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Paradoxical consumers in four European countries: Meat-eating justification and willingness to pay for meat from animals treated by alternatives to surgical castration

Li Lin-Schilstra [a,*], Arnout R.H. Fischer [b]

[a] College of Economics and Management, Nanjing Agricultural University, Nanjing 210014, Jiangsu, China
[b] Marketing and Consumer Behaviour Group, Wageningen University, Hollandseweg 1, 6706 KN Wageningen, the Netherlands

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ABSTRACT

To prevent boar taint, male piglets are commonly castrated without pain relief, causing them tremendous pain. There are, however, three alternatives, all of which have pros and cons: (1) surgical castration (SC) with pain relief, which removes boar taint but involves extra work for farmers and veterinarians; (2) raising non-castrated or entire male pigs (EM) in combination with a boar-taint detection method; and (3) immuno-castration (IC) by vaccination, which can lower the risk of boar taint acquired from GnRH pulses, but there are concerns about consumer response. The successful marketing of products from animals treated by alternatives to conventional castration depends on consumer acceptance. The current study (involving 3574 participants from Belgium, France, Spain, and Poland) aims to determine whether consumers' willingness to pay for meat from animals treated by alternatives depends on their attitude towards pork, attitude towards local ways of farming, and knowledge of animal welfare. We interpret these in the context of a meat-related moral dilemma and further investigate whether consumers resolve the moral dilemma by applying meat-eating-justification (i.e., apologetic or unapologetic) strategies. The results show that participants are least willing to pay for pork from castrates without pain relief. Willingness to pay for IC pork scores highest, followed by EM. Some consumer groups used an apologetic strategy to reduce the dissonance between moral dilemma and willingness to pay for meat from SC castrates. For the European market, it appears therefore feasible to market pork produced using IC or EM methods.

1. Introduction

Pork and meat in general form part of the human diet in many societies (Hestermann, Le Yaouanq, & Treich, 2019). However, eating meat does not always bring enjoyment. It can also elicit morality-related emotions (Bruckner, 2018), such as shame, guilt (Graça, Calheiros, & Oliveira, 2016), disgust, and even repulsion (Lin-Schilstra & Fischer, 2020). Concern about animal welfare is an important ethical factor that affects consumer preferences for food products (Kallas et al., 2013). Consumers require livestock farming to be carried out in such a way that animals are reared, fed, and housed in conditions that are as close as possible to their natural condition. Consumer demand has driven some producers to adjust their ways of production to be more ethical. For instance, in the Netherlands, the meat industry and animal protection groups have introduced the *"beter leven"* labelling system to communicate with consumers about how well the animal behind the meat product was cared for (Beter Leven, 2016; Thorslund, Aaslyng, & Lassen, 2017).

However, not all producers are proactive in meeting consumers' ethical demands. For reasons such as increased production cost or concerns about consumer acceptance, producers are reluctant to change their ways of treating pigs. Pigs routinely endure a set of painful and invasive surgical procedures such as tail docking, teeth clipping, and surgical castration (SC). Castration has long been applied to mitigate an unpleasant or even offensive odour, called boar taint, which can occur when pork products from non-castrated mature pigs are being prepared and eaten (Towers, 2016). About one-third of consumers are sensitive to boar taint (Aaslyng, Kristensen, Brockhoff, Christensen, & Broge, 2013; Panella-Riera et al., 2016). The risk of boar taint incidence in entire males (EM, i.e., non-castrates) is highly variable and ranges from 1.5%

* Corresponding author.
E-mail addresses: li.lin@njau.edu.cn (L. Lin-Schilstra), arnout.fischer@wur.nl (A.R.H. Fischer).

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to 75% according to various studies (e.g., Font-i-Furnols et al., 2016; Leidig, Hertrampf, Failing, Schumann, & Reiner, 2009). For many pork producers, the fear that consumers will reject pork altogether because of personal experiences with boar taint or reports from others who have experienced boar taint is reason to continue performing castration. In Europe, about 90 million piglets are castrated annually to prevent boar taint. Piglet castration is predominantly conducted without anesthesia and/or analgesia, causing tremendous pain for piglets (Tuyttens, Vanhonacker, Verhille, De Brabander, & Verbeke, 2012). To improve pig wellbeing, 33 stakeholders across the pork chain voluntarily signed the *European Declaration on Alternatives to Surgical Castration of Pigs* in 2010. The goal was to eliminate castration without pain relief by 2012, followed by a second phase – entirely phasing out castration by 2018. Neither goal, however, was reached by 2020. So far, only six countries have passed laws banning castration (Lin-Schilstra & Ingenbleek, 2021). Several countries within the EU have voluntary labelling systems that set criteria for pig castration, and for example in Belgium retailers distribute brochures to inform consumers about their policies for dealing with pig castration. Three alternatives to surgical castration without pain relief are currently proposed to producers: (1) surgical castration (SC) with various types of pain relief[1]; (2) raising non-castrated or entire male pigs (EM) in combination with a detection method that identifies the risk of boar taint; and (3) immuno-castration (IC), which relies on a vaccine against GnRH pulses to disrupt testis growth and steroid synthesis to lower the risk of boar taint.[2]

A major concern for stakeholders in selecting any of these methods is uncertainty about consumer response. Several studies have focused on consumer attitudes and sensory perceptions towards pork products regarding these alternatives (Di Pasquale et al., 2019; i Furnols et al., 2008; Lin-Schilstra, Backus, Snoek, & Mörlein, 2022; Tomasevic et al., 2020). The pork industry depends on consumers' willingness to buy and pay for pork products (Mancini, Menozzi, & Arfini, 2017). Vanhonacker and Verbeke (2011) found that respondents who preferred the immuno-castration method were only moderately willing to pay a price premium. Heid and Hamm (2013b) found that organic consumers were willing to pay more for the pork from EM method than from castrates without pain relief. Consumers sometimes manifest a double standard (Clark, Stewart, Panzone, Kyriazakis, & Frewer, 2017): on the one hand, they want to be good citizens who urge farmers to pay more attention to animal welfare, but, on the other hand, as consumers, they are not willing to pay extra for animal welfare. This double standard may result in a trade-off in consumers' meat-purchasing decisions; for instance, meat-loving consumers weigh their own enjoyment of meat consumption against animal welfare. By moving beyond sensory acceptance and investigating consumers' trade-offs, the pork industry can prioritise the more animal-friendly approaches to deal with boar taint.

This study approaches the castration issue from the perspective of consumer psychology by investigating consumer trade-offs preceding meat-purchasing decisions. The psychology of meat eating is complex and involves a mixture of morality, emotions, cognitions, and personal characteristics (Loughnan, Bastian, & Haslam, 2014). A large number of theoretical studies show the importance of consumer psychology for meat-related behaviours, including moral psychology, for meat purchase and consumption (De Backer & Hudders, 2015; Mameli, 2013). Modern marketing approaches particularly address the role of morality in consumer food choices; moral consumerism refers to consumption that takes moral considerations into account (Tang et al., 2016). In recent decades, moral consumption has become a topic in books, advertisements, and social media (Lewis, 2018). Moral consumerism includes consideration of ethical attributes, whereby consumers are willing to pay for meat products that are produced with concern for ethical attributes, including health-related, environmentally friendly, and animal-friendly attributes (Grunert, Sonntag, Glanz-Chanos, & Forum, 2018). In our case, piglet castration relates to animal-friendly attributes.

