration associated pain.

Figure 22. V29. Even with anaesthesia, I think boars should not be castrated, because I believe that we should not change the natural state of the animal.



The animal welfare NGOs are the only significant supporter of this statement, although a significant minority of them disagree, all located in countries where castration is practised in most of the animals.

Summary

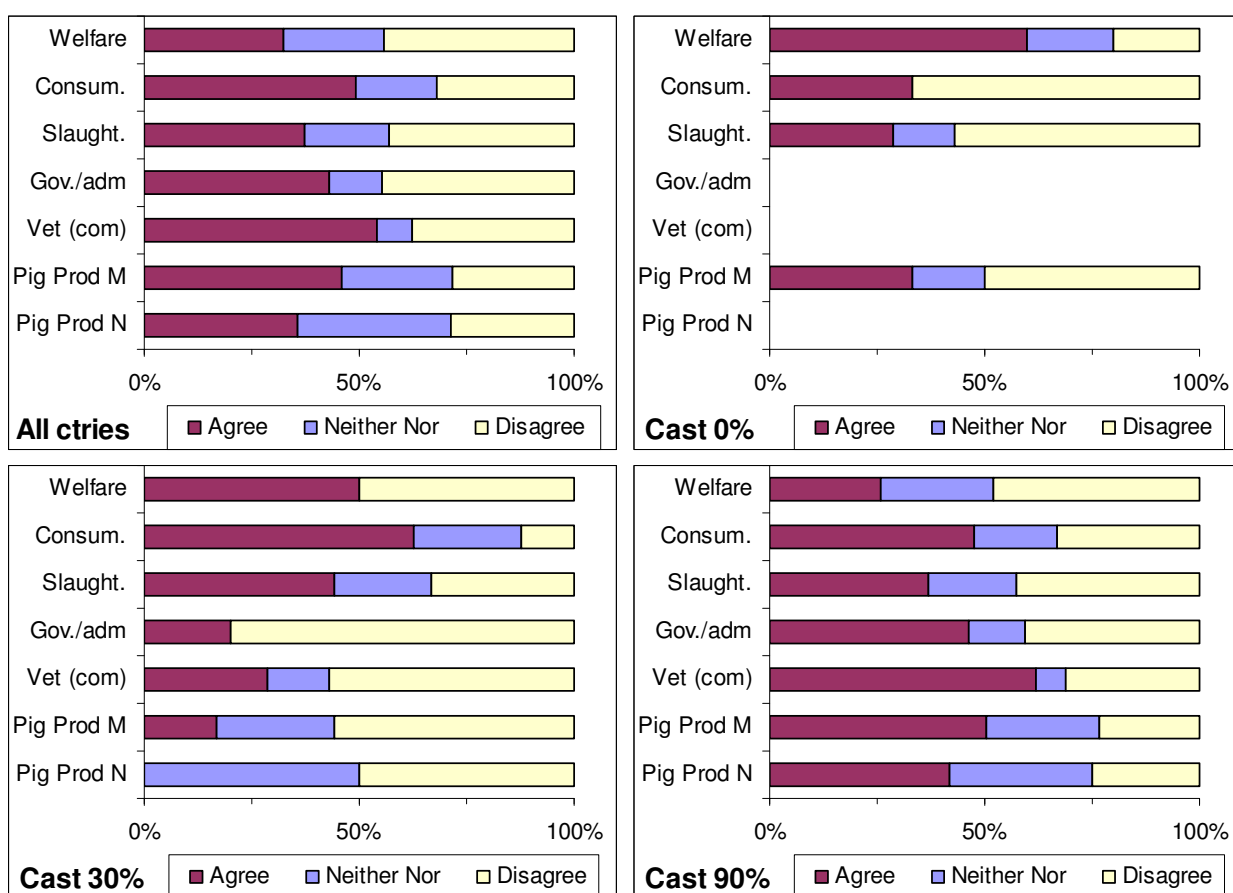
As an alternative to surgical castration without anaesthesia, 40% of the main stream producers consider that the extra work of using anaesthesia is worth doing, which is rather high taking into account the extra costs and workload associated with the practice. Chain stakeholders back the farmers vs. the consumer when it comes to pay the extra cost entailed by anaesthesia (There is more agreement in that consumers pay the extra cost than in that farmers pay).

The major conflicts of interest appear between animal welfare NGOs who strongly support the use of anaesthesia, do not mind whether the farmers or the consumers pay for the extra cost and are less concerned by risks of residues or consider that the risk does not exist.

4.4.3. Acceptability of immunocastration as an alternative to surgical castration (Question 6)

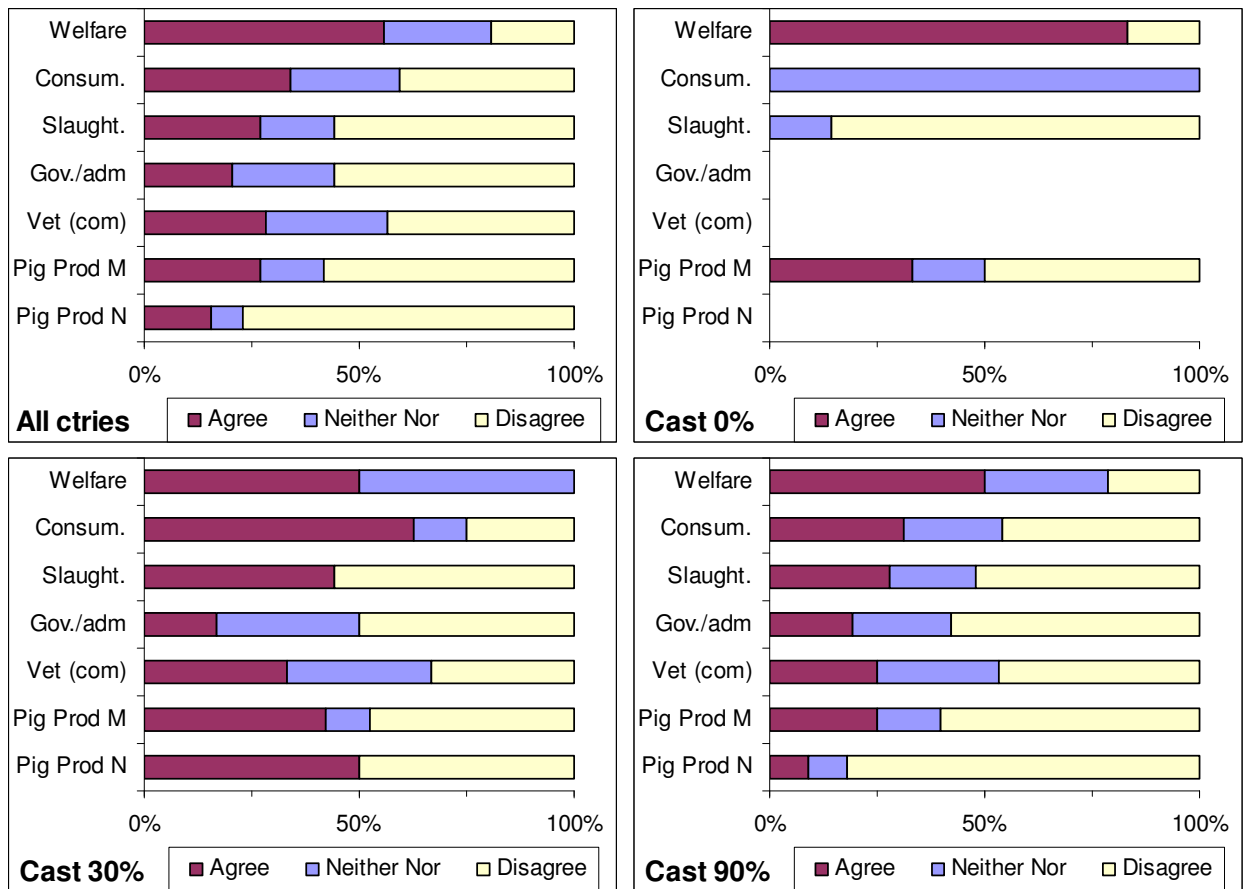
In the following section of the questionnaire, stakeholders were invited to indicate the degree to which they agree or disagree with the following opinions about immunocastration: (vaccination of male pigs against a reproductive hormone, resulting in an inhibition of testes development and function) as an alternative to surgical castration.

Figure 23. V30. I doubt that immunocastration of males can be done by the farmer without safety risk, so I think we should avoid immunocastration as an alternative to surgical castration.



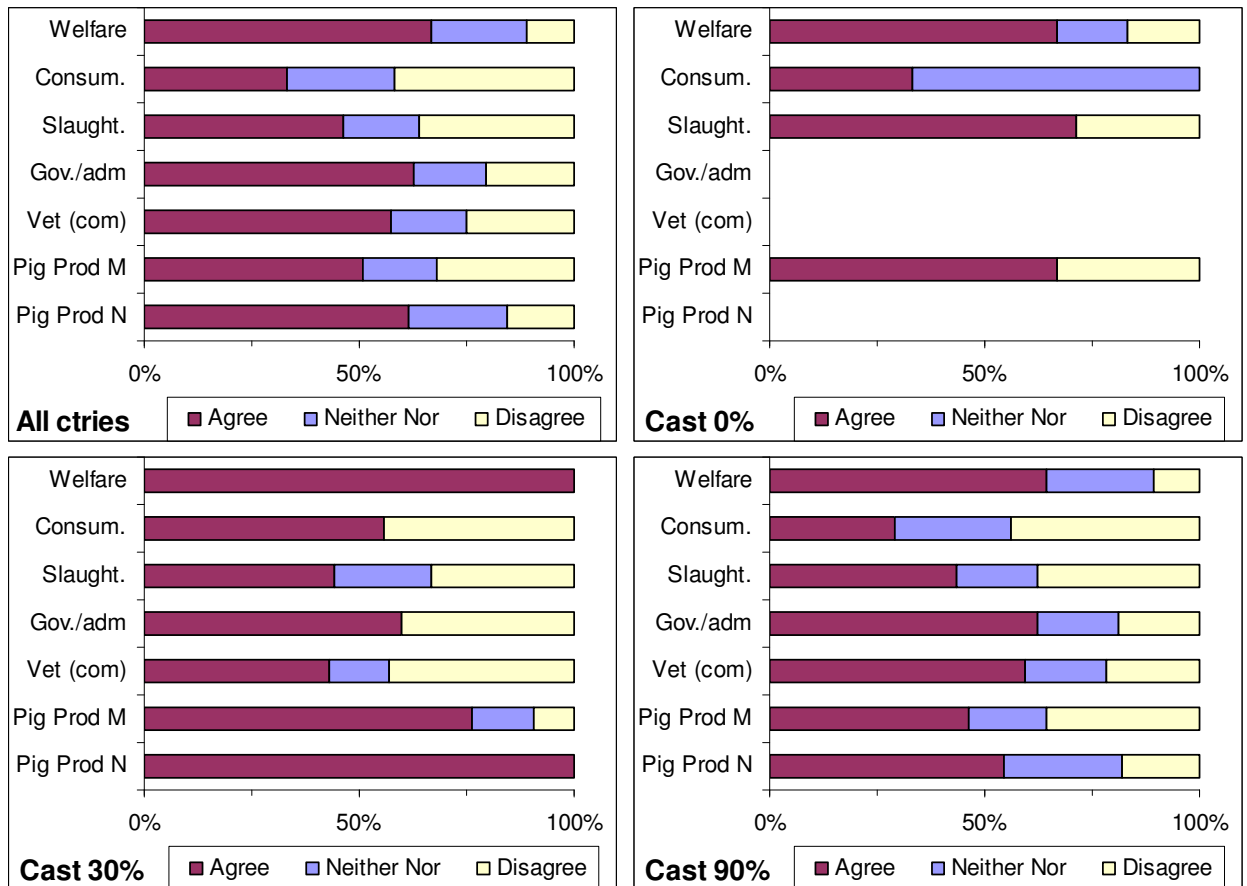
All categories of stakeholders have rather mixed feelings about this statement. Veterinarians (Cast 90%), consumers (Cast 30%) and welfare NGOs (Cast 0%) are the ones who agree most (more than 50% of the responses) although only one half of them do) on prohibiting immunocastration on the ground of farmer's safety. Pig producers, who are the ones who would actually face the risk directly, do not seem to be more concerned than the other categories of stakeholders.

Figure 24. V31. Immunocastration may entail increase in the production costs; however, I think any extra price is worth paying by the farmer.



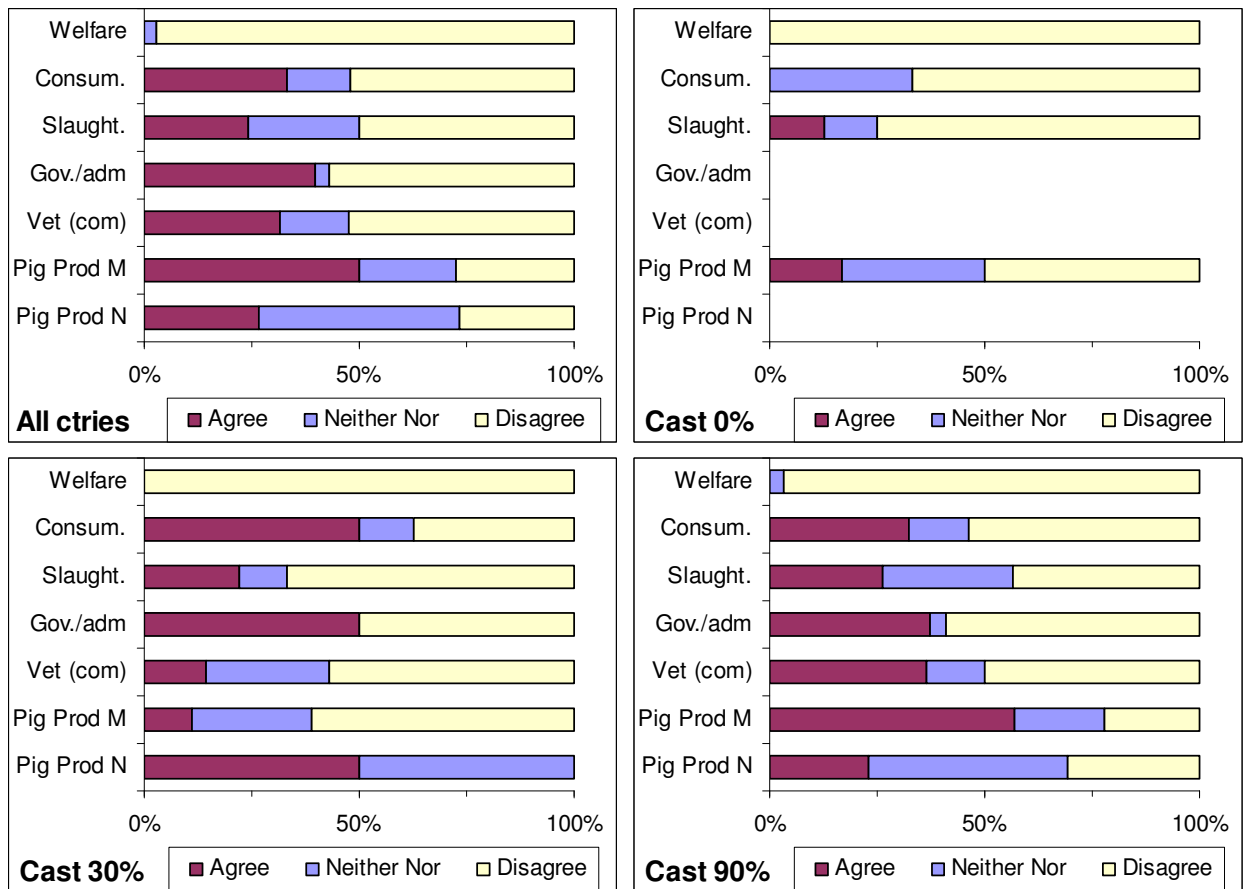
As for anaesthesia, a clear majority of stakeholders, with the exception of animal welfare NGOs, disagree with any idea of getting the producers support the extra cost of innovation in castration matters. Government, slaughterhouses and main stream producers (these especially on Cast 90% countries) disagree with the statement, followed by veterinarians and consumers. From the results, it can be inferred that the stakeholders are not willing to assign the costs only to the producers.

Figure 25. V32. Immunocastration may increase the production costs; however I think any extra is a price worth paying by the consumer.