Moral considerations may lead to a psychological tension, whereby consumers on the one hand want to enjoy eating meat yet on the other hand are concerned about animal wellbeing. The tension between widespread regard for animal lives and at the same time abundant meat consumption is generally referred to as the *meat paradox* in consumer studies. Furthermore, the paradoxical nature of meat consumption has become more prevalent through the growing awareness of animal welfare over the last two centuries (Ursin, 2016). To date, most consumer research into the meat paradox has looked at the paradox between consumers' reluctance to kill animals and their appetite for meat (Rothgerber, 2019; Van der Weele & Driessen, 2013), questioning the morality of killing animals for food. However, for many consumers, eating moderate amounts of meat from animals that have lived a good life and been slaughtered in a humane way is not morally unsound (Foer, 2009; Hölker, von Meyer-Höfer, & Spiller, 2019) and hence not necessarily paradoxical. A recent integrative review suggests that consumers' experience of moral dilemma applies not only to whether to eat meat from once-living animals but also to whether to choose meat products produced with a high regard for animal welfare (Lin-Schilstra & Fischer, 2020). The current paper provides empirical support for the assumed moral decisions in selecting meat produced using better animal welfare practices.

2. Theoretical background and framework development

To deal with the cognitive dissonance raised by the meat paradox, consumers can take two paths: (1) change behaviours, for example, becoming vegetarian/vegan; (2) change attitudes to justify existing behaviour. Previous studies have identified several strategies that facilitate attitude change. The strategies can be explicit and unapologetic, such as denying that animals are sentient beings, embracing a pro-meat position, or justification based on humans' nutritional needs (e.g., Gómez-Luciano, de Aguiar, Vriesekoop, & Urbano, 2019). Studies show that consumers who use unapologetic meat-eating-justification strategies are unlikely to substitute meat even though they evaluate a production system as unacceptable (Hartmann & Siegrist, 2020). Indirect and apologetic approaches such as dissociation of meat from its animal origins and avoiding thoughts about once-living animals may also help to reduce the dilemma experience (Benningstad & Kunst, 2019). How consumer-justification strategies in combination with different alternatives to conventional castration result in purchase decisions is both theoretically relevant for understanding moral consumer behaviour and practically relevant as it can support the pork industry to develop marketing approaches for different alternatives.

2.1. Consumers' attitudes, knowledge of animal welfare, and the dilemma experience

Most meat-eaters like to eat meat but do not want to harm animals. This paradox relates to cognitive dissonance – a psychological situation in which beliefs, attitudes, or behaviours conflict with one another (Festinger, 1962; Oshikawa, 1969). Such dissonance causes an experience of discomfort (Aronson, 2004; Littlejohn & Foss, 2005). Morality is central to the meat paradox, as psychologists argue that meat consumption can have a negative impact on the moral self-esteem of

[1] SC can be practiced with pain relief, notably general or local anesthesia and/or analgesia. General anesthesia suppresses the activity of the central nervous system to cause unconsciousness and a total lack of sensation. Local anesthesia blocks the transmission of nerve impulses from a specific part of the body. Analgesia leads to the loss of the ability to feel pain without the loss of consciousness.

[2] Immuno-castration is an active immunisation against the gonadotropin-releasing hormone (GnRH), a key hormone of the endocrine cascade regulating reproductive functions. The treatment requires at least two injections of Improvac® vaccines during the fattening period.

individuals because killing an animal can be viewed as a violation of personal norms of life preservation. Such arguments are becoming increasingly prevalent and emphasised. Tian, Hilton, and Becker (2016) posited the meaning of the meat paradox in different contexts as "the association of liking to eat meat but not wanting to kill animals". This has resulted in the claim that meat-eating behaviour is itself a moral issue (Van der Weele & Driessen, 2013), especially in Western societies (Vanhonacker, Verbeke, Van Poucke, & Tuyttens, 2007). The moral dilemma experience associated with eating meat becomes salient when the media report the cruelty of intensive husbandry. The disturbing stories and images in many of such media reports (e.g., Horwich, 2020) may remind consumers that purchasing animal products from intensive framing is in fact supporting cruel treatments to animals and is thus morally unsound. This argument is, however, more an argument against poor animal welfare in intensive farming than against meat consumption per se (Schröder & McEachern, 2004). Following this line of reasoning, consumers could resolve the moral dilemma by eating ethically sound meat, such as free-range poultry or grass-fed beef (Lin-Schilstra & Fischer, 2020). The outcome of dealing with the moral dilemma may then be that consumers are willing to pay more for meat from animals that have had a good life and were humanely slaughtered.

Attitudes, perceptions, or knowledge could intervene in a person's information processing and judgements towards meat consumption (Hung, de Kok, & Verbeke, 2016). Attitudes reveal a person's affective evaluations towards an object, in terms of liking or disliking it (Petty & Krosnick, 2014). The relationship between attitudes and behaviour has been extensively researched in consumer studies (Verbeke & Viaene, 1999). Consumers with more favourable attitudes towards meat are less likely to reduce meat consumption (Hayley, Zinkiewicz, & Hardiman, 2015), because the more consumers are in favour of meat, the less likely they are to experience moral dilemma. In addition, it is found that people who are positive about their own local meat production system are more confident about the morality of meat (Hoffmann, 2000; Vanhonacker, Van Poucke, Tuyttens, & Verbeke, 2010). Negative attitudes can relate to emotional responses. For example, Fessler, Arguello, Mekdara, and Macias (2003) show that consumers' moral beliefs can trigger disgust reactions to meat. Negative attitudes towards local farming could contribute to negative beliefs and thus provoke stronger feelings of moral dilemma.

Consumers may have concerns about animal wellbeing prior to purchase. Previous studies have shown that moral concerns over animal welfare are among the most important reasons for reducing meat consumption and take precedence over concerns about health effects and the environment (de Boer, Schösler, & Aiking, 2017; Fessler et al., 2003; Ruby & Heine, 2012). De Backer and Hudders (2015) found that concerns over animal welfare set vegetarians and flexitarians apart from full-time meat-eaters. For a growing number of consumers who follow vegan diets, the animal welfare concern is the main reason to reject any animal product (Janssen, Busch, Rödiger, & Hamm, 2016; Miguel, Coelho, & Bairrada, 2021). Concern about animal welfare is likely to play a role in meat choices for those consumers who have more knowledge about animal welfare and about the potential detrimental effects of intensive meat production and consumption. Knowing the impact of industrial meat production on animals may provoke moral concerns over animal wellbeing. Thus, people with more knowledge of animal welfare will experience a stronger conflict between pursuing hedonic goals (e.g., good taste, nutrition, or cheap) and altruistic goals (e.g., morality) than people with less knowledge.

Hypothesis 1a. Consumer attitudes that are more positive towards pork meat reduce the moral dilemma experience relating to meat consumption.

Hypothesis 1b. Consumer attitudes that are more positive towards local farming reduce the moral dilemma experience relating to meat consumption.

Hypothesis 1c. More knowledge of animal welfare increases the moral dilemma experience relating to meat consumption.