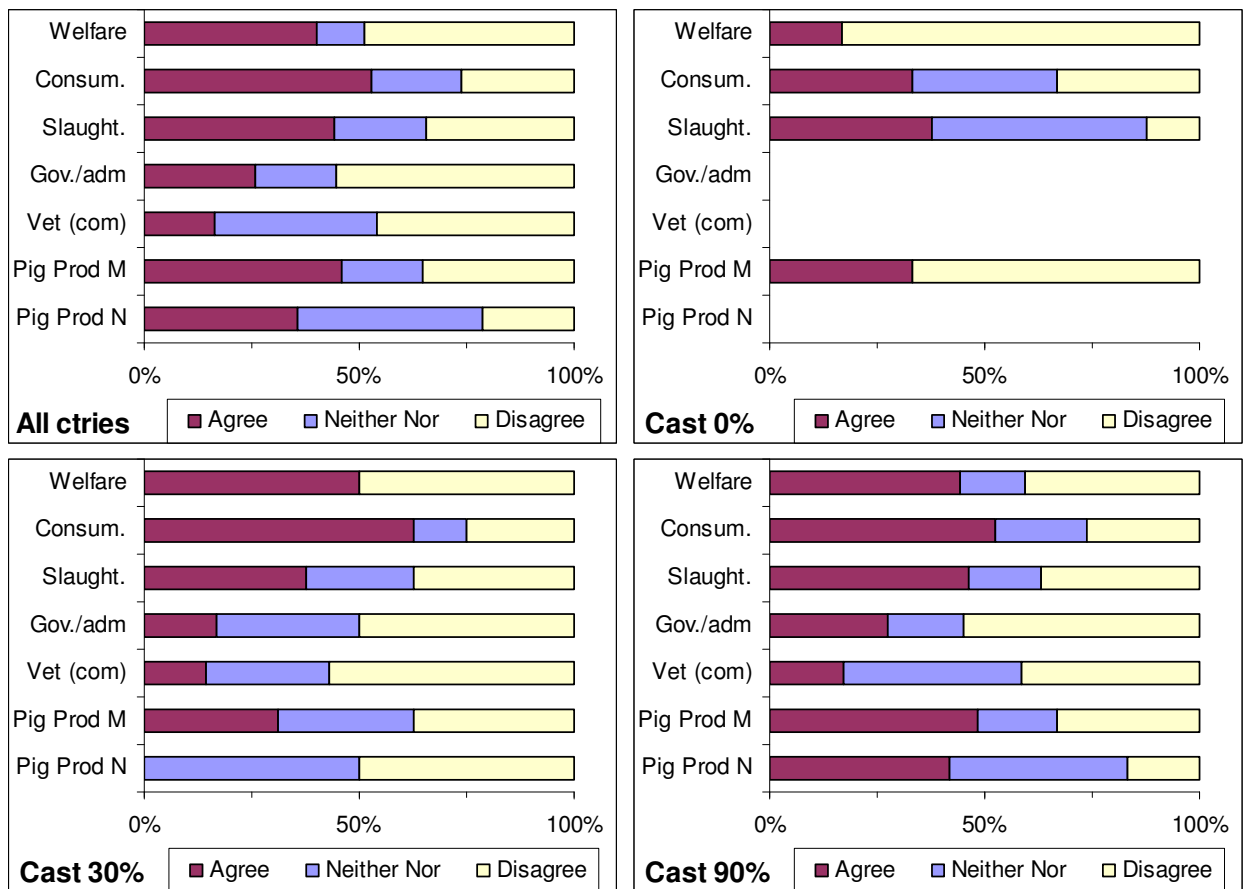
Most of the stakeholders back strongly the idea that extra-cost entailed by immunocastration, as anaesthesia previously, should be paid by the consumers rather than by the producers. The highest percentages of disagreement with this statement were given by Consumers, Government and Veterinarians in Cast 30% and by Consumers, Slaughterhouses and Main Producers in Cast 90% countries. The convergence of agreements on the fact that consumers vs. producers should support the extra cost entailed by innovations in castration may reflect a common perception that these innovations are desired, and ordered by the consumers. If that was true, it may explain the fact that consumers themselves seem not sure of whether they should not accept to pay that extra cost: considering all the countries, 33% of the consumers category agree with the statement, 25% neither agree nor disagree, and 41% disagree. However, any definite statement cannot be made, as V32 may simply be perceived as a moral imperative by many consumers, while, at the opposite, when the producers are concerned with extra cost, the question is perceived as engendering extra-constraint.

Figure 26. V33. Because I think immunocastration may affect consumer health, I would rather have all boars castrated without anaesthesia.



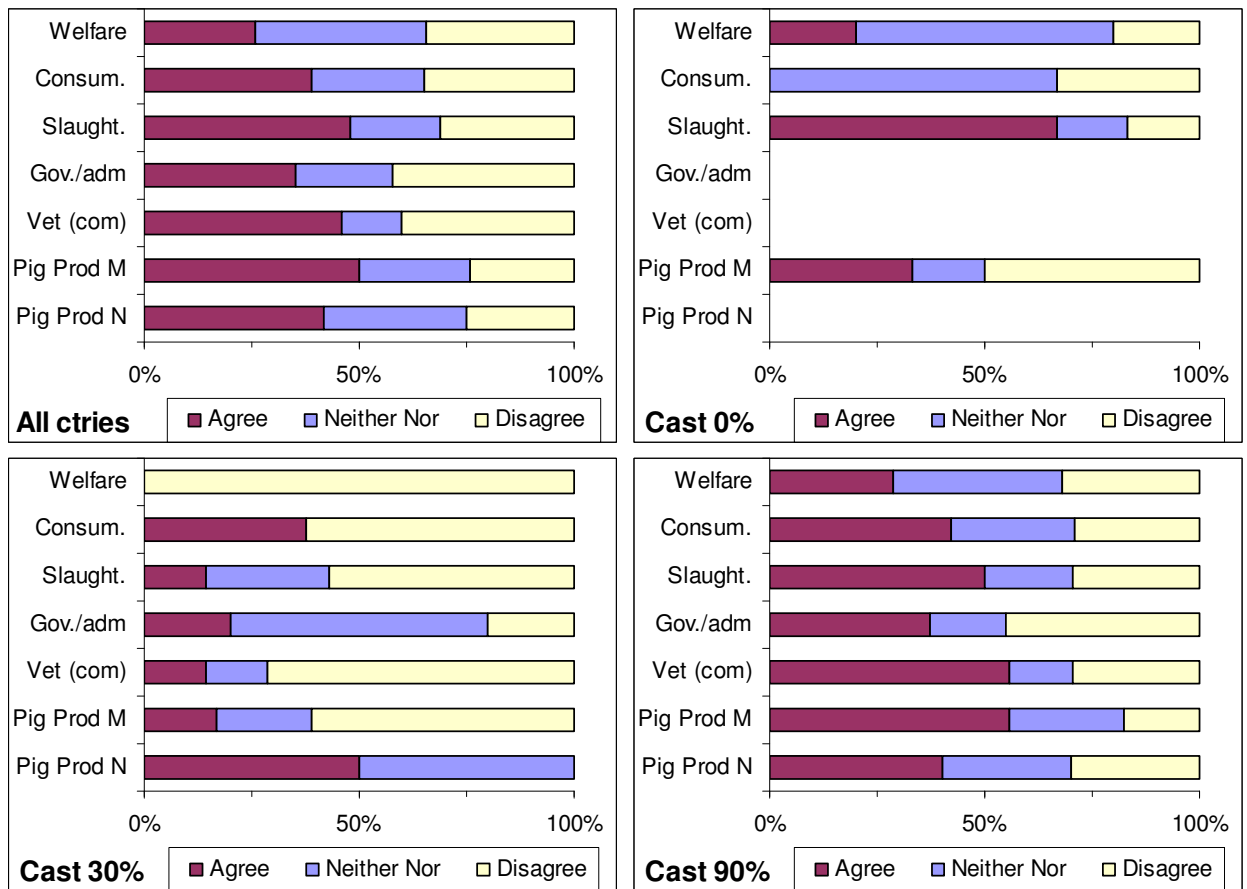
Half of the main stream pig producers agree with this statement, however only in those countries where castration is practiced on most of the male piglets (“Cast 90%”). Apart from them, a majority of stakeholders, including the consumers’ category, disagree with this statement. Approximately 30% of the consumers prefer castration without anaesthesia than immunocastration because the former practice cannot affect human health. Not surprisingly, animal welfare NGOs completely disagree with the statement.

Figure 27. V34. Because I think immunocastration may affect consumer health, I would rather have all boars castrated with anaesthesia.



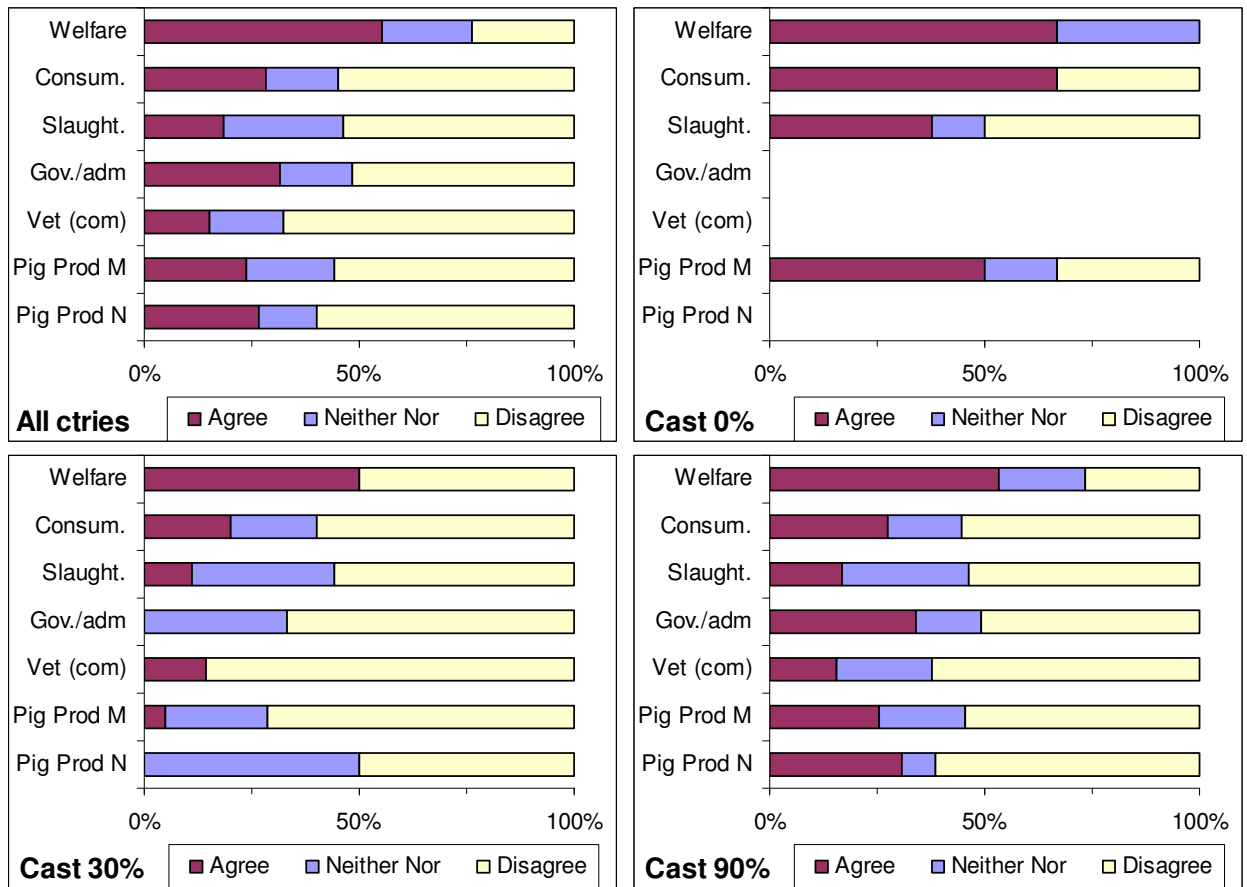
Because castration is more acceptable to them with than without anaesthesia, animal welfare NGOs agree more (although not unanimously) with this statement than with the previous one where castration without anaesthesia was the alternative. This statement mainly brings into conflict the consumers' category, where a majority prefers surgical castration to immunocastration, on the ground of health, against the Government and the Vets. In that respect main stream pig producers and slaughterhouses seem to be more in line with Consumers than with Government and Vets.

Figure 28. V35. I doubt that all vaccinated males will be free from boar taint, so I think we should avoid immunocastration.



There is no clear-cut agreement, nor disagreement, with this statement in any of the stakeholder's categories. It is driven by equivalent levels of disagreement and mixed opinions, so one wonder if the current mistrust reflects lack of knowledge about the specific technique of immunocastration or if it tells more about stakeholders' concern with eating quality of pork. The reason why chain actors in the "Cast 30%" countries seem to be more confident in the efficacy of immunocastration to prevent boar taint cannot be ascertained from the present results.

Figure 29. V36. Because I think immunocastration is unnatural, I would prefer farmers to rear entire males.



With the exception of animal welfare NGOs, the stakeholders disagree with the idea of unnaturalness as well as with the production of entire males. The situation is indeed different in “Cast 0%” countries where a majority of stakeholders in these countries seem to be more comfortable with raising entire males (which is what that are used to) than with immunocastrating their male piglets. Interestingly, the chain actors in the “Cast 30%” countries, although well used to raise entire male pigs, are more willing to go for the immunocastration.

Summary

The major conflicts of interest appear between animal welfare NGOs and the other stakeholders. Similarly to what they expressed regarding the use of anaesthesia, NGOs do not mind whether the farmer or the consumer is supporting the extra cost of immunocastration, clearly put castration associated pain before meat safety risks and prefer raising entire males to immunocastration on the ground of naturalness.

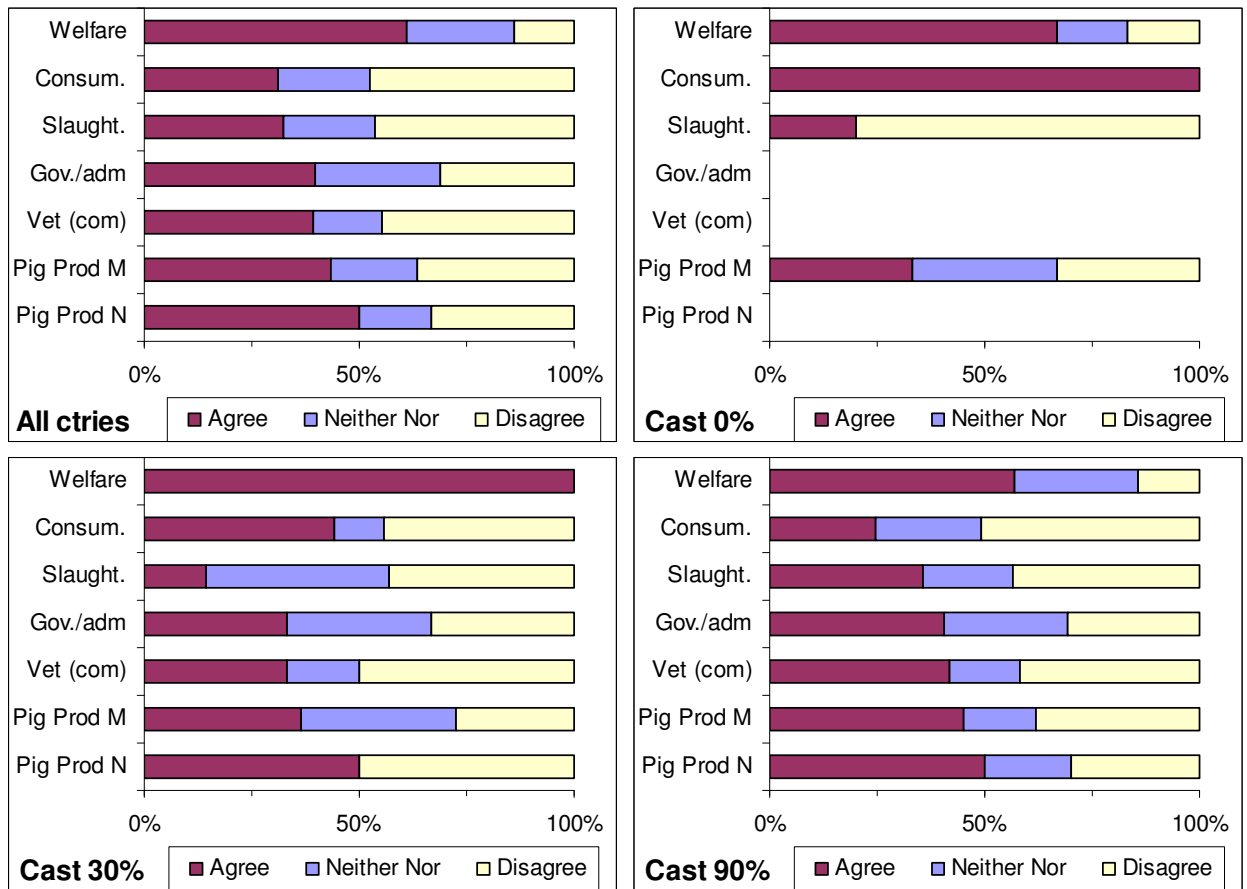
Consumers do not clearly perceive whether immunocastration presents risks regarding residues or of off-odours in the meat. They seem to prefer it to surgical castration without anaesthesia, but not to surgical castration with anaesthesia, probably because their concern about castration associated pain is higher than their perception of the possible risks associated with immunocastration.