Recent studies focusing on the meat paradox and cognitive dissonance assume that meat-eaters need to resolve the meat dilemma and its associated psychological discomfort (e.g., Loughnan, Haslam, & Bastian, 2010). The dilemma revolves around conflicting attitudes, beliefs, and behaviours related to meat consumption (Rothgerber, 2019). As meat-eaters are confronted with the inconsistency of meat-eating enjoyment and moral principles, they may attempt either to make some behavioural change (Rothgerber, 2013) or to adjust their attitudes. The outcome of dealing with the moral dilemma is not necessarily vegetarianism or veganism, as research has shown that people who experience such dilemmas merely intend to reduce their meat consumption (Berndsen & Van der Pligt, 2004) or opt for more animal-friendly ways to eat meat. Hence, we hypothesise that the effect of meat-eating attitudes, perceptions of local meat production, and knowledge about animal farming is mediated by experienced moral dilemma such that:

Hypothesis 2. Consumers' moral dilemma experience mediates the relationship between their attitude to meat, attitude to local farming, knowledge of animal welfare, and willingness to pay for products from animals treated by (a) SC without pain relief, (b) IC, and (c) EM compared with SC with pain relief.

2.2. *Justification of meat consumption*

The moral dilemma experience is a situation of psychological discomfort that people have to resolve, because the discomfort induced by a moral dilemma is emotionally disturbing (Onwezen & van der Weele, 2016; Rosenfeld, 2020). To cope with the mismatch between moral principles and pursuing enjoyment by eating meat, people could choose to reduce meat consumption or to selectively disengage from their moral principles (Bandura, 1999; Buttlar & Walther, 2018, 2019; Graça, Calheiros, & Oliveira, 2014). Using direct strategies, they defend their choice to eat meat by believing that eating meat is natural, normal, necessary, and nice (the 4 N's, Piazza et al., 2015). Consumers also use indirect strategies, such as dissociating or avoiding thoughts of animal suffering. Both strategies involve a moral disengagement mechanism, through which people selectively deactivate moral self-regulation to reduce dissonance when they start to consider the damage associated with their own behaviour (Mitchell, 2011). De Backer and Hudders' (2015) finding – that attitudes not only towards meat, but also towards animal welfare set full-time meat-eaters apart from vegetarians and flexitarians – suggests that morally disengaging from animal welfare issues may be one way to resolve the dilemma. Other studies have shown that people attribute a lower mental capacity to food animals (Bratanova, Loughnan, & Bastian, 2011). Hsiao (2015, 2017) even argued that animals lack the capacity for rational agency and that they should not be granted moral status, and hence, if humans want to eat animals, they have the right to do so. Through such arguments, moral concerns about eating animals or treating them poorly are reduced (Bilewicz, Imhoff, & Drogosz, 2011). These and other arguments about why animal welfare is not central to meat consumption can be summarised in nine strategies to reduce meat-related cognitive dissonance: avoidance, dichotomisation, dissociation, denial of animal pain, fate justification, health justification, hierarchical justification, pro-eat justification, and religious justification (Rothgerber, 2013). People who apply one or more of these strategies are less likely to resolve the meat dilemma by choosing more animal-friendly products.

Hypothesis 3. Increasing the level of meat-eating justification weakens the relationship between individuals' experience of moral dilemma and their willingness to pay for meat products from animals treated by (a) SC without pain relief, (b) IC, and (c) EM compared with SC with pain relief.

2.3. The research model

In summary, this study hypothesises that attitude to pork (H1a), attitude to local farming (H1b), and knowledge of animal welfare (H1c) contribute to the moral dilemma experience, which serves as a mediator for these effects towards the willingness to pay for animal-welfare-friendly products (H2). Finally, we hypothesise that the way in which consumers justify their meat-eating behaviour moderates the relation between dilemma experience and willingness to pay (Fig. 1). This model was tested in a large-scale survey across four EU countries.

3. Methods

3.1. Data collection

A pilot study was conducted in a Belgian institute before large-scale data collection was launched in four European countries (Belgium, France, Spain, and Poland). Sixty-eight students and staff from the Belgian institute participated in the pilot study, which was intended to investigate the feasibility of communicating the differences in the three methods for managing boar taint (SC, IC, and EM) and to provide initial evidence on the relationship between key variables. The main survey was administrated by Lightspeed Online Research, a private marketing research and analysis company with offices across Europe. The data were collected simultaneously in the four countries from mid-April to early-June 2019. The company performed random sampling among its existing panels in each country. Participants' screening criteria were: (1) include respondents who eat pork; (2) exclude people who are under 18 or over 70 years of age. The respondents received a small reward for participating.

3.2. Measures

Several constructs were measured: (1) attitude towards pork; (2) attitude towards local farming; (3) knowledge of animal welfare; (4) experience of dilemma; (5) meat-eating justification; (6) willingness to pay for meat products from animals treated by the three methods. The final survey was translated/back-translated into Flemish Dutch, French, Polish, and Spanish. A 115-s video with explanations of each castration method was embedded in the survey. The content validity of the video was supported by a group of experts in consumer studies and animal science (English script in Appendix A; translated scripts and videos are provided in supplementary material). The video was played after participants responded to questions relating to their demographic characteristics and the first five constructs. After watching the video, participants indicated their willingness to pay for different types of pork (construct 6).

Attitude towards pork was measured with five semantic differential scales completing the statement "Overall, I think eating pork is…" (Berndsen & Van der Pligt, 2004). Attitude towards the local farming status of animal welfare was measured by completing the statement "Overall, I believe the current state of farm animal welfare in [Belgium/France/Spain/Poland] is…". (Vanhonacker et al., 2007). For both attitudes, the 7-point options were anchored at bad–good, unpleasant–pleasant, against–for, unfavourable–favourable, and negative–positive.

Knowledge about general farm animal welfare was assessed using four items on Flynn and Goldsmith's (1999) 7-point scale, ranging from totally disagree to totally agree. An example statement was: "I have a lot of knowledge about how farm animals are kept".

Explicit assessment of dilemma was adopted from Péneau et al.'s (2017) dilemma measurement. Participants indicated whether a dilemma, and which dilemma, appeared to be the most obvious: "When buying pork, my doubt is mostly between: (1) animal-friendly and cheap; (2) animal-friendly and tasty; (3) animal-friendly and healthy; (4) cheap and tasty; (5) cheap and healthy; (6) tasty and healthy; or (7) No, I never have doubts". They were asked to identify their single most important dilemma. Participants choosing option (7) were directed to the question: "I never have doubts when purchasing pork, because I always buy the [cheap/animal-friendly/healthy/tasty] pork". These categories were then grouped into four categories: extreme-hedonic eaters (subcategory 1, $N = 802$, 22.4%); hedonic-dilemma eaters (subcategory 2, $N = 1339$, 37.5%); moral-dilemma eaters (subcategory 3, $N = 1380$, 38.6%); extreme-moral eaters (subcategory 4, $N = 53$, 1.5%). Extreme-moral eaters always buy animal-friendly products. Moral-dilemma eaters experience doubt between animal friendly and other hedonic dimensions, i.e., (1), (2), and (3). Hedonic-dilemma eaters experience doubt among hedonic dimensions, i.e., (4), (5), and (6). Extreme-hedonic eaters have no doubt regarding either morality or hedonic concerns, i.e., those who always buy the [cheap/healthy/tasty] pork.

Meat-eating justification (MEJ) was measured with the 27-item MEJ scale (Rothgerber, 2013), consisting of nine 3-item subscales rated on a 1–7 scale (1 = strongly disagree; 4 = neutral; 7 = strongly agree). Example items include "Meat is essential for strong muscles" and "Animals do not feel pain the way humans do".