Regarding the question of who should pay for the extra cost of immunocastration, animal welfare NGOs do not mind, consumers seem undecided while other stakeholders prefer to pass the bill to the consumers. This is very similar to what was observed about the extra cost associated with the use of anaesthesia.

4.4.4. Acceptability of sexing spermatozoa to raise only females as an alternative to surgical castration (Question 7)

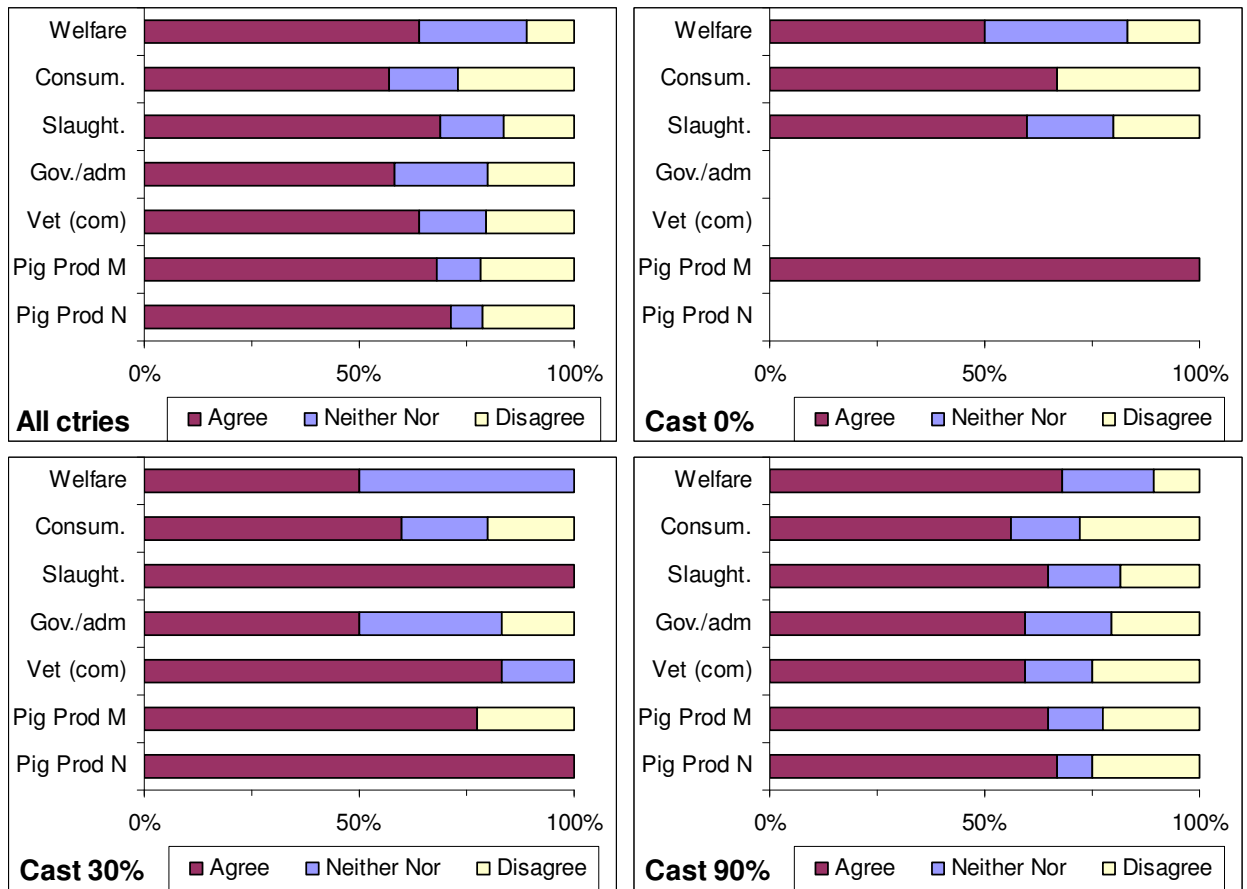
Stakeholders were invited to indicate the degree to which they agree or disagree with the following opinions about sexing spermatozoa to raise only females and thereby avoid castration.

Figure 30. V37. Sexing sperm is not cost effective for the farmer, but I think the extra price is worth paying by the consumer.



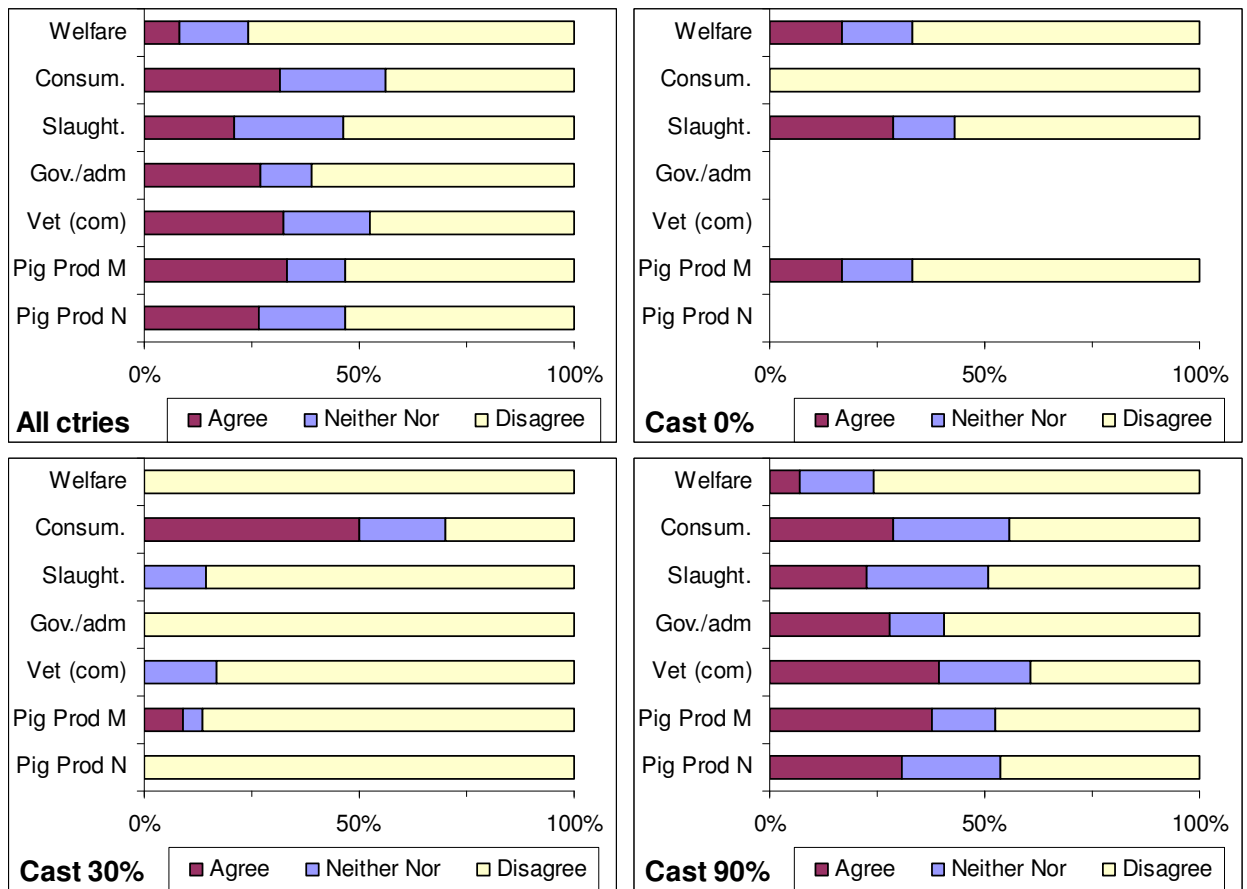
Only the animal welfare NGOs agree in more than a 50 % with this statement, that the other stakeholders may have considered as sealing an uneven situation. The consumer representatives, the slaughterhouses and the veterinarians are the most opposed to having the consumers pay for the cost of sperm sexing. The position of consumer representatives in “Cast 0%” countries would need to be confirmed with a higher number of responses.

Figure 31. V38. Sorting semen adequately would be the best way to avoid castration, so I think that techniques to do it properly need to be developed.



Stakeholders altogether agree with this statement, which describes and exalts a safe, painless way to avoid castration. Caution is needed in interpretation of these responses as the statement is more projective, developmental than factual and experimental.

Figure 32. V39. Because sexing sperm to raise females only is unnatural, I would rather have all boars castrated.



Stakeholders altogether disagree with this statement, particularly so in countries where castration is uncommon or rare. On one side, stakeholders do not consider sperm sexing as an unnatural practice, and on the other they are not in favour systematically for castration without anaesthesia.

Summary

The major result about sexing spermatozoa to raise females only is that stakeholders altogether agree with the idea that it is a technique worth to be developed and do not consider it as unnatural.

4.5. Ranking of Alternatives to surgical castration by stakeholders (Question 8)

Figure 33 provides a direct comparison of the overall results (all countries) of the ranking from 1 (low priority) to 5 (high priority), obtained for “surgical castration without anaesthesia” (C), in comparison with each of the four alternatives given in the questionnaire.

- Surgical castration of male pigs with anaesthesia (A)
- Immunocastration of male pigs (I)
- Raising entire male pigs (E)
- Raising only females via sperm sorting (S).

The left hand side of Figures 34 to 38 provide paired comparisons between C and each of the alternatives, A, I, E and S for the overall results (all countries). The right hand side of the figures provides a comparison of the mean scores given by stakeholders in the 3 groups of countries where castration is very rare (Cast 0%), applied to a 30% of the male piglets (Cast 30%) or to most of them (cast 90%).

On the whole, animal welfare NGOs single out in their marked preference for raising entire males and sperm sorting and their outright rejection of surgical castration without anaesthesia. Producers are the most in favour of keeping surgical castration without anaesthesia. Surgical castration with anaesthesia appears as the most consensual alternative. Raising entire males and immunocastration are ranked at a low level.

A Friedman test has been applied by stakeholder category to assess the differences between alternatives, and pair wise comparisons (Bonferroni test) have been performed for each group of countries and for countries produce mainly entires (Cast 0% + Cast 30%) (Table 8 to Table 12). Consumer's category for Cast 0% and PigProd N and Welfare for Cast 30% were excluded due to the low number of answers.

Figure 33. Compared evaluation of the various alternatives by the different stakeholders.

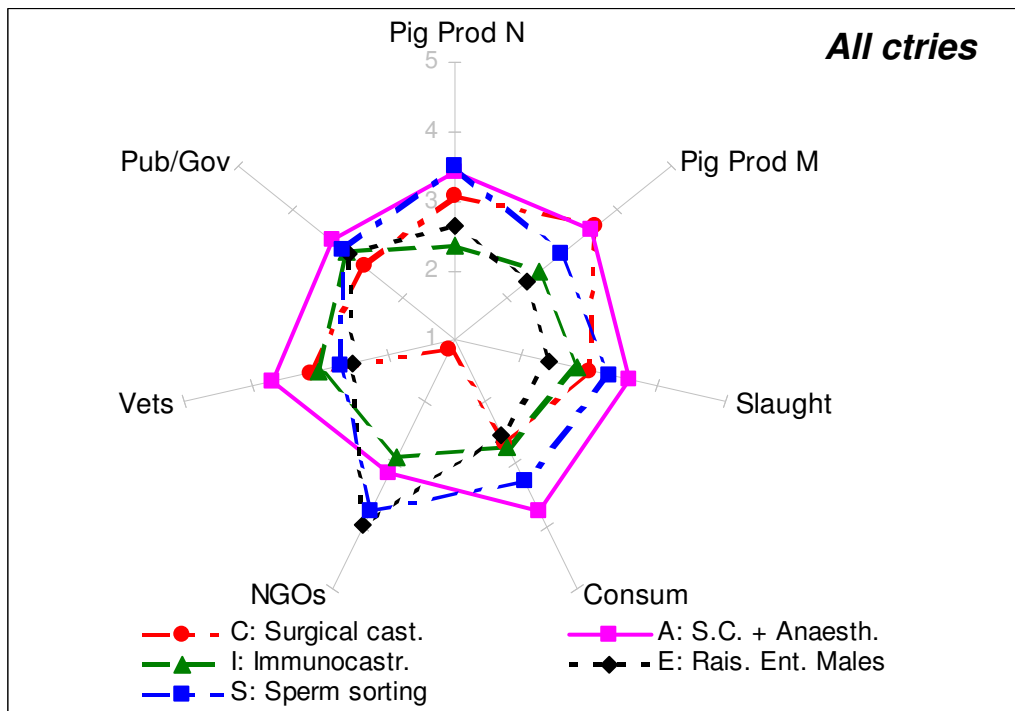
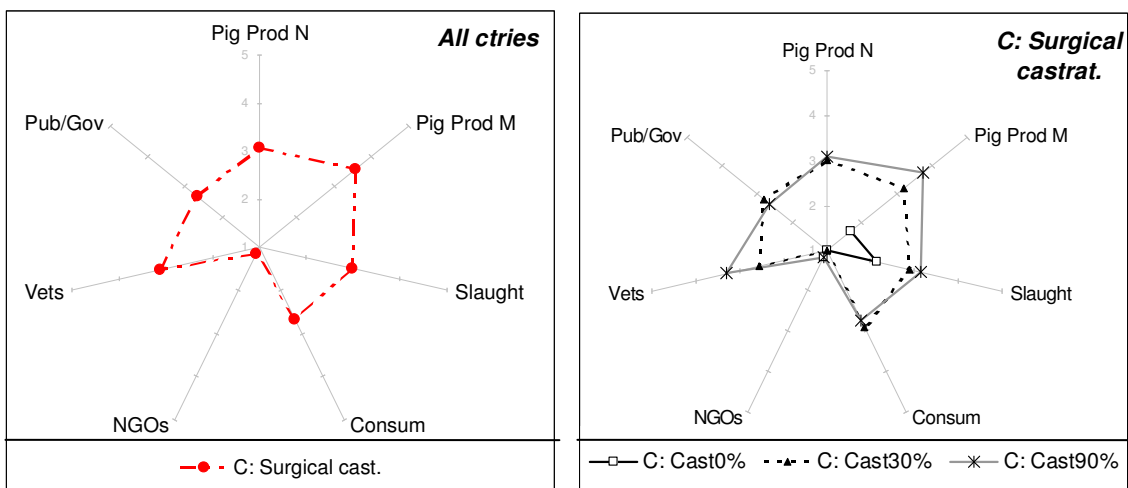
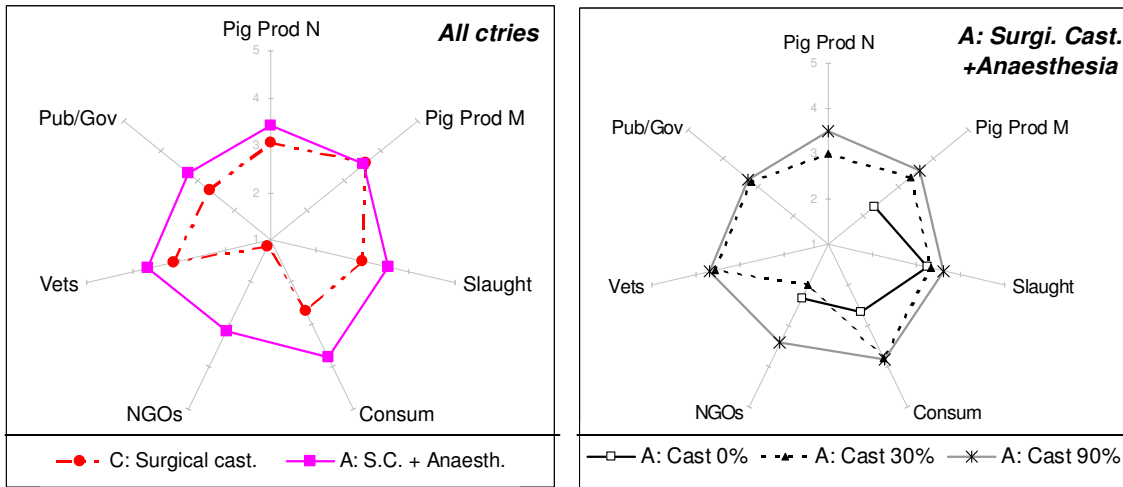


Figure 34. Evaluation of surgical castration without anaesthesia by the different stakeholders.