Videos were recorded in local languages and shown to participants. After seeing the video, 142 participants decided not to buy pork regardless of production method ($n_{Spain} = 32$; $n_{France} = 36$; $n_{Belgium} = 35$; $n_{Poland} = 39$). Their willingness to pay (WTP) was set at 0. The remaining 3432 participants responded to a two-stage contingent valuation WTP measure (cf. Fischer et al., 2016) for three methods (SC without pain relief, immuno-castration, and entire males) were measured relative to SC with pain relief.[3] The reason for choosing the two-stage contingent valuation WTP measure was to understand participants' acceptance for three methods. The reference price for SC with pain relief was set at 9 Euros/kg in Belgium and France, 6 Euros/kg in Spain, and 18 Złoty/kg (4.2 euros/kg) in Poland, based on local markets. We first asked respondents "The market price now for products from pigs castrated with pain relief is [9 Euros/kg, 6 Euros/kg, 18 Złoty/kg]. Would you buy products from [surgically castrated pigs without pain relief/immuno-castrated pigs/entire male pigs]?". The choices were "No, I won't buy it no matter what the price is", "Yes, I will probably buy it if it's cheaper", "Yes, I will buy it for [9 Euros/kg, 6 Euros/kg, 18 Złoty/kg]", "Yes, I may also accept a higher price". If the answer was "No, I won't buy it no matter what the price is", WTP was set at 0. If the reference price was chosen, WTP was set at the reference price. If participants indicated that they would buy at a lower price, they could indicate their WTP on a slider from 0 to the reference price (e.g., 0–9 Euro). If they indicated a higher price, they could indicate their WTP from the reference to twice the reference price (e.g., 9–18 Euro). To compare different countries, WTP was expressed as a proportion of the reference price (e.g., 9 was set at 1, 0 Euro at 0, and 18 Euro at 2). Willingness to pay for each castration method was then calculated as the average across all participants. A similar approach was applied by Fischer et al. (2016).

Control variables. We follow past research on meat consumption in including sex, age, and level of education as control variables (Beardsworth & Bryman, 2004; Verbeke, 2000). Level of education was specified at four levels: (1) primary (up to 8 years); (2) secondary (up to 14 years); (3) university (bachelor) (up to 18 years); (4) university (master and above). Age was measured in 5-year age groups, except for the first group: (1) 18–25; (2) 25–29; (3) 30–34; (4) 35–39; (5) 40–44; (6) 45–49; (7) 50–54; (8) 55–59; (9) 60–64; (10) 65–69, analysed as intervals. To measure pork consumption frequency, participants indicated how many times per week they buy/consume pork in: (1) supermarket; (2) butcher; (3) canteen/restaurant; (4) others; with weekly consumption calculated as the sum across all locations.

[3] We selected surgical castration as that is currently the least animal-friendly method promoted in Europe. Surgical castration without pain relief was added as this used to be the default option and remains in widespread practice.

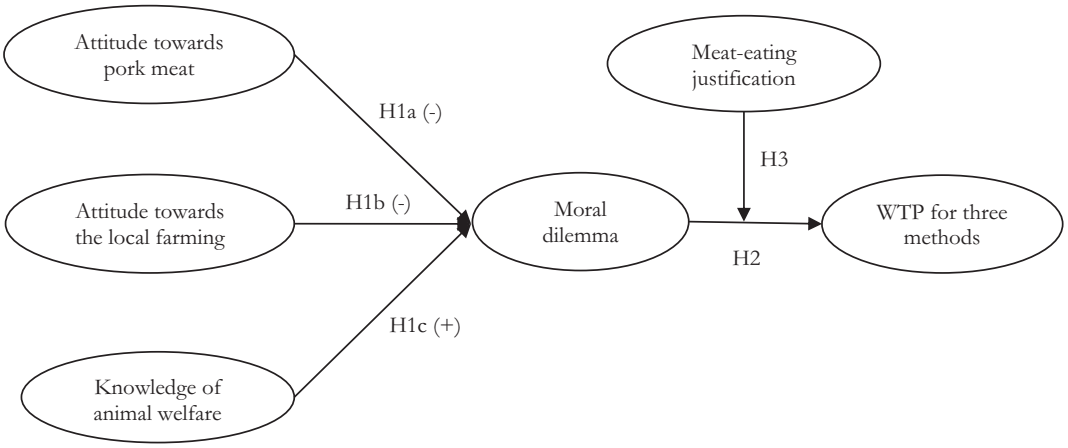

Fig. 1. The conceptual model (WTP = Willingness to pay).

3.3. Data analysis

As we applied the maximum likelihood estimation procedure, the first step was to explore data and confirm the normality of distributions using SPSS 25. Measurement invariances were tested using AMOS. To accommodate the nested nature of the data, R Lavaan (Rosseel, 2012) was used to test the structural equation model (SEM), which allows simultaneous estimation of multiple indirect paths while providing model fit indices.

4. Results

The analysis of the pilot study indicated differences between WTP for the presented methods. Specifically, the WTP for IC products was higher than for EM products. Consistent with Vanhonacker, Verbeke, and Tuyttens (2009) and Aluwé et al. (2020), WTP for SC without pain relief was on average the lowest. Thus, we could assume that all respondents were equally informed and could understand the procedures of each practice. Second, results showed similarity in MEJ structures compared to the original Rothgerber (2013) study, suggesting that the Dutch translation of the instrument is robust. Because of the small sample size ($N = 68$) and convenience sampling among student and university staff, we could not relevantly test for hypotheses.

4.1. Descriptive analysis

A total of 3574 consumers from four countries (Belgium $n = 825$ (23.1%), France $n = 913$ (25.5%), Spain $n = 914$ (25.6%), Poland $n = 922$ (25.8%)) completed the survey for the large-scale study (further sample description in Table 1).

Consumers responded to a two-stage contingent valuation WTP measure. Table 2 displays the outcome of the first stage. Participants in surveyed countries show similar pattern of WTP for three methods. For the method of SC without pain relief, about half of consumers stated their strong opposition by stating "No, I won't buy it no matter what the price is". IC method receives the most acceptance: between 60% to 70% of consumers are willing to buy meat from IC if the price remains the same as the reference price or cheaper. For EM method, Polish consumers indicated the strongest opposition with 52% of participants being unwilling to buy EM products regardless the price; while around 30% of consumers from Spain, France, and Belgium were unwilling to accept EM.

Consumers in the four dilemma groups differ in their WTP for each method. Fig. 2 shows the average WTP for meat from animals treated by surgical castration without pain relief, immuno-castration, and entire males in comparison to SC with pain relief across four groups of hedonic-

Table 1
Demographic characteristics of respondents ($N = 3574$).

	Overall sample % or mean (sd)	Belgium % or mean (sd)	France % or mean (sd)	Spain % or mean (sd)	Poland % or mean (sd)
n		825	913	914	922
Age group[a]	35–39 (2.58)	35–39 (2.70)	35–39 (2.61)	30–34 (2.44)	35–39 (2.57)
Sex[b]					
Male	49.02%	50.49%	48.34%	48.24%	49.13%
Female	50.98%	49.51%	51.65%	51.76%	50.87%
Education[c]					
Primary	2.80%	4.30%	2.74%	2.74%	1.74%
Secondary	45.80%	43.00%	47.04%	41.40%	51.57%
University (bachelor)	29.20%	35.56%	33.00%	36.91%	12.05%
University (master and above)	22.10%	17.17%	17.22%	18.95%	34.64%
Pork consumption/ purchase frequency (times per week per location)					
Supermarket	2.05 (0.68)	2.01 (0.61)	2.05 (0.62)	2.11 (0.72)	2.01 (0.77)
Butcher	1.75 (0.77)	1.53 (0.74)	1.53 (0.73)	1.87 (0.75)	2.05 (0.72)
Canteen	1.39 (0.79)	1.22 (0.70)	1.42 (0.77)	1.48 (0.84)	1.45 (0.80)
Others	0.64 (0.74)	0.59 (0.82)	0.59 (0.72)	0.57 (0.68)	0.78 (0.79)
Total	5.82 (1.88)	5.34 (1.66)	5.60 (1.77)	6.02 (1.94)	6.29 (1.96)
Willingness to pay (relative to reference price as 1)					
SC without pain relief	0.37 (0.45)	0.40 (0.45)	0.36 (0.47)	0.36 (0.45)	0.37 (0.43)
IC	0.63 (0.45)	0.65 (0.44)	0.59 (0.47)	0.66 (0.47)	0.64 (0.45)
EM	0.51 (0.47)	0.53 (0.46)	0.57 (0.48)	0.56 (0.48)	0.37 (0.45)

[a] Five-year age groups.
[b] Female = 1, Male = 2.
[c] Primary (up to 8 years) = 1; Secondary (up to 14 years) = 2; University (bachelor) (up to 18 years) = 3; University (master and above) = 4.

Table 2
First-stage WTP measure for three methods in four countries.

	Spain	France	Belgium	Poland
Surgical castration without pain relief				
No, I won't buy it no matter what the price is.	54%	53%	49%	52%
Yes, I will probably buy it if it's cheaper.	26%	24%	30%	31%
Yes, I will buy it for the same price.	15%	17%	17%	14%
Yes, I may also accept a higher price.	5%	6%	5%	3%
Immunocastration				
No, I won't buy it no matter what the price is.	24%	30%	22%	25%
Yes, I will probably buy it if it's cheaper.	38%	34%	38%	39%
Yes, I will buy it for the same price.	27%	26%	31%	27%
Yes, I may also accept a higher price.	11%	10%	10%	9%
Entire male				
No, I won't buy it no matter what the price is.	33%	30%	34%	53%
Yes, I will probably buy it if it's cheaper.	38%	35%	39%	29%
Yes, I will buy it for the same price.	20%	23%	18%	13%
Yes, I may also accept a higher price.	9%	11%	9%	5%

moral eaters. The immuno-castration method is favoured the most by all groups, followed by the entire-male method (except for the extreme-moral group). The most animal-unfriendly option (SC without relief) is rated the lowest, even among extreme-hedonic eaters.

4.2. Assessment of common method bias and multicollinearity

To screen for common method bias and multicollinearity in the data, we applied Harman's single-factor analysis (Jin, Lin, & McLeay, 2020; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Common method bias can result in artificially high covariances when the same respondent reports on multiple variables. The results suggest that common method bias is not a serious issue, as variance explained by analysing all answers as a single factor is 29.94%, which is less than the benchmark of 50%. A multiple regression model with demographics and antecedents showed no indications of problematic multicollinearity (largest VIF = 1.6).

4.3. Confirmatory factor analysis of MEJ scale

Principle component analysis with Promax rotation was performed to explore whether the structure of all meat-eating-justification components in the data aligned with the original scale. This analysis outcome showed that the items from the dichotomisation component had high cross-loadings and poor loading performance on the MEJ construct. Similar results were found in Rothgerber (2013). Therefore, the dichotomisation component (three items) was omitted.

Substantial correlations were found among six factors (health justification, fate justification, hierarchical justification, pro-meat justification, religious justification, and denial) and between two factors (avoid and dissociate) (Appendix B Table 1). This suggests that there might be two higher-level latent factors distinguishing between unapologetic (denial, religious justification, hierarchical justification, fate justification, health justification, and pro-meat) and apologetic (avoid and dissociate) meat-eating justifications, similar to Hartmann and Siegrist (2020). A confirmatory factor analysis confirmed the hierarchical factor analysis, showing acceptable fit: RMSEA = 0.08 (Browne & Cudeck, 1992), CFI = 0.89 (Bentler, 1990), and TLI = 0.86 (Tucker & Lewis, 1973).

4.4. Measurement invariance across countries

The second step of the analysis was to establish the measurement models across the four countries and associated translations. Multigroup confirmatory factor analysis was performed using IBM SPSS AMOS 25 Graphics. Following the procedure suggested by Steenkamp and Baumgartner (1998), tests for measurement invariance, configural (testing the presence of relationships between items and constructs), metric (testing the similarity of item loadings), and scalar (testing means scores), were performed separately. The results of the invariance test (configural, metric, and scalar) support the measurement invariance of attitude to meat, attitude to local farming, and knowledge of animal welfare. For the two second-order factors: unapologetic and apologetic MEJ, the results show configural and metric invariance but no scalar invariance. However, scalar invariance can be considered indicative of cultural differences between countries rather than measurement issues (Steenkamp & Baumgartner, 1998); hence, we consider the factor structure sufficiently stable to include it in further analyses. For the detailed analytical procedure see supplemental material (Appendix B Table 2).

4.5. Hypothesis testing

In the SEM, the overall fit measures of the full model indicate that the model fits well (WTP for SC without pain relief: CFI = 0.90, TLI = 0.89, RMSEA = 0.05, SRMR = 0.06; WTP for immuno-castration: CFI = 0.90, TLI = 0.89, RMSEA = 0.05, SRMR = 0.06; WTP for entire males: CFI = 0.90, TLI = 0.89, RMSEA = 0.05, SRMR = 0.06). All the values for fit indices comply with the recommended threshold suggested by Bagozzi

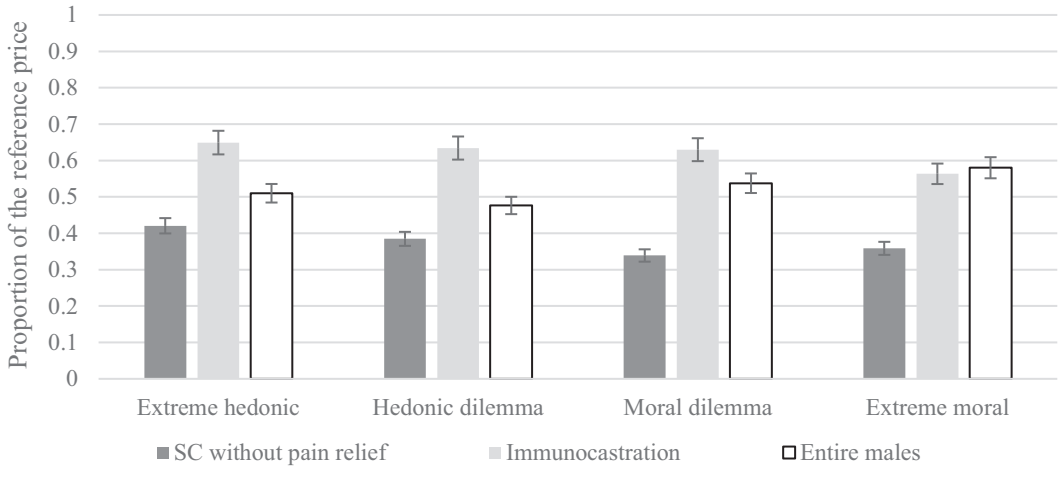

Fig. 2. Average willingness to pay for the three methods (as proportion of the reference price). The error bars represent 95% confidence interval.

and Yi (2012).