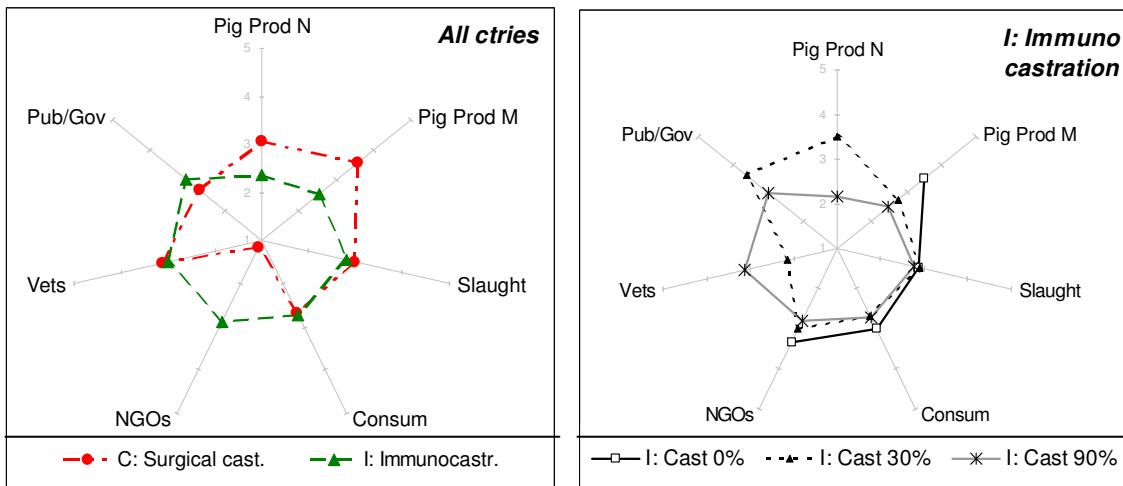
Surgical castration without anaesthesia (C) is totally rejected by animal welfare NGOs. On the opposite, main stream producers have the higher acceptance of the procedure except for Cast 0% countries. Also slaughterhouses in the “Cast 0%” countries have a lower acceptance of (C) than their counterparts in the other countries.

Figure 35. Evaluation of surgical castration with anaesthesia by the different stakeholders.



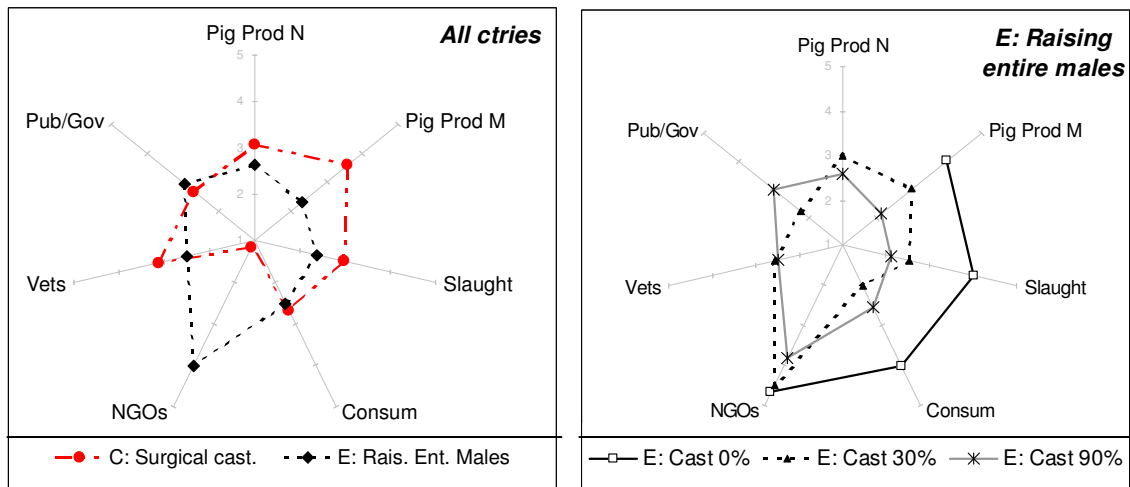
Surgical castration with anaesthesia (A) is considered a better option than C for all the categories of stakeholders, except for Producers that gave it the same ranking as for C. The ranking of A by animal welfare NGOs is lower in countries where castration is uncommon (“Cast 0%” and “Cast 30%”). Furthermore the ranking of A by Pig Producers (main stream) and consumers is lower in Cast 0% countries.

Figure 36. Evaluation of immunocastration by the different stakeholders.



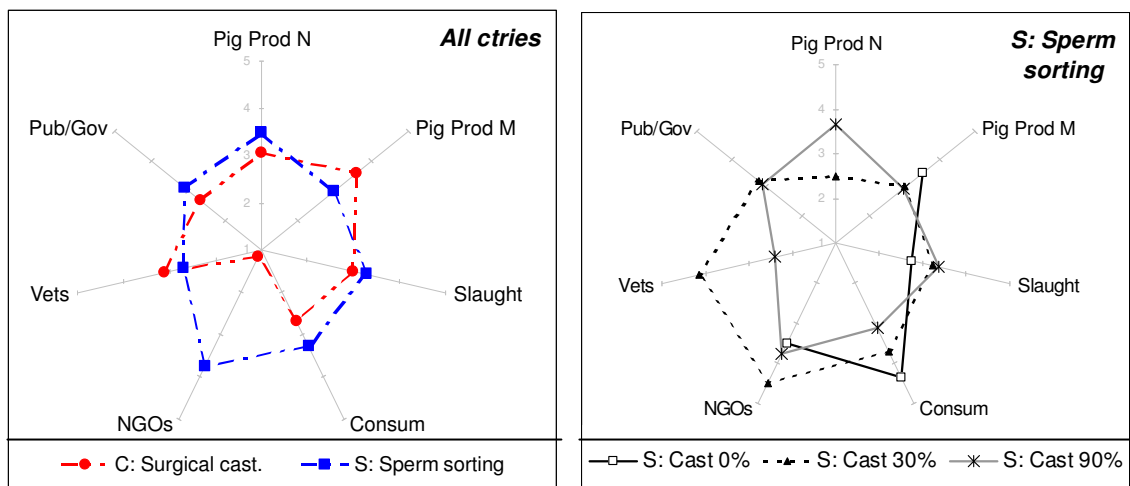
Immunocastration (I) was ranked as a worst option than C by Producers and a better option for Administration and NGOs. The other stakeholders ranked this option similarly to C.

Figure 37. Evaluation of raising entire male pigs by the different stakeholders.



Animal welfare NGOs ranked raising entire males (E) better than C. Slaughterhouses, Producers and Veterinarians considered it a worst option than C in “Cast 90%” countries, in contrast with their counterparts in “Cast 0%” countries which strongly prefer E.

Figure 38. Evaluation of sperm selection to raise only females by the different stakeholders.



Sperm selection (S) was preferred to C by all stakeholders with the exception of vets and main stream producers.

Table 8. Mean and significant differences of items from question 8 within stakeholder (all ctries).

	Consum	NGOs	PigProd M	PigProd N	Pub/Gov	Slaught	Vets
C	2.7 b	1.2 d	3.6 a	3.1	2.7	3.0 b	2.9 ab
A	3.8 a	3.2 bc	3.5 a	3.4	3.3	3.6 a	3.7 a
I	2.7 b	2.9 c	2.5 c	2.4	3.0	2.8 bc	3.0 c
E	2.5 b	4.0 a	2.3 c	2.8	3.0	2.4 c	2.5 c
S	3.3 a	3.8 ab	3.0 b	3.5	3.1	3.3 ab	2.7 b

Different letters within a column indicated significant differences ($P < 0.05$).

C: Surgical castration of male pigs without anaesthesia; A: Surgical castration of male pigs with anaesthesia; I: Immunocastration of male pigs; E: Raising entire male pigs; S: Raising only females via sperm sorting.

Table 9. Mean and significant differences of items from question 8 within stakeholder (Cast 0%).

	Consum	NGOs	PigProd M	PigProd N	Pub/Gov	Slaught	Vets
C		1.2 c	1.7			2.1	
A		2.3 bc	2.3			3.3	
I		3.3 ab	3.5			2.9	
E		4.7 a	4.0			4.0	
S		3.5 ab	3.5			2.8	

Different letters within a column indicated significant differences ($P < 0.05$).

C: Surgical castration of male pigs without anaesthesia; A: Surgical castration of male pigs with anaesthesia; I: Immunocastration of male pigs; E: Raising entire male pigs; S: Raising only females via sperm sorting.

Table 10. Mean and significant differences of items from question 8 within stakeholder (Cast 30%).

	Consum	NGOs	PigProd M	PigProd N	Pub/Gov	Slaught	Vets
C	2.9		3.2		2.8	2.9	2.6
A	3.8		3.3		3.2	3.3	3.6
I	2.7		2.8		3.6	2.9	2.1
E	2.0		3.0		2.2	2.6	2.6
S	3.7		3.0		3.2	3.2	4.1

Different letters within a column indicated significant differences ($P < 0.05$).

C: Surgical castration of male pigs without anaesthesia; A: Surgical castration of male pigs with anaesthesia; I: Immunocastration of male pigs; E: Raising entire male pigs; S: Raising only females via sperm sorting.

Table 11. Mean and significant differences of items from question 8 within stakeholder (Cast 0% + 30%).

	Consum	NGOs	PigProd M	PigProd N	Pub/Gov	Slaught	Vets
C	2.5	1.1 c	2.9		3.0	2.5	2.4
A	3.5	2.3 bc	3.2		3.2	3.3	3.6
I	2.8	3.3 ab	2.9		3.3	2.9	2.5
E	2.5	4.6 a	3.1		2.7	3.2	2.5
S	3.8	3.8 a	3.1		2.8	3.0	4.0

Different letters within a column indicated significant differences ($P < 0.05$).

C: Surgical castration of male pigs without anaesthesia; A: Surgical castration of male pigs with anaesthesia; I: Immunocastration of male pigs; E: Raising entire male pigs; S: Raising only females via sperm sorting.

Table 12. Mean and significant differences of items from question 8 within stakeholder (Cast 90%).

	Consum	NGOs	PigProd M	PigProd N	Pub/Gov	Slaught	Vets
C	2.7 bc	1.2 c	3.8 a	3.1	2.6	3.1 ab	3.3 a
A	3.8 a	3.4 ab	3.6 a	3.5	3.3	3.6 a	3.7 a
I	2.7 bc	2.8 b	2.5 c	2.2	3.0	2.8 b	3.1 ab
E	2.5 c	3.8 a	2.1 d	2.6	3.0	2.1 c	2.5 bc
S	3.1 b	3.8 a	2.9 b	3.7	3.1	3.3 a	2.4 c

Different letters within a column indicated significant differences ($P < 0.05$).

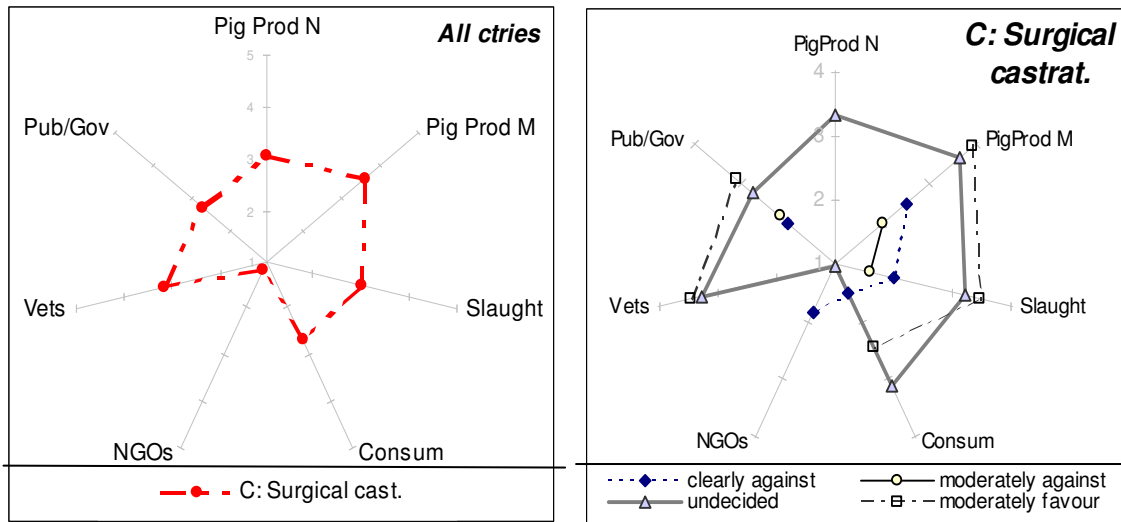
C: Surgical castration of male pigs without anaesthesia; A: Surgical castration of male pigs with anaesthesia; I: Immunocastration of male pigs; E: Raising entire male pigs; S: Raising only females via sperm sorting.

With the PCA, four groups of countries were differentiated according to their opinion about castration (see point 5.3.). For that reason the same analyses have been repeated considering these 4 groups. These groups of countries are the following:

- Clearly against castration: United Kingdom, Greece and The Netherlands
- Moderately against castration: Portugal, Ireland and Finland
- Undecided: Spain, France, Austria, Denmark, Sweden, Switzerland, Norway, Estonia, Eslovenia, Poland, Germany and Lithuania
- Moderately in favour of castration: Cyprus, Italy, Slovakia, Hungary, Belgium and Latvia.

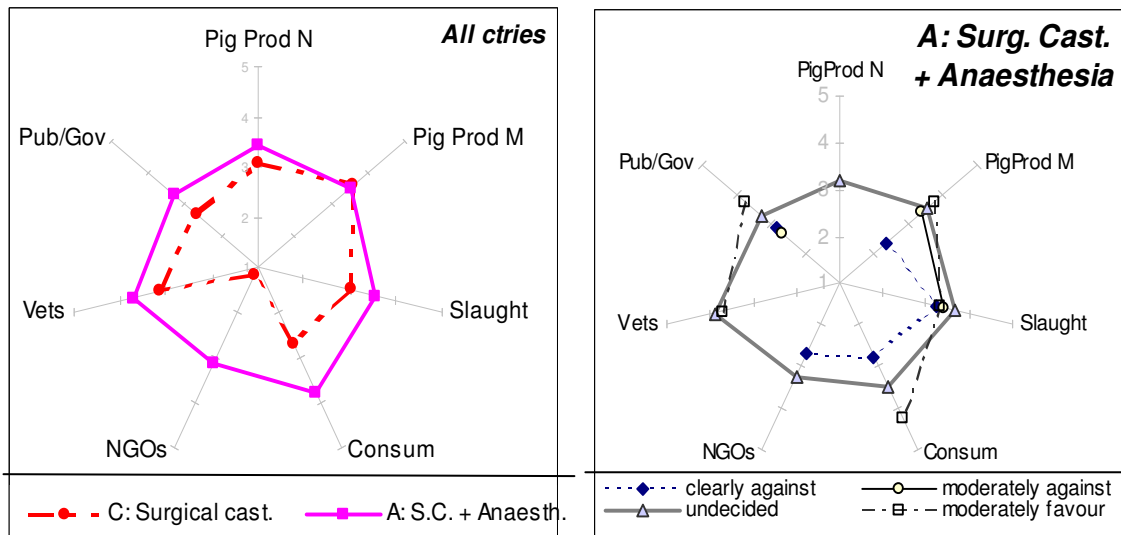
The results are presented in Figures 39 to 43 and on Tables 13 to 16.

Figure 39. Evaluation of surgical castration without anaesthesia by the different stakeholders.