The results of the SEM are presented in Tables 3 and 4. To test the impact of attitudes and knowledge on dilemma, first a baseline model with participants' age ($\beta = -0.135$, $p < .001$), sex ($\beta = -0.035$, $p < .10$), and education ($\beta = -0.023$, ns) was estimated. In support of our hypotheses, the effect of attitude to meat ($\beta = -0.052$, $p < .10$), attitude to local farming ($\beta = -0.094$, $p < .001$), and knowledge of animal welfare ($\beta = 0.215$, $p < .001$) significantly influenced dilemma in the predicted direction. Thus, Hypotheses 1a, 1b, and 1c are supported.

4.5.1. Mediation effect

To test Hypothesis 2, we first estimated models (M1.1, M2.1 and M3.1) where WTP for three methods was predicted by demographics and attitudes and then added dilemma. Consumers' attitude to local farming had positive impacts on WTP for SC without pain relief ($\beta = 0.158$, $p < .001$; M1.1), but negative impacts on WTP for EM ($\beta = -0.074$, $p < .05$; M3.1), and no impact for IC (M2.1).

When dilemma was subsequently added, for SC without pain relief (M1.1 vs M1.2) and EM (M3.1 vs M3.2), marginal improvements of the model were found and a significant effect of dilemma in the expected direction (higher dilemma, lower WTP for animal unfriendly, no pain relief meat; higher dilemma, higher WTP for possibly tainted EM meat). No effect of dilemma on WTP for IC was found (M2.1 vs M2.2). As pre-existing effects of attitude changed only marginally, we found evidence of partial mediation only for SC without pain relief and EM, providing partial support for Hypotheses 2a and 2c.

4.5.2. Moderating impact of MEJ on the relationship between dilemma experience and WTP

To test the interaction effect of the second-order MEJ constructs (apologetic and unapologetic), the main effects and interaction effects (mean centred) between dilemma and the two MEJ constructs were tested (Table 4). For SC without pain relief (M1.3), we found a (non-hypothesised) main effect of unapologetic MEJ on WTP ($\beta = 0.185$, $p < .001$) but no interaction effect, a (non-hypothesised) main effect of apologetic MEJ ($\beta = -0.094$, $p < .001$) on WTP, and also an interaction effect of apologetic and dilemma on WTP ($\beta = 0.051$, $p < .05$) to the extent that the higher apologetic MEJ for a high dilemma increased WTP for SC without pain relief (i.e., for people who have high apologetic MEJ, moral dilemma was compensated). For IC (M2.3), only a non-hypothesised main effect for unapologetic MEJ was found ($\beta = 0.078$, $p < .05$). For EM (M3.3), no effects of MEJ were found. Hence, we find partial support for Hypothesis 3a (SC without pain relief).

The final tested model is depicted in Fig. 3.

5. Discussion

This research investigated how consumers' knowledge of animal welfare and their attitudes towards pork and local farming regimes influence their experience of hedonic-moral dilemmas and consequently affect their willingness to pay for pork products produced using various farming methods (namely, surgical castration without pain relief, immuno-castration, and entire-male solutions). Through the lens of moral disengagement theory, our study demonstrates that an apologetic meat-justification strategy plays a role in dealing with the dilemma experience of animal-friendly meat in relation to consumers' willingness to pay.

Table 3
Results of direct effects.

Relationships	Estimates (sig. level)	Proposed effect	Decision
H1a: Attitude towards meat → Moral dilemma	−0.052***	Negative	Accept
H1b: Attitude towards local farming → Moral dilemma	−0.094***	Negative	Accept
H1c: Knowledge of animal welfare → Moral dilemma	0.215***	Positive	Accept
Moral dilemma → WTP for SC without pain relief	−0.039***	Negative	Accept
Moral dilemma → WTP for immuno-castration	−0.012(NS)	Negative	Not supported
Moral dilemma → WTP for entire males	0.020*	Negative	Accept

* $p < .10$.
*** $p < .001$.

5.1. Theoretical implications

Less than half the participants experienced a moral dilemma about eating meat (i.e., the moral-dilemma-eater group). Moral dilemma did not differ by sex or education level. Participants who reported a higher level of morality dilemma were younger. Both the current study and Cornish et al. (2020) found that, for meat production, moral dilemma occurs particularly in younger people, implying that they are more engaged with animal-friendly morals. This is in line with increasing activities of animal protection groups that aim to involve young people via diverse education programmes (e.g., Swiss Animal Protection).

The fact that less than half of consumers experience moral dilemma contrasts with other studies that generally report much higher levels of consumer criticism over animal mishandling. A 2015 survey showed that 94% of EU citizens believed it important to protect the welfare of farmed animals and that 82% of them contended that the welfare of farmed animals should be improved (European Commission, 2016). This difference might be explained by the fact that, in the current study, we asked whether people felt friction between personal benefits of eating pork and animal welfare, whereas other studies elicited opinions about animal welfare without a trade-off against personal-benefit consequences. Our study suggests that, when confronted with trading off personal benefits against animal welfare, most people care more about their own hedonic experience, similar to observations of Heid and Hamm (2013b). The lack of a clear trade-off in other animal welfare surveys may explain why consumer claims about interests or concerns for animal wellbeing do not always translate into buying preferences. Hence, our study provides a more realistic case where concerns for animal wellbeing have to be traded off against other attributes in predicting buying preferences. We recommend the systematic inclusion of consumer trade-offs in future animal welfare research.

The hypotheses that knowledge of animal welfare and general attitudes to meat and local farming practices influence consumers' experience of hedonic-moral dilemmas were supported. When consumers have a positive attitude about eating meat or are positive towards local farming, they are less likely to experience moral dilemma. This makes sense, given that these are central elements in meat production systems. The more knowledge one has about animal welfare, the more likely one is to experience moral dilemma. These findings are in line with studies that show that attitudes towards eating meat motivate consumers to choose between being vegetarian, flexitarian, or omnivore (e.g., De Backer & Hudders, 2015; Miranda-De La Lama et al., 2017) and that consumers with additional information on animal welfare standards are more inclined to purchase higher welfare products (Cornish et al., 2020). Some vegans are even open to forms of animal agriculture if animal welfare standards go beyond current practices (Janssen et al., 2016). Therefore, education or animal protection programmes should present clear and understandable knowledge about industrial farming and animal welfare to be effective in raising the public's awareness.

We found that apologetic strategies mitigated the negative effect of experienced dilemma on willingness to pay for the most animal-unfriendly option (SC without relief). This suggests that the strategy of dissociating the animal–food connection and avoiding negative thoughts about animal husbandry is effective in reducing the influence of psychological discomfort when consumers are confronted with products that are not animal friendly. The unapologetic strategy, which denies

Table 4
Results of mediation and moderation effects.