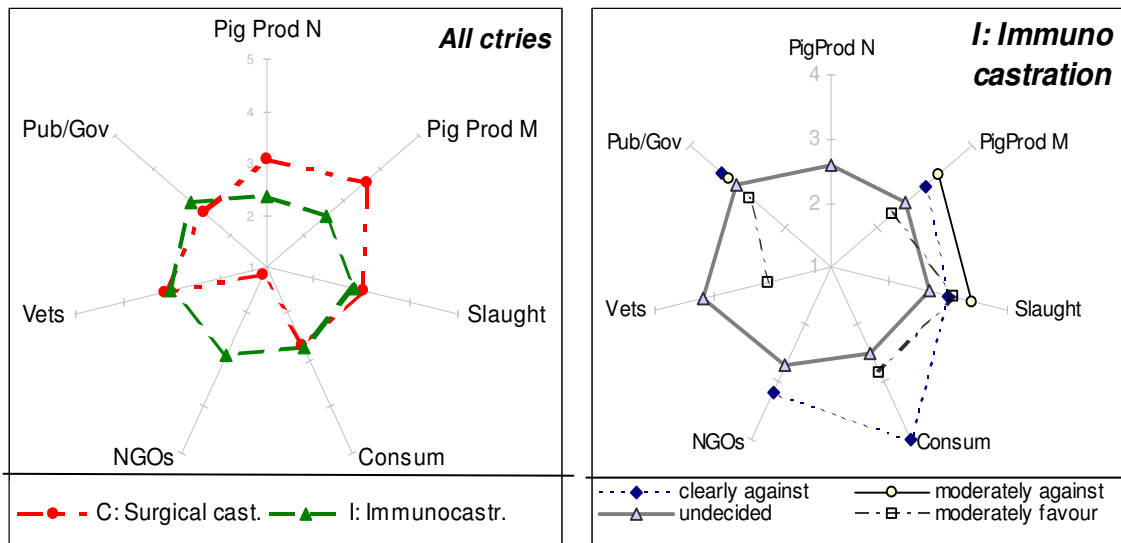
Surgical castration without anaesthesia (C) is totally rejected by animal welfare NGOs. It is also rejected by all the other stakeholders from countries that belong to the ‘clearly against’ and ‘moderately against’ castration groups. On the opposite, all the stakeholders except NGO from countries that belong to the ‘moderately in favour’ of castration and ‘undecided’ group have higher acceptance of (C).

Figure 40. Evaluation of surgical castration with anaesthesia by the different stakeholders.



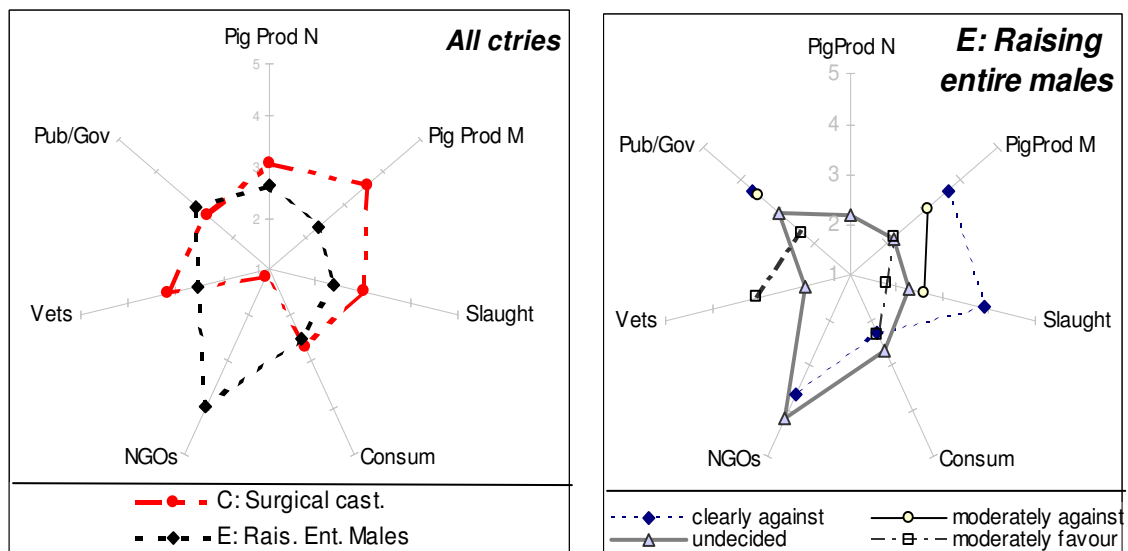
The ranking of A is almost at the same level for all the stakeholders of all the groups of countries according to their position about castration. Only countries of the group ‘clearly against’ presented a little bit lower acceptance of A, but the difference is not important. Moreover, Consumers of the group of countries ‘moderately in favour’ of castration presented a little bite of higher acceptance of A.

Figure 41. Evaluation of immunocastration by the different stakeholders.



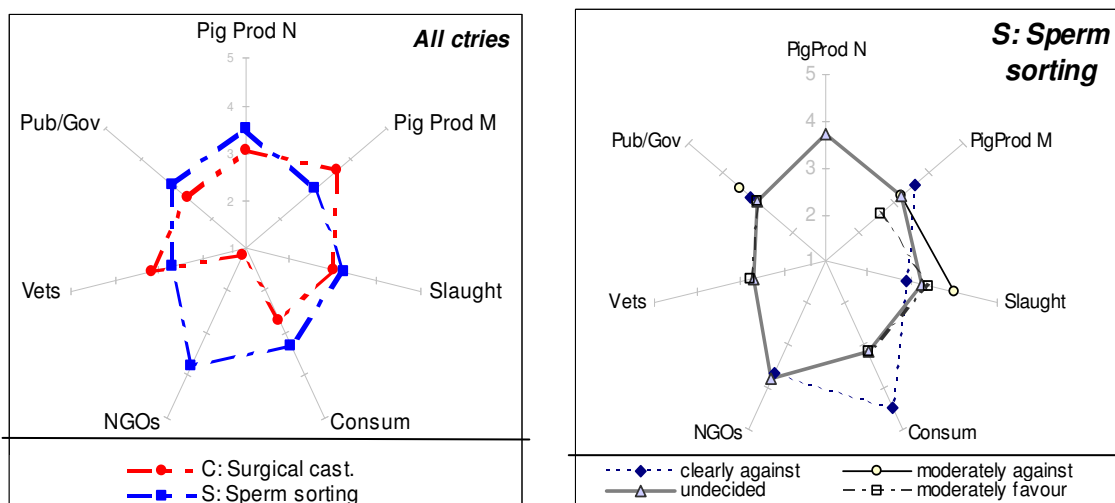
Immunocastration was ranked higher by the different stakeholders of the group of countries ‘clearly against’ and ‘moderately against’ castration. It was also accepted by consumers organizations and slaughterplants of countries of the group ‘moderately in favour’ of castration. For the ‘undecided’ group of countries, immunocastration is a good alternative for all the stakeholders.

Figure 42. Evaluation of raising entire male pigs by the different stakeholders.



Raising entire males (E) has been ranked very high by all the stakeholders of ‘clearly against’ and ‘moderately against’ castration countries. E has also high ranking for NGOs of the ‘undecided’ countries. The lower ranking values of E were for Pig Producers main stream of ‘undecided’ and ‘moderately in favour of castration’ countries.

Figure 43. Evaluation of sperm selection to raise only females by the different stakeholders.



Sperm selection (S) was ranked high by all the stakeholders of all the groups of countries. The higher values were for consumers of the group of countries 'clearly against' castration.

Table 13. Mean and significant differences of items from question 8 within stakeholder (Clearly against castration).

	Consum	NGOs	PigProd M	PigProd N	Pub/Gov	Slaught	Vets
C	1.5 c	1.8	2.5		2.0	2.0	
A	2.8 abc	2.7	2.3		2.8	3.3	
I	4.0 ab	3.2	3.0		3.3	3.0	
E	2.3 bc	3.7	3.7		3.7	3.9	
S	4.5 a	3.7	3.6		3.2	2.9	

Different letters within a column indicated significant differences ($P < 0.05$).
 C: Surgical castration of male pigs without anaesthesia; A: Surgical castration of male pigs with anaesthesia; I: Immunocastration of male pigs; E: Raising entire male pigs; S: Raising only females via sperm sorting.

Table 14. Mean and significant differences of items from question 8 within stakeholder (moderately against castration).

	Consum	NGOs	PigProd M	PigProd N	Pub/Gov	Slaught	Vets
C			2.0		2.2	1.6	
A			3.4		2.7	3.4	
I			3.3		3.2	3.4	
E			3.1		3.5	2.6	
S			3.2		3.5	4.0	

Different letters within a column indicated significant differences ($P < 0.05$).

C: Surgical castration of male pigs without anaesthesia; A: Surgical castration of male pigs with anaesthesia; I: Immunocastration of male pigs; E: Raising entire male pigs; S: Raising only females via sperm sorting.

Table 15. Mean and significant differences of items from question 8 within stakeholder (Undecided).

	Consum	NGOs	PigProd M	PigProd N	Pub/Gov	Slaught	Vets
C	3.1	1.0 d	3.6 a	3.3	2.7	3.2 ab	3.3 ab
A	3.5	3.3 bc	3.6 a	3.2	3.3	3.7 a	3.9 a
I	2.5	2.7 c	2.6 b	2.6	3.0	2.6 bc	3.2 ab
E	2.7	4.2 a	2.1 b	2.2	2.9	2.3 c	2.0 c
S	3.2	3.8 ab	3.2 a	3.7	3.0	3.2 ab	2.7 bc

Different letters within a column indicated significant differences ($P < 0.05$).

C: Surgical castration of male pigs without anaesthesia; A: Surgical castration of male pigs with anaesthesia; I: Immunocastration of male pigs; E: Raising entire male pigs; S: Raising only females via sperm sorting.

Table 16. Mean and significant differences of items from question 8 within stakeholder (moderately in favour).

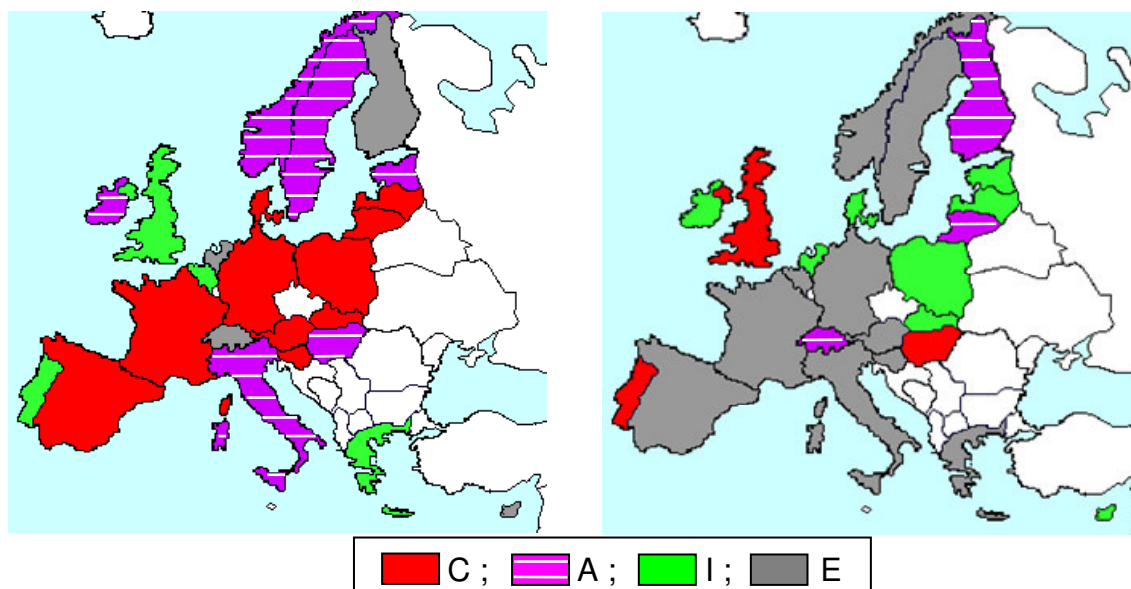
	Consum	NGOs	PigProd M	PigProd N	Pub/Gov	Slaught	Vets
C	2.4 bc		3.9 a		3.1	3.4 a	3.4
A	4.3 a		3.7 a		3.7	3.3 a	3.8
I	2.8 bc		2.3 b		2.7	3.1 a	2.1
E	2.3 c		2.2 b		2.4	1.8 b	3.0
S	3.2 b		2.6 b		3.0	3.4 a	2.8

Different letters within a column indicated significant differences ($P < 0.05$).

C: Surgical castration of male pigs without anaesthesia; A: Surgical castration of male pigs with anaesthesia; I: Immunocastration of male pigs; E: Raising entire male pigs; S: Raising only females via sperm sorting.

Because main stream producers were well represented in all countries, it was possible to analyse the geographical variation of their preferences regarding the various alternatives. Figure 44 presents maps of their most preferred or less preferred alternative. Sperm sorting was not considered because it is not yet technically feasible and therefore cannot be envisaged in a foreseeable future. This was unfortunately not possible for other stakeholder categories (see Table 2).

Figure 44. Most preferred (left hand side) and less preferred (right hand side) alternatives for main stream pig producers, according to country (Sperm sorting was not considered).



Taken together, the countries where main stream pork producers would prefer surgical castration without anaesthesia represent 68% of the EU pig production. They are distributed along a North-East → South West diagonal, from Latvia to Spain, and include the 5 largest EU pork producing countries (Germany, Spain, France, Poland and Denmark).

Raising entire males is the preferred alternative of main stream pig producers in Finland (only 1 response), Netherlands and Cyprus. Taken together these countries represent 11% of the EU pork production. The position of Switzerland in this group should be considered carefully, because there were only 2 responses from this country.

Surgical castration with anaesthesia is the preferred alternative for main stream pig producers in a few EU countries including Sweden, Ireland (only 1 response), Italy and Hungary. Taken together these countries represent 10% of the EU pork production. The procedure seems to be well accepted by Norwegian main stream producers, who have to apply it by law since 2002.

Immunocastration is the preferred alternative of main stream pig producers in UK, Belgium, Portugal and Greece (only 1 response). Taken together these countries represent 7% of the EU pork production.

Spain is an interesting case as surgical castration without anaesthesia is the preferred alternative and entire male pig production the less preferred one, although 70% of male

piglets are left entire in this country (see WP2 report on practice). However, surgical castration with anaesthesia ranks almost equally to surgical castration without anaesthesia.

Raising entire males is the less preferred alternatives for main stream pig producers in a large number of countries accounting for 60% of the EU pork production. The countries where immunocastration is the less preferred alternative for main stream pig producers account for 26% of the EU pork production.

Summary

Taking together the results from all countries, surgical castration with anaesthesia appears to be the most consensual procedure. Sperm selection is also ranked quite high by all categories of stakeholders.

There is a clear conflict of interests between animal welfare NGOs, who have a much higher acceptance of entire male pig production than the other categories of stakeholders and clearly reject surgical castration without anaesthesia. The conflict is particularly important with pig producers, notably the main stream one, who are quite willing to stick with surgical castration without anaesthesia in a majority of countries representing two thirds of EU pig production.

Immunocastration and entire male pig production are poorly rated, the only exception being entire male pig production by animal welfare NGOs.

The acceptability of surgical castration without anaesthesia is in general higher in countries classified as 'undecided' or 'moderately in favour' of castration than in countries classified as clearly or moderately against castration.

5. Principal Component Analysis about attitudes towards castration and alternatives by stakeholder

Questions 4 to 7 (subquestions 16 to 39) have been analyzed with multivariate techniques, to try to understand all the questions globally and in a multidimensional way. Principal Component Analyses (PCA) were performed with varimax rotation to 309 questionnaires (without missing values and 'Don't know' answers). Each PC represents an independent cause of variation, thus answers to questions that are close to each other on a plane representing two PCs are positively correlated, traits projected on the plane at a 90° angle are independent, and traits represented at a 180° angle are negatively correlated. Data was analysed grouping all the participant countries first, and then classified in different categories, depending on the percentage of castrated male pig population: Castration 0% for countries that do perform piglet castration rarely, Castration 30% if they castrate around one third of male pigs or less, and Castration 90% for countries that castrate most of the male pigs. Another analysis was performed considering together Castration 0% and Castration 30%, so considering countries that produce mainly entire males (Cyprus, Ireland, United Kingdom, Spain and Portugal).

PCA shows the correlations of the different questions with the two principal components. A letter plus the number of the question is represented. The letters represent:

- “c” questions related to surgical castration without anaesthesia/analgesia
- “a” questions related to surgical castration with anaesthesia/analgesia
- “i” questions related to immunocastration as an alternative to surgical castration
- “s” questions related to sexing spermatozoa to raise only females to avoid castration

and the number is related to the question number. Moreover different colours have been used depending on the topic of the question:

- **brown**: questions related to cost
- **green**: questions related to “naturalness” aspects
- **blue**: questions related to eating quality
- **orange**: questions related to safety aspects
- **light violet**: questions related to behaviour-welfare
- **red**: other non classified questions

The average (by country and stakeholder category) of the coordinates of the projection of the different observations after application of a PCA analysis with rotation varimax also are represented in PCA.

The observations, corresponding to the different stakeholder categories, are represented in italics and black:

- *VET*: Veterinarians (commercial)
- *SLAUGH*: Slaughterhouses + meat industry + wholesalers
- *PROD*: Pig producers (main stream)+ feed companies + breeders
- *NICHE*: Pig producers (niche)
- *GOV*: Public/Government administration
- *CONS*: Consumers + retailers (those who sell to consumers, e.g. supermarkets, butcher)
- *NGO*: Non Governmental Organizations about animal welfare

5.1. Data analysis including all participant countries

In Figure 45 and 46, data from all the countries were analyzed together. First axis explained 27.14% of the variance accounted for and the second one explained 11.10% of this variance (plane represented in the figure = 38.24%).

First axis is related with “*castration*” as well as “*naturalness*” concepts.

Positive side of axis 1 is related to the “*against castration*” and “*naturalness*” questions. When raising entire males is the “*natural*” alternative to surgical castration (C23), castration with anaesthesia (a29) or immunocastration (i36), there is a positive correlation with axis 1. Avoid castration because is painful (c18) is also positively related to axis 1. However, when surgical castration without anaesthesia is the alternative to sperm selection (s39), there is no relation with the other “*naturalness*” questions. This question is correlated with the negative part of axis 2. Questions c19 and c21 are together, closely related with positive part of axis 1, and uncorrelated to axis 2. Both questions are about avoiding castration on the ground of cost (c19) or welfare (c21).

The negative side of the first axis is related with questions favourable to castration, so it is the “*in favour of castration*” side: c16 (rather castrates than bad eating quality), c17 (rather castration than high aggression and mounting) and c22 (castration is an old practice well endured by animals).

Second axis, explaining 11 % of the variation is related with the “*extra cost-avoiding pain is worth*” and “*avoiding immunocastration*”.

Positive part of axis 2 is the “*extra cost-avoiding pain is worth*” side, grouping questions stating that techniques resulting in less pain are worth doing (a24, s38) and paying for (a26, a27, i31, i32, s37) and more important than the risk of drug residues (a28).

The negative part of the second axis is related mainly to questions stating that immunocastration should be avoided on the ground of farmers’ safety (i30), consumers’ health (i33 and i34), eating quality (i35) and welfare (i36)..

Figure 46 shows the average (by country and stakeholder) of the coordinates of the projection of the different observations in all participant countries, after applying a PCA with rotation varimax.

The most striking observation is that “*against castration*” and “*naturalness*” area (positive side of axis 1) are related with animal welfare NGOs. This result is consistent with welfare NGOs general positions leading them to favour raising entire males rather than castrating them. To a much lesser extent Producers (niche) were also related to this side, probably due to “*naturalness*” aspects. Government administration is also placed in that side. Greece, UK and the Netherlands are clearly in this side, as well as, although less clearly, Sweden, Finland, Norway, Estonia, Lithuania, Ireland, Germany, Switzerland, Poland, Slovenia and Portugal.

The “*in favour of castration*” side is related mainly with answers given by veterinarians and producers main stream. Moreover countries like Cyprus, Italy, Slovakia, Austria, Hungary, Latvia, Spain, France and Belgium are in that side of the plot.

Denmark is placed just in the middle, so, it cannot be assigned to any of the two sides of axis 1.

The “*extra cost-avoiding pain is worth*” area is related mainly with answers given by NGO and, to a lesser extent by government administration. Finland is clearly in this side of the axis as well as, although less clearly, Sweden, Norway, Ireland, Belgium, France, Spain, Cyprus and Portugal.

The “*avoiding immunocastration*” area is weakly related to answers given by Producers (main stream and niche) and slaughter plants. The countries present in this side of the axis are Denmark, Latvia, Lithuania, Poland, and Hungary as well as, although less clearly, Estonia, Slovakia, Slovenia and Austria.

Consumers and retailers categories are located very close to the centre.

Figure 45. Correlations of the different questions about castration without anaesthesia/analgesia, castration with anaesthesia/analgesia, immunocastration and sexing spermatozoa, as shown by the two first components of the PCA (all countries).

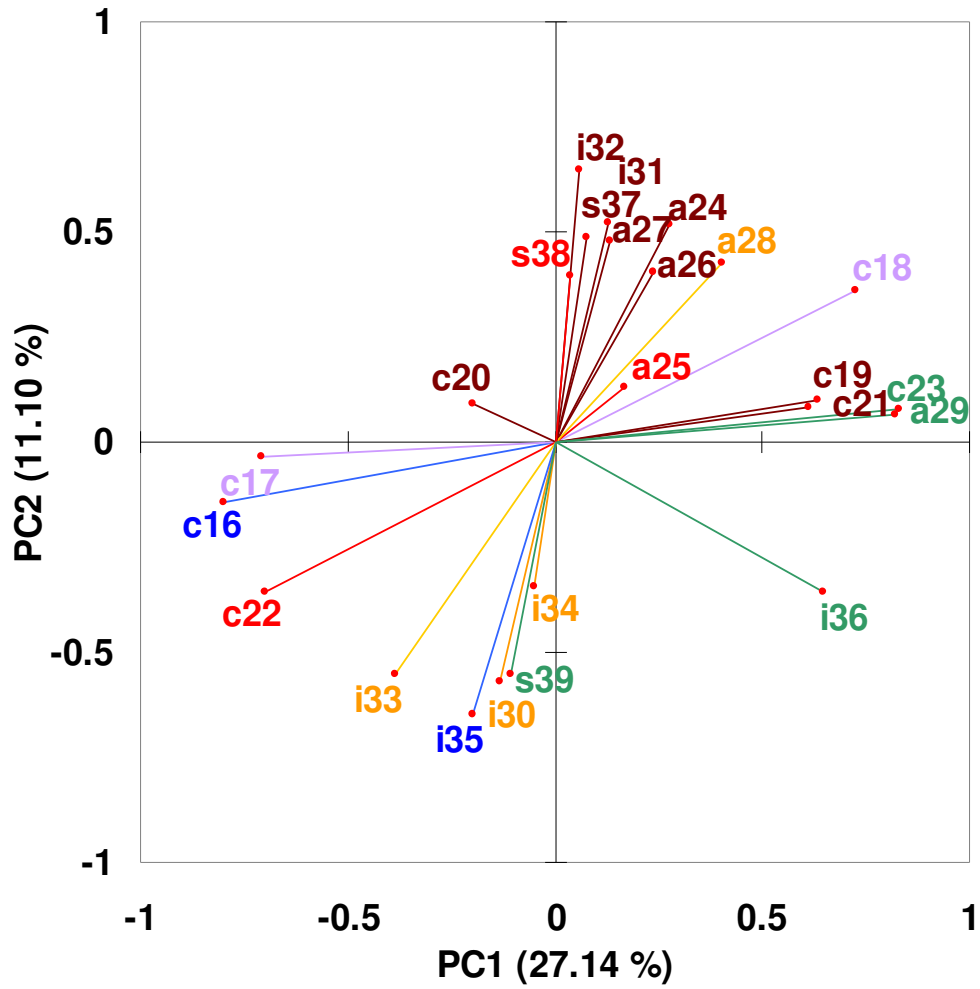
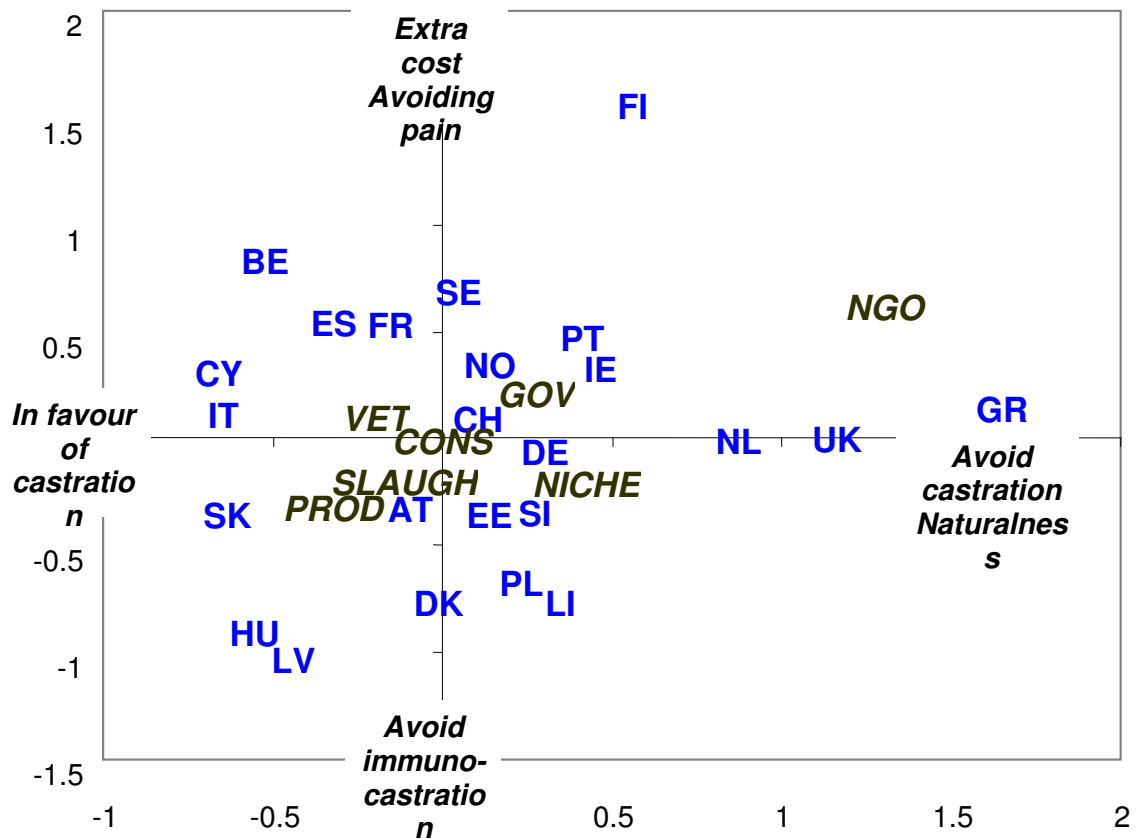


Figure 46. Projection of the averaged (by country and stakeholder) observations, including all participant countries, to the two first principal components of the PCA.

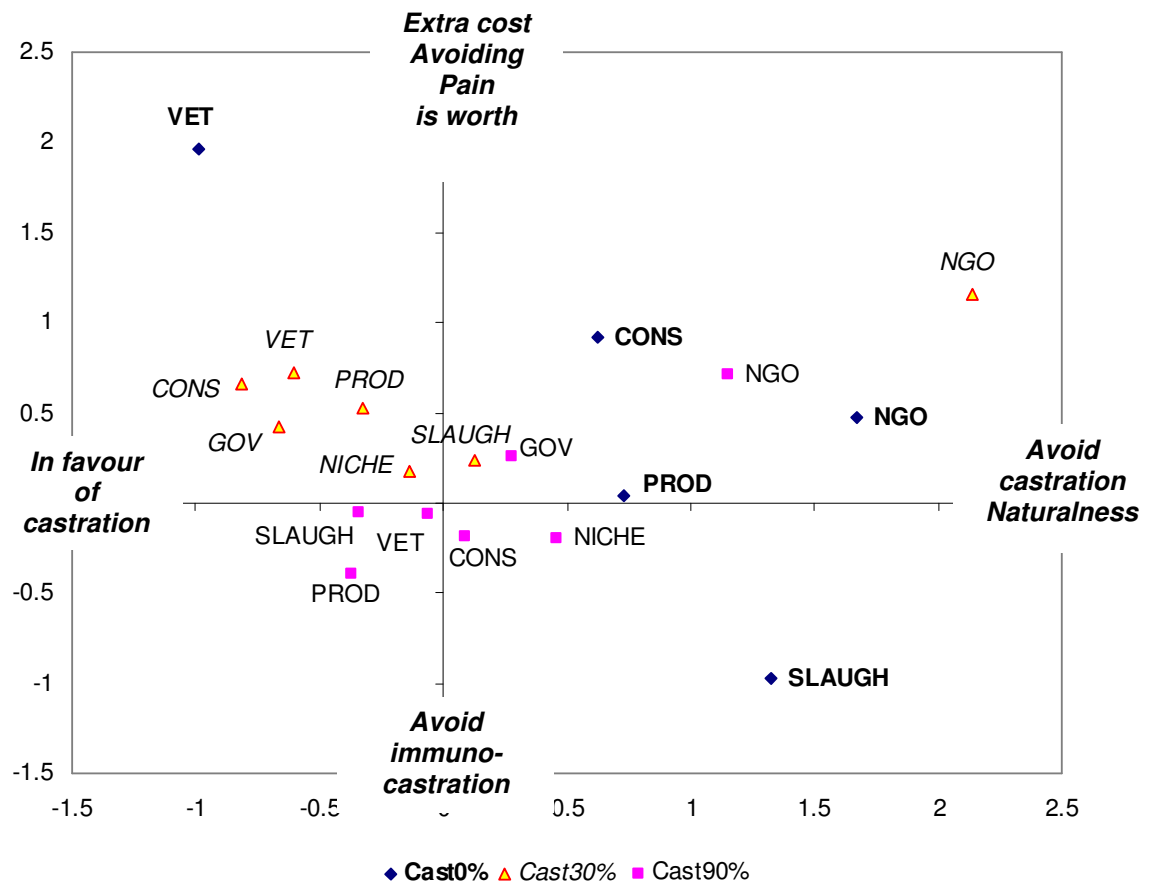


5.2. Results grouping countries by castration/no castration practice (Cast 0%, Cast 30% and Cast 90%)

Figure 47 shows the average (by country and stakeholder within castration group, see WP2 report) of the coordinates of the projection of the different observations in all participant countries, after applying a PCA. All the welfare NGOs are logically placed in the extreme right hand side of axis 1 (against castration area). It can be seen that all the stakeholders of the group of countries that produce mainly entire (Cast0%) are placed in the positive part of axis 1 (against castration) except the Veterinarians. However in that group there is only one questionnaire answered by veterinarians. The group of countries that castrate around one third of the pigs or less (Cast30%) had all the stakeholders, including consumers+retailers and except Slaughterplants and

NGOs, in the left hand side of axis 1 (in favour of castration). The group of countries that produce mainly castrates (Cast 90%) is more variable and more placed to the centre of the plot (except NGOs). This group is composed by a lot of countries and it is possible that there are different opinions within stakeholder groups, some of them contradictory. For that reason the average between answers for each stakeholder can be closer to the centre.

Figure 47. Projection of the averaged (by country and stakeholder within castration group) observations to the two first principal components.



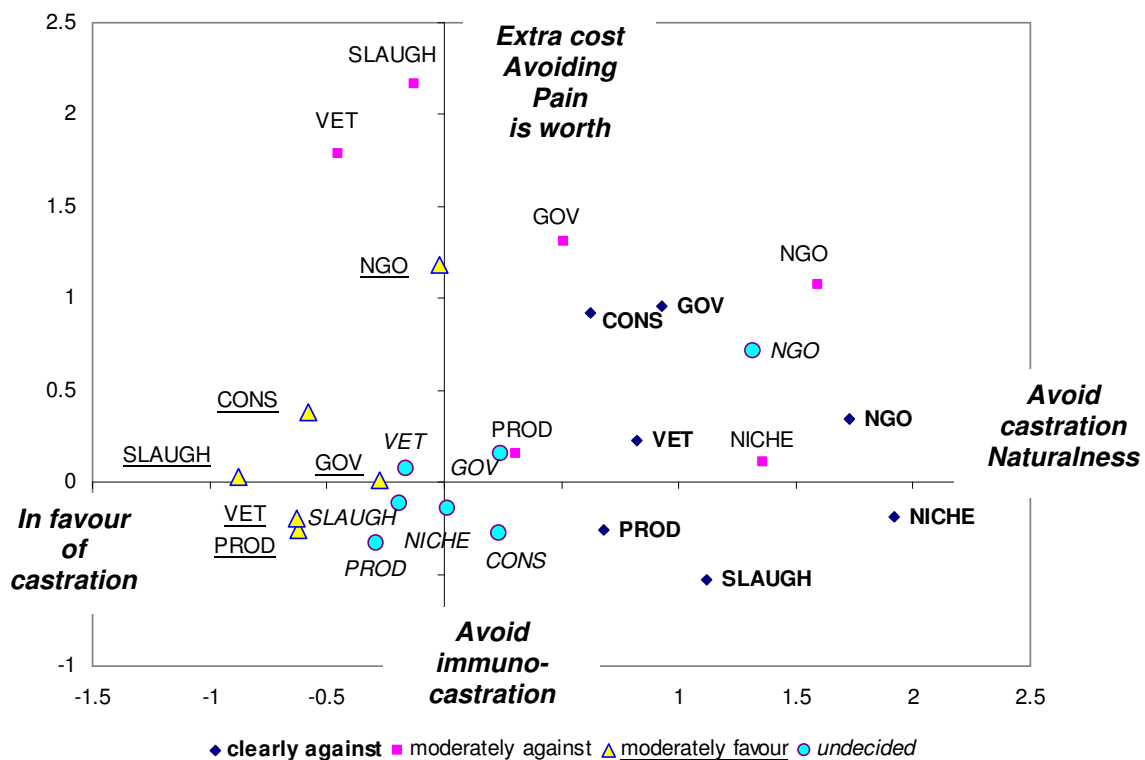
5.3. Results grouping countries by PCA classification

From the averaged (by country and stakeholder) projection of the observations to axis 1 (those obtained to produce Figure 46) the countries have been classified in 4 PCA groups:

- **Clearly against castration** (> 0.70): United Kingdom, Greece and The Netherlands
- **Moderately against castration** (between 0.70 and 0.35): Portugal, Ireland and Finland
- **Undecided** (between 0.35 and -0.35): Spain, France, Austria, Denmark, Sweden, Switzerland, Norway, Estonia, Slovenia, Poland, Germany and Lithuania
- **Moderately in favour of castration** (< -0.35): Cyprus, Italy, Slovakia, Hungary, Belgium and Latvia.