	Willingness to pay (WTP)								
	SC without pain relief			Immuno-castration			Entire males		
	M1.1	M1.2	M1.3	M2.1	M2.2	M2.3	M3.1	M3.2	M3.3
Control variables									
Age[a]	−0.028**	−0.038**	−0.041**	−0.004	0.004	0.005	−0.016	−0.013	−0.013
Sex[b]	−0.128***	−0.125***	−0.106***	−0.066***	−0.066***	−0.066***	−0.097***	−0.098***	−0.092***
Education[c]	0.002	0.003	−0.001	0.053**	0.053**	0.053**	0.071***	0.071***	0.069***
Weekly consumption	0.107***	0.118***	0.116***	0.038*	0.038**	0.030*	0.059***	0.056**	0.056**
Antecedents									
Attitude to meat	0.075**	0.071**	−0.003	0.179***	0.179***	0.144***	0.133***	0.135***	0.125***
Attitude to local farming	0.158***	0.148***	0.083***	0.018	0.017	−0.011	−0.074**	−0.071**	−0.085**
Knowledge of animal welfare	0.045**	0.064***	0.035**	−0.026	−0.025	−0.036**	0.030*	0.025	0.018
Mediating effect									
Dilemma		−0.085***	−0.068**		−0.004	0.004		0.026*	0.031*
Moderating effect									
Unapologetic MEJ			0.185***			0.078**			0.028
Dilemma*unapologetic MEJ			−0.021			0.017			0.011
Apologetic MEJ			−0.094***			0.027			−0.033
Dilemma*apologetic MEJ			0.051**			0.01			0.032
Conclusion		Partial mediation	Partial support for moderation		No mediation	Direct-only effect		Partial mediation	No support for moderation

[a] Five-year age groups.
[b] Female = 1, Male = 2.
[c] Primary (up to 8 years) = 1; Secondary (up to 14 years) = 2; University (bachelor) (up to 18 years) = 3; University (master and above) = 4.
* p < .10.
** p < .05.
*** p < .001.

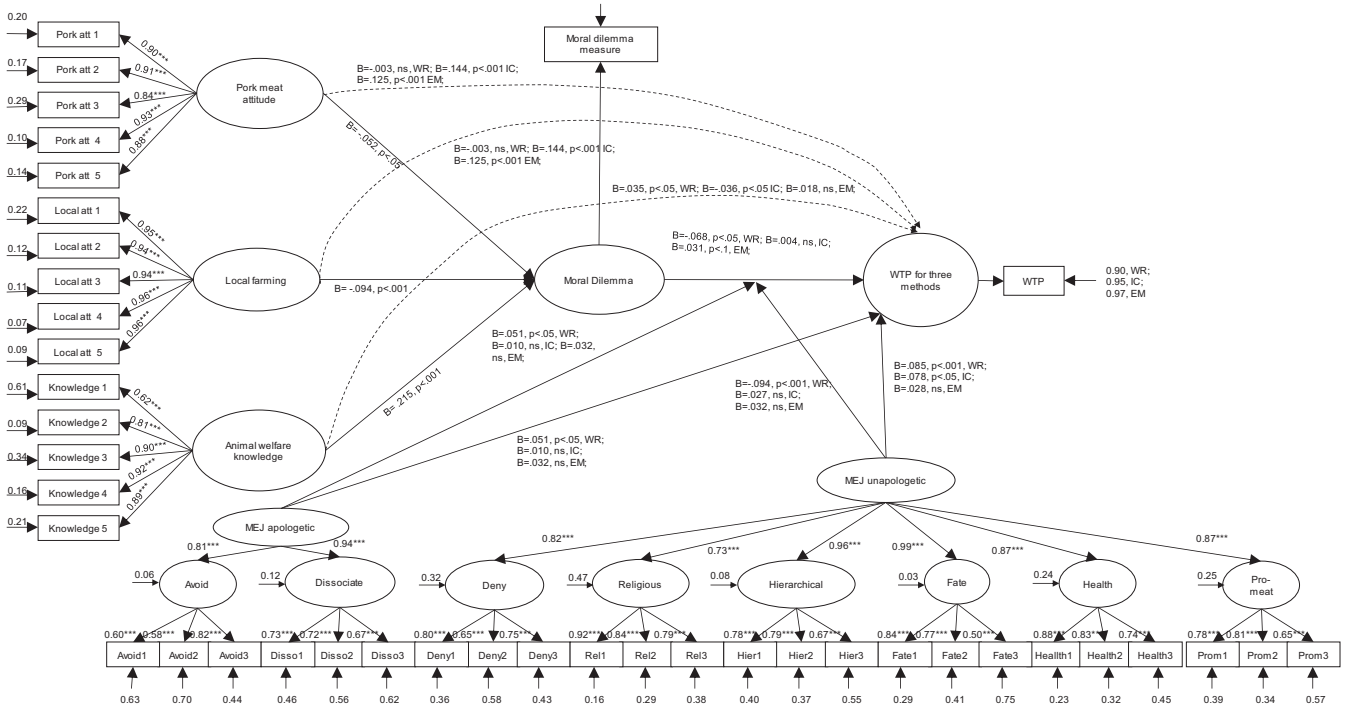

Fig. 3. Final structural equation model including the factorial structure of the MEJ scale and partial mediations. Where relevant, parameters for the three castration methods are given (WR = castration without pain relief, IC = immuno-castration, EM = entire male, WTP=Willingness to pay).

that pigs are worthy of moral concern, increased willingness to pay for surgically castrated boars, but it did not reduce the impact of moral dilemma on willingness to pay for meat from any of the pig production methods. Thus, it appears that, at least in Europe, using the unapologetic strategy (e.g., animals have no rights, or it is human destiny to eat meat) does not help in resolving dilemma experiences.

Consistent with Hartmann and Siegrist (2020), the current study found that the nine strategies from the MEJ to deal with meat-related moral dilemma could be empirically clustered into two overarching theoretical factors, reflecting apologetic (attempts to avoid the

associations between meat and living animals) and unapologetic (stating that meat serves human needs and brings pleasure and eating meat is the natural order) strategies, although the 4 N scale (natural, necessary, normal, and nice), developed by Piazza et al. (2015) to measure consumers' rationalisations for eating meat, often shows more psychometric consistency than the MEJ. The fact that a similar grouping of MEJ into two different factors was found elsewhere (Hartmann & Siegrist, 2020) suggests that the MEJ is usable at least at the higher order level. The MEJ scale, unlike the 4 N approach, includes apologetic strategies. Our study shows somewhat different effects of apologetic compared with unapologetic strategies on consumers' willingness to pay, which could only be found through the MEJ scale, thereby justifying its continued use at least until the 4 N scale is extended to include apologetic coping strategies.

Inclusion of both apologetic and unapologetic coping mechanisms is justified by regulatory focus theory (Higgins, 2012), which posits that people act either to ensure the realisation of a desired goal-related (promotion-focused) unapologetic coping or to avoid the absence of negative outcomes, e.g., harming animals (prevention-focused), linked to apologetic strategies (Rothgerber, 2019). Our study shows that high levels of apologetic strategies reduce the negative impact of a morally unacceptable option (i.e., SC without pain relief) on willingness to pay for that option. This is in line with Chernev's (2004) study, which suggests that using an apologetic strategy helps people with a prevention focus to continue their behaviour.

5.2. Limitations and directions for future studies

The first limitation is the measure of willingness to pay, which our study elicits through a contingent valuation method. Although contingent valuation has long been used to evaluate consumers' intention to adopt a new product at a specific price level (Gross, Waldrop, & Roosen, 2021), it has some weaknesses. Among them are the possible anchor bias from the given reference price and participants' answers of "No, I won't buy it no matter what the price is" (WTP sets as 0), making arithmetic mean less relevant. All boar-taint methods score below the reference price, suggesting that anchoring bias and a peak of zeros may have influenced our results. Nevertheless, as alternatives were compared against the same reference price, we could still make relevant relative comparisons. Although this makes it hard to interpret absolute willingness to pay values as a market guidance for setting price, our results do show that willingness to pay is lower among people who experience more moral dilemma than among people with less moral dilemma. Another limitation in our study is that we did not include household income as a control variable. Early studies report that people who were more financially advantageous are more willing to pay for ethical meat products (Clark et al., 2017). Thus, a question remains: Between the link of income and WTP, to what extent does extra WTP for ethical products provide justifications to reduce one's meat-eating dilemma? Future research could explore the potential interaction of income-dilemma in the context of ethical meat consumption and how it impacts consumers' WTP for alternatives to castration.