The averaged by country and stakeholder within PCA groups is plotted in Figure 48. The four groups are placed in much defined areas, according to the previous classification.

Figure 48. Projection of the averaged (by country and stakeholder within PCA group) observations to the two first principal components.



When we have a look at the number of individual answers, per country and stakeholder category (for each PCA group), placed in each side of the axis:

- Against castration (NO): positive side of axis 1
- Not against castration (YES): negative side of axis 1.

It can be seen that the 'clearly against castration' group (Table 17) have most of the observations placed in the 'NO', i.e. in the against castration side. Similar behaviour can be found for the 'moderately against castration' group (Table 18), except for the veterinarians that were 50% in each side and for slaughter plants, where there is only one observation placed in the 'yes' side. For the 'undecided' group, not a clear pattern can be seen in the number of observations placed in each side of the first axis. Finally the 'moderately against castration' group presented, logically, the majority of the answers in the 'YES' side.

Table 17. Number of individual answers per country and stakeholder category of the ‘clearly against castration’ group, placed in the positive part of PCA axis 1 (against castration or “NO”) and the negative part of PCA axis 1 (in favour of castration or “YES”).

	CONS		NGO		PROD (main)		PROD (niche)		GOV		SLAUGH		VET		TOTAL	
	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
Greece					1				1		1		1		4	0
Netherlands			3		3	1	1		3	1		1	1		11	3
UK	1	1	4		5						3	1			13	2
Total	1	1	7		9	1	1		4	1	4	2	2		28	5
%	50	50	100	0	90	10	100	0	80	20	67	33	100	0	85	15

Table 18. Number of individual answers per country and stakeholder category of the ‘moderately against castration’ group, placed in the positive part of PCA axis 1 (against castration or “NO”) and the negative part of PCA axis 1 (in favour of castration or “YES”).

	CONS		NGO		PROD (main)		PROD (niche)		GOV		SLAUGH		VET		TOTAL	
	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
Finland			1						2			1			3	1
Ireland			1		1									1	2	1
Portugal					4	2	1						1		6	2
Total			2		5	2	1		2			1	1	1	11	4
%			100	0	71	29	100	0	100	0	0	100	50	50	73	27

Table 19. Number of individual answers per country and stakeholder category of the ‘undecided’ group, placed in the positive part of PCA axis 1 (against castration or “NO”) and the negative part of PCA axis 1 (in favour of castration or “YES”).

	CONS		NGO		PROD (main)		PROD (niche)		GOV		SLAUGH		VET		TOTAL	
	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
Austria			2			6			3	2		2	2	4	7	14
Denmark	1		1			4	1					4			3	8
Estonia			1	1	1	1				1		2			2	5
France	1		2			5	3			1		3			3	12
Germany	1	1	2		1		1				1	1			5	3
Lithuania	2	2			5	3			3	2	4	1	2	1	16	9
Norway	2		1			3			2			2		1	5	6
Poland	1		1		4	4			1			2		1	7	7
Slovenia	1		5		1	6					4	1		1	11	8
Spain		1	2			7	1		1	2	3	1		2	6	14
Sweden		1	1		1	1			1	2	1		1		5	4
Switzerland		1				2	2		2	1	2	3		2	6	9
Total	9	6	18	1	13	42	3	5	13	11	15	22	5	12	76	99
%	60	40	95	5	24	76	38	63	54	46	41	59	29	71	43	57

Table 20. Number of individual answers per country and stakeholder category of the ‘moderately in favour of castration’ group, placed in the positive part of PCA axis 1 (against castration or “NO”) and the negative part of PCA axis 1 (in favour of castration or “YES”).

	CONS		NGO		PROD (main)		PROD (niche)		GOV		SLAUGH		VET		TOTAL	
	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
Belgium	1	2	1	1	1	4			1	1		4			4	12
Cyprus		4				1						1	1	1	1	7
Hungary		2		1	4	12								2	4	17
Italy		1			1	14			1	5		1		1	2	22
Latvia						2			1	1		4			1	7
Slovakia					2	7									2	7
Total	1	9	1	2	8	40			3	7		10	1	4	14	72
%	10	90	33	67	17	83			30	70	0	100	20	80	16	84

5.4. Data analyses including all participant countries (average per country and stakeholder)

To perform the explained PCA all the questionnaires individually have been used. Therefore we can think that there can be a bias in the result due to the fact that the different stakeholder categories were not balanced between countries. For that reason the same PCA was performed using the mean values of the questionnaires per country and stakeholder. Similar results were obtained and only slight differences could be appreciated (see Figure 49). No differences were found in the stakeholders position (Figure 50). Countries position is similar for most of the countries although in some cases like Germany and Estonia is somewhat different.

Figure 49. Correlations of the different questions about castration, castration with anaesthesia/analgesia, immunocastration and sexing spermatozoa with the two first components of the PCA (all tries).

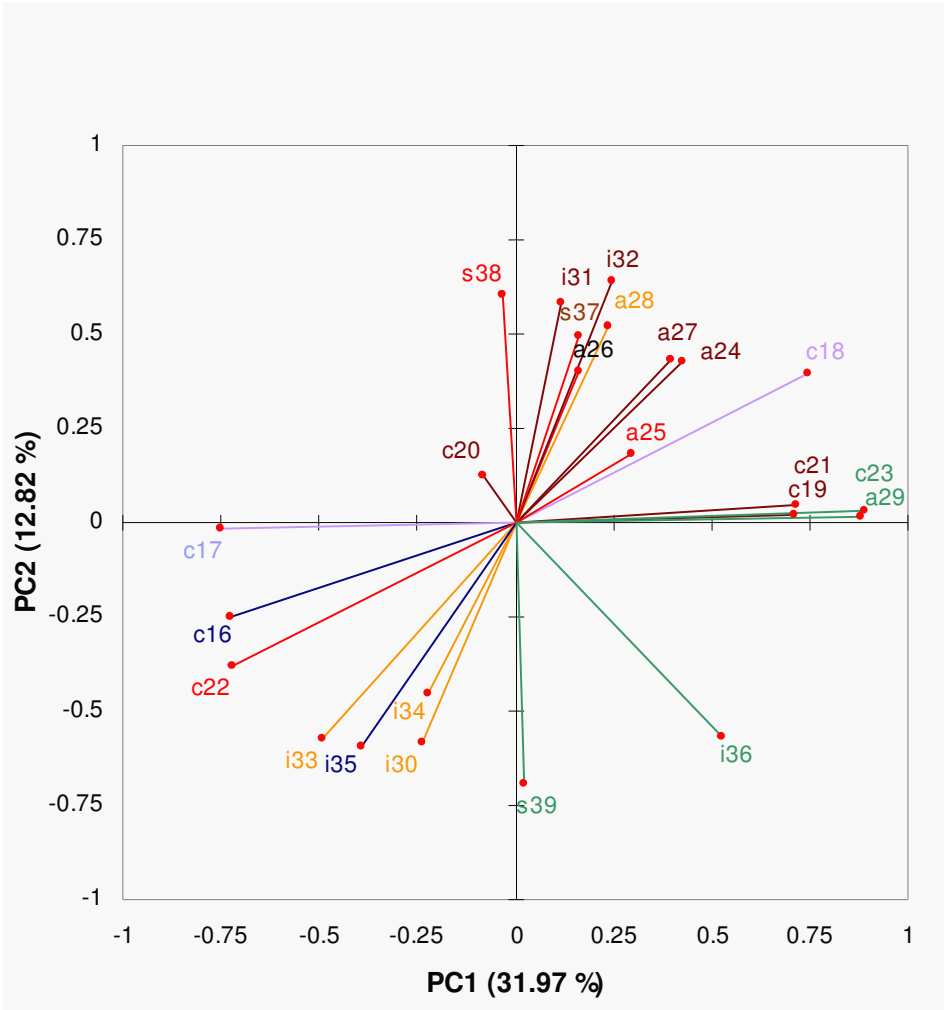
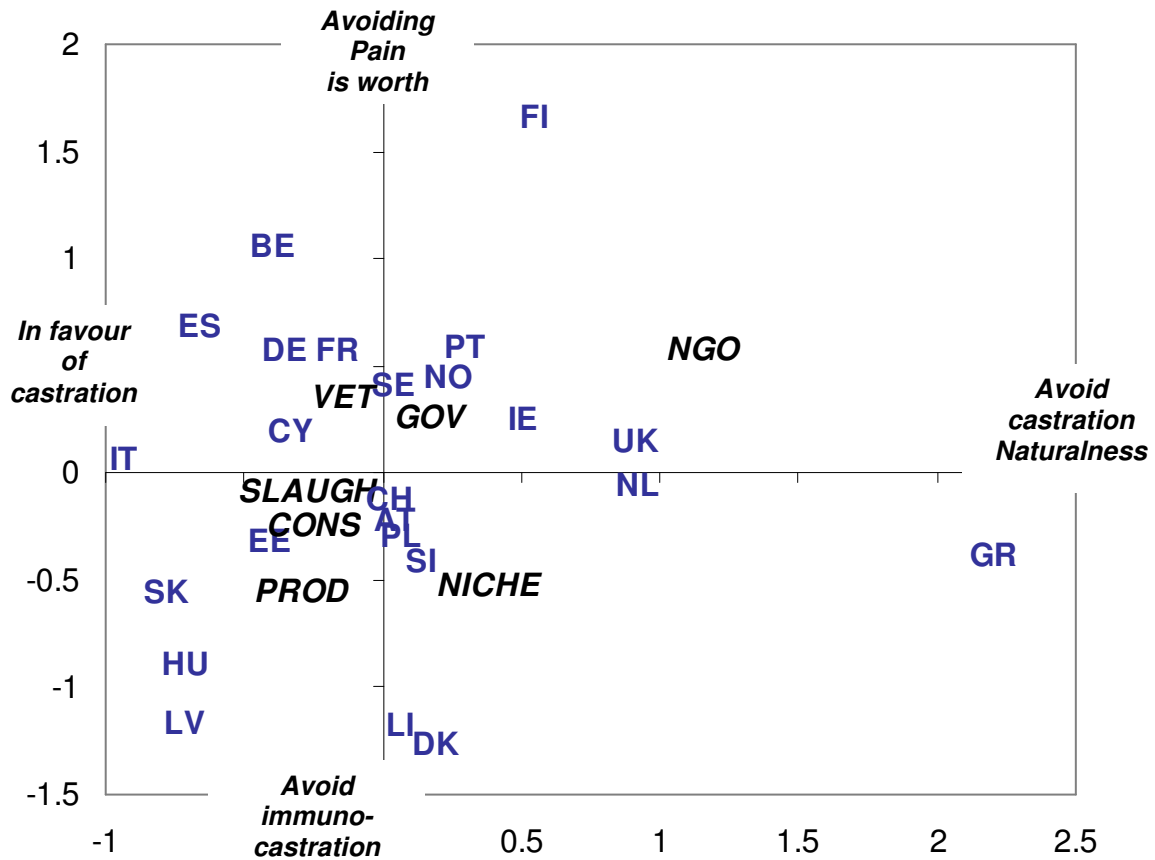


Figure 50. Projection of the averaged (by country and stakeholder) observations, including all participant countries, to the two first principal components of the PCA (all ctries).



Summary

In general NGOs, and in a weaker way Government/Administration are against castration and in favour of natural state of the animals and veterinarians, producers (main stream) and slaughter plants in favour of castration. The PCA allows to classify the countries in 4 group according to their opinion about castration. United Kingdom, Greece and The Netherlands are clearly against castration. Portugal, Ireland and Finland are moderately against castration. Spain, France, Austria, Denmark, Sweden, Switzerland, Norway, Estonia, Eslovenia, Poland, Germany and Lithuania had an undecided position about castration. Finally Cyprus, Italy, Slovakia, Hungary, Belgium and Latvia can be considered moderately in favour of castration. However some differences can be observed when the average per country and stakeholder is considered (in special with respect to the attitudes of Spain and Germany (more in favour of castration) and Belgium (more undecided)).

When the different groups of countries were studied separately some differences can be found. Animal welfare NGO's have similar behaviour. However consumers of countries that produce mainly castrates (Cast90%) are placed in the area "against castration" while for countries that produce mainly entire (Cast 0% + Cast 30%) they are placed in the opposite situation. Same situation was found for Administration/Government. Slaughter plants were placed "against castration" in entire countries and in the opposite side in Cast90% countries. Producers (main stream) were not positioned in entire countries and they were in the "yes" castration side for Cast90% countries.

6. Conclusions

6.1. Attitudes towards pig production aspects, surgical castration without anaesthesia and its alternatives by the different stakeholder category

From the results of the present survey, the first statement one could observe is that stakeholders considered themselves, in general, well informed about pig production methods, with the exception of niche pig producers and consumers' categories who involve 'not informed' people. Aspects of pig production compete with each other in stakeholders' preoccupations. However, eating quality of pork and derived products get everyone's vote.

When stakeholders were asked to rank the different aspects of pig productions, the hierarchical principle we pointed above, becomes more apparent. In general, the higher values were observed in the Eating quality, so this would be the most concerning issue. The least concerning issue for all of stakeholders was Working conditions, closely followed by the Farmers safety. Producers and Slaughterhouses considered Production costs and Eating quality the most important issues. For NGOs the most important issue was animal welfare, far from the values given to the other aspects. Government' category stands out in giving the highest grade to Farmers safety.

In a majority of countries, representing two thirds of the EU production, main stream pig producers would prefer keeping surgical castration without anaesthesia followed by the use of anaesthesia, in order to avoid off flavour. To a lesser extent, other stakeholder categories with the exception of NGOs who are firmly opposed and disagree with it, also agree. However, few stakeholders go in favour for the avoidance of castration on the grounds that it entails pain to animals; in addition, animal welfare is not a sufficient criterion for selling entire males at a higher price than pork from castrates, except for NGOs.

Use of anaesthesia prior to castration is more accepted unanimously than castration without anaesthesia. Stakeholders consider altogether that consumers, instead of producers should support extra cost entailed by anaesthesia and to a lesser extent for immunocastration.

6.2. Differences in attitudes towards pig production aspects, castration and alternatives by countries

As a result of the PCA it can be concluded that in general NGOs, and in a weaker way Government/Administration are against castration and in favour of natural state of the animals and veterinarians, producers (main stream) and slaughter plants in favour of castration.