Additionally, participants were asked to watch the 115-s video to learn about the issue as well as the alternatives, making both the issue and the alternatives salient. The video was necessary as it provided essential background knowledge for participants to engage in the study, but in reality the general public is often not aware of the castration issue at the moment of choice, not to mention the existence of three alternatives (Vanhonacker et al., 2009). Hence, compared with purchase situations, our observed effects may be overestimations (Musto, Cardinale, Lucia, & Faraone, 2016). Moreover, the video explanations may potentially lead to a response bias of the WTP estimates because external cues about the castration method is influential to consumer purchasing behaviour and WTP (e.g., Kallas et al., 2013). Studies have shown that how individuals interpret external cues, such as background information (in forms of audio-visual or textual) and tasting product samples (cold or warm), influence their acceptance of alternatives (e.g., Fredriksen, Johnsen, & Skuterud, 2011). For instance, Heid and Hamm (2013b) showed that in Germany organic consumers' tasting experience of salami from EM had a significant negative effect on their WTP; and later observed that these consumers' WTP for IC is lower than for EM during a Vickrey auction (Heid & Hamm, 2013a). Their results are contradictory to our study. Possible explanations for the contrast might be related to the different consumer groups (organic vs. conventional) (Aluwé et al., 2020) and country differences. German consumers at least at that moment were more reluctant with regard to IC than consumers of other countries (Vanhonacker & Verbeke, 2011). Information provided about IC was interpreted by some respondents in a very negative way, fearing the so-called residues of hormone (Heid & Hamm, 2012; Huber-Eicher & Spring, 2008), but we find no such indications in our study or pilot. Hence the differences could be to the lasting reluctance of Germans, a temporal spike in that relocation, or the fact that the Vickrey auction is a closer proxy of actual purchase than our WTP measure. To confirm the ecological validity of our findings, we recommend future research to study actual purchase of the alternatives by conventional and organic consumers in real-life buying settings, including the purchase location and the type of pork product (e.g., minced meat, bacon, or ham) with applications of other approaches such as choice experiments or double-bounded dichotomous choice. Such studies should, in the meantime, be cautious about the effect of external cues on consumers' preferences and WTP.

Our study focuses on pork in a generic way to allow comparison across four European countries. Pork is used in many products that depend partially on specific food habits. This varies between generally consumed products like deep-frozen pizzas – where we expect little consumer deliberation on the meats and few differences between European countries – and Christmas dinners, where high-quality cured ham and products typical of local cuisines are served. Consumers are likely to buy these products rather than generic pork. Thus, future research should take account of habitual difference between products but also of the effect of, for example, the context of festive meals, where the deliberate choice of specific foods for consumption may make moral dilemma more salient. This topic was beyond the scope of the current study, and so we recommend that future studies should include such contextual factors and explore the impact of culinary traditions in different cultures.

Finally, future research should consider the replication of our study in other European countries or other continents. According to the European Food map (Askegaard & Madsen, 1998), Flemish Belgium sets as a representative for Germanic area which is characterized by a preference for heavy meals; French people generally attach great importance to sensory enjoyment, as similar to patterns of Italians; and Spain represents a food culture with a preference for natural products, which is closed to Portugal; Polish people perceive pork as the most valuable and most filling foodstuff (Stańczak-Wiślicz, 2014). But the earlier reported reluctance of Germans regarding IC may suggest cultural differences are more subtle than these broad regions capture. More studies are needed to understand consumers' meat-eating dilemma and behaviours across cultures. A few cross-cultural studies have found national/regional differences in consumers' association of meat with animals (e.g., Evans & Miele, 2012). Several factors contribute to the differences. One is that countries vary in the extent to which animal welfare issues are of priority for the public (Sandøe et al., 2020). For instance, in Norway, animal welfare was the most important influencing factor for the assessment of castration methods (Sødring, Nafstad, & Håseth, 2020); while in Eastern European countries, consumers did not have a clear opinion on whether castrating pigs is something natural or artificial (Tomasevic et al., 2020). People in a society with less concerns over animal welfare are less likely to experience meat-eating moral dilemma. Another reason is the industrialization level (Benningstad & Kunst, 2019). Research has shown that the majority of consumers in industrialized societies are used to neatly packed, ready-to-cook meat (Kunst & Hohle, 2016). They give little thoughts to associate such products to

once living animals. Moreover, it should be noted that, our study performed random sampling in four countries. Our sample seemed to have a slightly younger and more highly educated respondents than representative for the countries. Though the method of random sampling is widely used, we suggest future study to consider stratified sampling strategies.[4] Because within the Europe, the population size and density vary within Europe. Stratified sampling could provide better coverage of the population thus ensure estimates to have equal accuracy in different parts of the Europe, leading to more generalizable results. The challenge of this method, though, is to properly identify sampling frame for strata (Wright, Noble, & Bailer, 2007). Researchers could stratify samples based on demographic characteristics in individual countries, such as education level, age, and gender.

In spite of these limitations, this study shows that the meat-eating moral dilemma influences consumers' willingness to pay for meat with a higher or a lower level of animal friendliness. Consumers indicate strong opposition against castration without pain relief, and they prefer the immuno-castration method to the entire-male method to replace castration without pain relief; this opens possibilities for pork producers to bring boar-taint-free meat to the market while maintaining high levels of animal welfare.

5.3. Practical implications

The current study contributes to the ongoing debate about piglet castration. First, the study shows consumers' acceptance of SC without pain relief, IC, and EM in terms of willingness to pay. About half the consumers in four surveyed countries (i.e., Belgium, France, Spain, and Poland) rejected the method of SC without pain relief regardless the price. They are on average not willing to pay more than the reference price for any of the products. Nevertheless, preference for the methods shows a clear order of consumer preference IC > EM > SC without pain relief. That is, consumers are most likely to accept the IC method, and the method of SC without pain relief is most opposed. Similar results were found in a recent survey of 3251 consumers from 16 countries. About 71% of respondents accept IC and 49% accept EM (Aluwé et al., 2020). Given the results, we suggest that the pork industry should consider using IC as a market-acceptable alternative to replace the practice of castration without pain relief in these four countries. At the same time, however, how the information of castration and IC/EM methods is introduced to consumers (e.g., by labelling or advertisements) requires more marketing research in a certain country. Second, the low willingness to pay for SC without pain relief in this study and several other studies (e.g., Vanhonacker et al., 2009) clearly shows consumers' opposition to this painful method. Thus, producers are advised to abandon the method of SC without pain relief. We found no indications that consumers might not accept the novel methods of IC or EM "if consumers find out", which is sometimes used by producers as a reason not to change current practice. In fact, "if consumers find out" that the industry is mistreating its animals (e.g., SC without pain relief), the negative market responses can easily be worse than adopting either the EM or the IC method.

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CRediT authorship contribution statement

Li Lin-Schilstra: Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft. **Arnout R.H. Fischer:** Conceptualization, Methodology, Writing – review & editing, Investigation, Funding acquisition.

[4] We appreciate an anonymous reviewer for providing this suggestion.

Declaration of Competing Interest

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