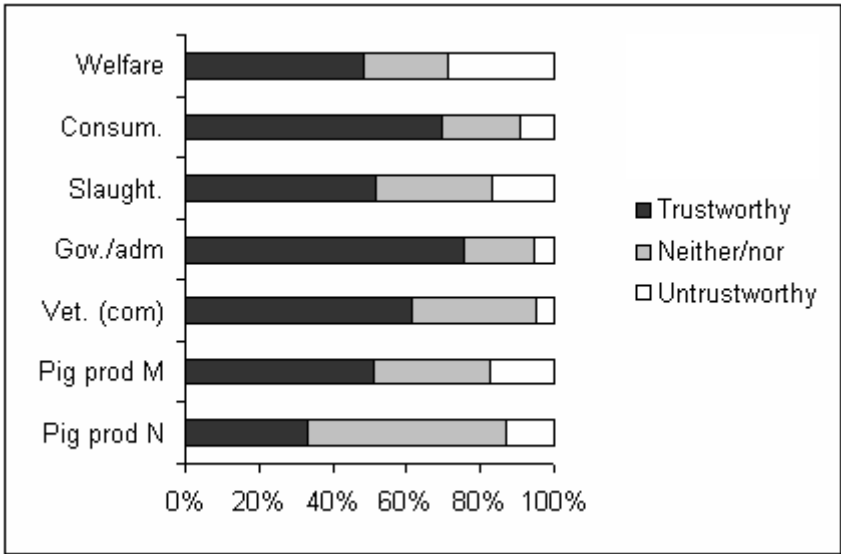
Moreover the PCA allows classifying the countries in 4 groups according to their opinion about castration from the results of this survey. United Kingdom, Greece and The Netherlands are more clearly against castration. Portugal, Ireland and Finland are moderately against castration. Spain, France, Austria, Denmark, Sweden, Switzerland, Norway, Estonia, Slovenia, Poland, Germany and Lithuania had an undecided position about castration. Finally Cyprus, Italy, Slovakia, Hungary, Belgium and Latvia can be considered moderately in favour of castration. However some differences can be observed when the average per country and stakeholder is considered (in special with respect to the attitudes of Spain and Germany (more in favour of castration) and Belgium (more in the group of countries considered as *undecided*).

When the different countries were studied in relation to the percentage of males castrated/country some differences can be found with respect to attitudes. Animal welfare NGO's have similar behaviour. However consumers of countries that produce mainly castrates (Cast90%) are placed in the area "against castration" while for countries that produce mainly entire (Cast 0% + Cast 30%) they are placed in the opposite situation. Same situation was found for Administration/Government. Slaughter plants were placed "against castration" in entire countries and in the opposite side in Cast90% countries. Producers (main stream) were not positioned in entire countries and they were in the "yes" castration side for Cast90% countries.

7. Trust in Institutions in ensuring acceptable piglet welfare

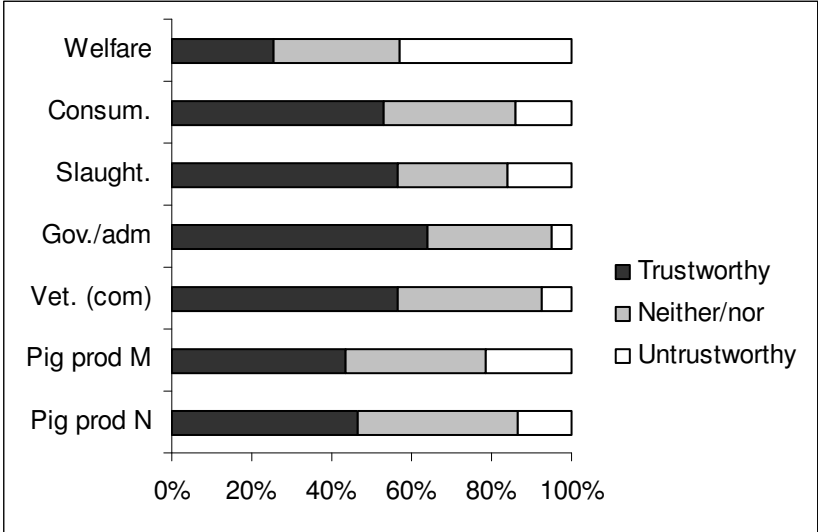
In the last section of the questionnaire, stakeholders were asked to choose the most trustworthy institution for ensuring acceptable standards of piglet welfare. Institutions included the EU, National Government, the Veterinarian Associations, Food Retailers, Food Industry / Meat Processors, Farmers, Consumer Organisations, Animal Welfare Organisations, and Environmental Organisations.

Figure 51. Q45. How trustworthy would you find the EU for ensuring piglet welfare?



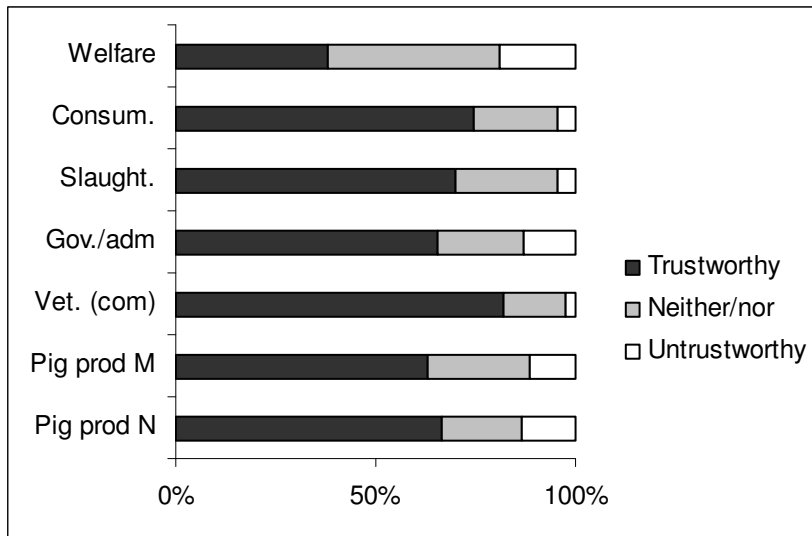
With the exception of animal welfare NGOs, majority of stakeholders trust the EU as a responsible body for ensuring acceptable piglet welfare. However, one is justified to consider the general positive image of the EU as a new phenomenon, not confirmed by previous studies; such change may be linked to the ongoing globalisation of agricultural markets, which may lead some European agricultural stakeholders to consider the EU as a more protective body than the National Governments.

Figure 52. Q46. How trustworthy would you find National Government for ensuring piglet welfare?



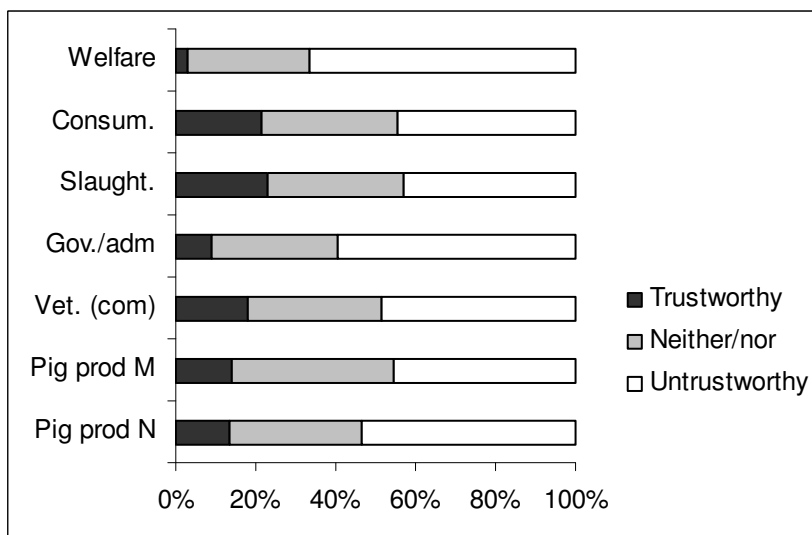
With the exception of animal welfare NGOs, stakeholders trust their National Government for ensuring piglet welfare. Here is made apparent the fact that in the frame of the EU agricultural common policy, National Governments appear as the most reliable intercessors between citizens and the global market; they are protective and therefore trustworthy bodies. However, the relation between the National Government and pig stakeholders carries some ambivalence, because of the high proportions of ‘neither trustworthy nor untrustworthy’ columns.

Figure 53. Q47. How trustworthy would you find Veterinarian Associations for ensuring piglet welfare?



Veterinarians are highly ranked as trustworthy to ensure pig welfare, by almost all the stakeholders, with the exception of animal welfare NGOs. When the animals’ health is at stake, the ‘vet’ is the first to be called for; veterinarians provide care, and possibly technical advice; be they private (commercially driven) or public (civil servant), they are rightly looked on by stakeholders as the genuine people in whom to trust about piglet welfare.

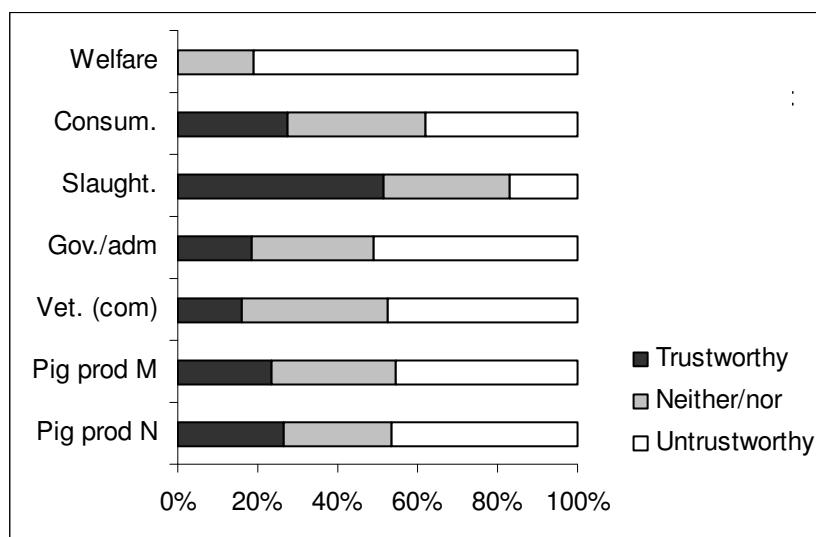
Figure 54. Q48. How trustworthy would you find Food Retailers for ensuring piglet welfare?



Food retailers take up the precise opposite side when compared to the Veterinarians, in the mind of stakeholders. The trend about food retailers is their untrustworthiness, mainly for animal welfare NGOs, followed by Government. Large proportions, among the other

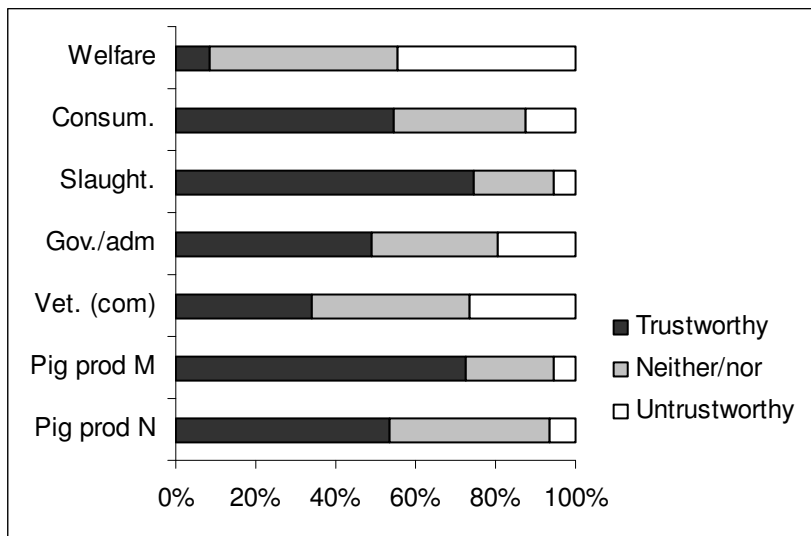
stakeholders also found food retailers neither trustworthy nor untrustworthy. However, the position of food retailers in the food chain, between producers and consumers, make them hardly to blame when pig welfare comes to play.

Figure 55. Q49. How trustworthy would you find -Food Industry, Meat Processors- for ensuring pig welfare?



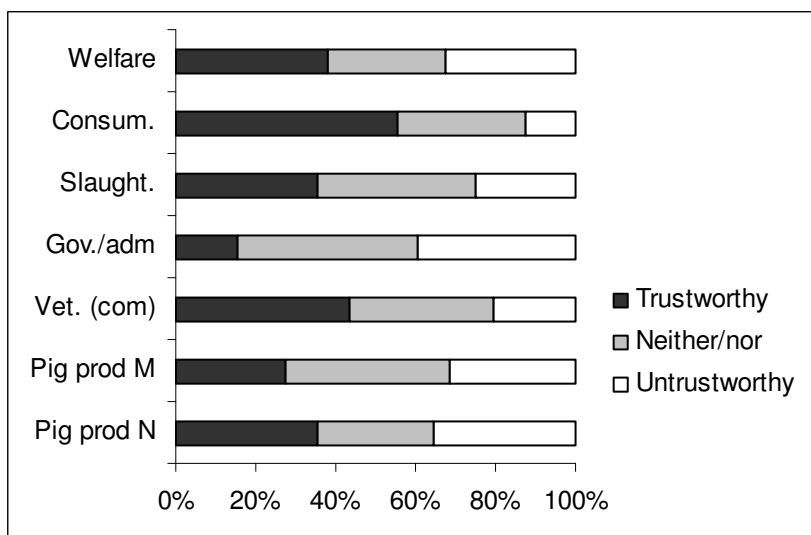
With the exception of slaughterhouses, most of the stakeholders do not trust the food industry and meat processors for ensuring piglet welfare. Animal welfare NGOs come first in the mistrust scale; they are followed by the Government, Veterinarians, and pig producers, while consumers' category take on a middle position, finding Food industry 'neither trustworthy nor untrustworthy'.

Figure 56. Q50. How trustworthy would you find -Farmers - for ensuring piglet welfare?



Farmers benefit from the trust of most of the stakeholders - with the exception of animal welfare NGOs and the veterinarians - to ensure acceptable standards for piglet welfare. Dealing daily with the animals, the farmers also depend on them for their living, so they are rightly perceived as the natural care providers to the animals. Precisely their position set them in tricky situation with both veterinarians and animal welfare NGOs when animal welfare is at stake, as the latter have also their own legitimacy when intervening in the farms.

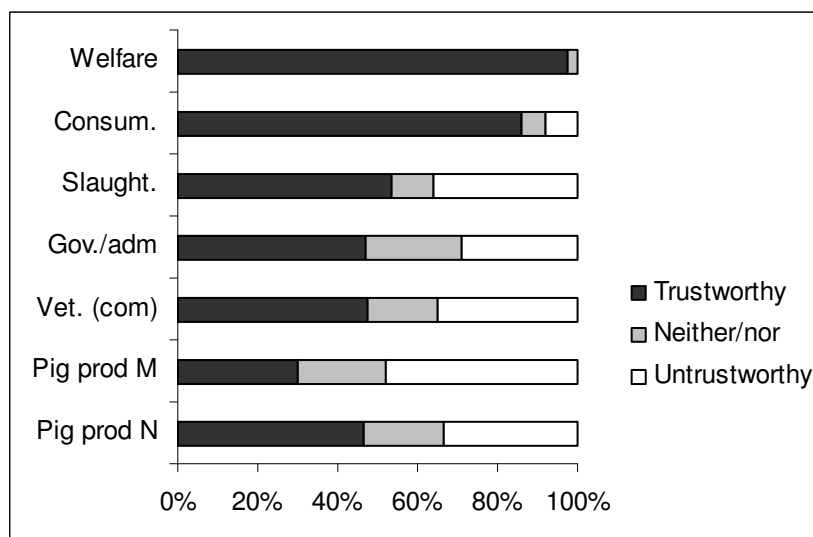
Figure 57. Q51. How trustworthy would you find -Consumer Organisations - for ensuring piglet welfare?



When they consider the relation between consumer organisations and piglet welfare, stakeholders are rather sceptical: they are numerous rating 'neither nor untrustworthy',

including the Government (45%), main stream pig producers (41%), slaughterhouses (40%) and veterinarians (32%). Stakeholders may consider consumer organisation as a potential social force, but not reliable enough in welfare matters.

Figure 58. Q52. How trustworthy would you find -AW Organisations- for ensuring piglet welfare?



Main stream pig producers trust more the Vets than the animal welfare NGOs for ensuring piglet welfare. With the exception of these pig producers, animal welfare NGOs are trustworthy to most of the stakeholders. Because animal welfare is their ‘raison d’être’, animal welfare NGOs may arouse conflict of interests, notably with the conventional farmers, who are at the same time objects and targets of their action.

Summary

Even though it is impossible to make definite conclusions about trust on the grounds of the present survey, there are clear-cut assumptions that the respondents found the EU, National Government, Veterinarians, Farmers, and Animal Welfare NGOs trustworthy for ensuring piglet welfare. On the contrary they mostly do not trust the Food Industry / Meat Processors, neither the Food Retailers.

8. References

PIGCAS home page: <http://w3.rennes.inra.fr/pigcas>

9. Acknowledgements

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