Vertical Coordination in the Meat Supply Chain – The Effects of (Unlabeled) Private Standards for Animal Welfare

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Abstract

Animal welfare is increasingly relevant in the public debate. As a reaction, German companies and associations in the farming, meat and retail sector intervened in the market for meat and founded an animal welfare initiative. Farmers are compensated for implemented animal welfare measures with money which is funded by retailers. The resulting meat is not labeled and thus not distinguishable from conventional meat. In our model, we show the relative merits of the initiative especially from a retailer's point of view as compared to the introduction of labeled meat produced under restrictive practices. We combine our results with considerations on the distribution of market power and the degree of vertical coordination along the value chain for meat.

Key Words

animal welfare; vertical coordination; meat supply chain; standards; competition

1 Introduction

Animal keeping, animal welfare as well as safety and quality of food have become increasingly relevant in the public debate. At the request of the European Commission (2016), a survey on the attitude of Europeans towards animal welfare was carried out. 27,672 EU citizens were interviewed. A large majority believes that the welfare of farm animals should be better protected than it is now (EUROPEAN COMMISSION, 2016). In accordance with previous studies (for an overview see LAGERKVIST and HESS, 2011, or SAITONE et al., 2015), it was found that a majority of consumers are willing to pay a premium for farm animal welfare friendly products. However, close to half of the participants state that there is no sufficient choice of animal welfare friendly products. The highest share of participants missing a sufficient choice is located in Germany (62%). This share had even increased since the last survey in 2006 (EUROPEAN COMMISSION, 2016).

The fact that most Germans consider the available choice of animal welfare friendly products as insufficient is supported by a current study conducted by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety and the Federal Agency for Nature Conservation (BMUB and BFN, 2016). 93% of the recipients demand a consideration of animal welfare aspects in agricultural production. At first, these results are surprising as animal welfare attributes are mandatory in the value chain for organic meat. Furthermore, in 2013, German companies and associations in the farming, meat and retail sector intervened in the value chain for pork and poultry by forming the German Animal Welfare Initiative. The initiative aims at improving animal welfare for a vast amount of animals and at strengthening the awareness of animal welfare. All central stages of the value chain are involved in the project (INITIATIVE TIERWOHL, 2016g)[1]. Since autumn 2015, the corresponding meat (AW meat) is available in food retail. Food retailers pay 4 cents per kilogram of sold pig and poultry meat, whether produced within the initiative or not, into a fund. In 2015, 85 million euros were paid (INITIATIVE TIERWOHL, 2016b). For each implemented measure, the participating farmers are refunded at a specified rate. Within the initiative, animal welfare meat can be provided at a lower price than in organic production as the restrictions on feed, available space and medication are lower.

The results of the EU study are less surprising as the initiative is still largely unknown to the public (INITIATIVE TIERWOHL, 2016f) and is exposed to criticism, especially as consumers are not able to distinguish AW meat from conventional meat since it is not labeled. More than half of the EU's citizens look for identifying labels when buying products (EUROPEAN COMMISSION, 2016), as food labels help them to find products that fit their preferences (LUSK and NORWOOD, 2011). For consumers, it is pure chance whether the purchased meat has been produced within the initiative or not. They do not have a chance to pay a premium for the offered AW meat.

[1] Unfortunately, literature on the initiative is available in German only.

Well-functioning competition in markets is assumed to lead to an efficient allocation of resources to their most valued uses. Prices direct sellers to investment opportunities and reveal to buyers the opportunity cost of buying one good in contrast to another (LUSK, 2011). By setting their own standard for AW meat in this way, the participants of the initiative prevent consumers from expressing their very diverse preferences for improved welfare through their actual purchases (HARVEY and HUBBARD, 2013). According to a press release (INITIATIVE TIERWOHL, 2016f), the initiative's aim is to decouple animal welfare from the buyer's decision and to promote animal welfare from the supply side. However, it is unclear why and how the participants should set the standard for animal welfare (HARVEY and HUBBARD, 2013; VANHONACKER and VERBEKE, 2014).

In the last few years, food retailers have faced a heavy increase in concentration. The initiative can be understood as the expression of a trend towards retail chains' increasing engagement in specifying the conditions of food production (CODRON et al., 2005). Market mechanisms are bypassed in favor of contractual agreements. A limited number of farmers participate on a voluntary basis. Although the resulting meat is sold without a label, retailers use their participation in the initiative for their advertising (e.g. ALDI, 2016; REWE, 2016).

Existing studies on animal welfare often focus on issues related to consumer preferences (LUSK and NORWOOD, 2011). In our case, AW meat is not recognizable for the consumers. As a result, they are prevented from revealing their willingness to pay for animal welfare. Therefore, supply chain participants will forego additional turnovers. This raises the question why the whole supply chain is involved in the standard. In the light of the retailers' increasing importance in the supply chain, we want to focus on the retailers' perspective. However, private standards like the initiative do not only influence the final good, but also affect the organization of the supply chain and the distribution of market power among the actors (HAMMOUDI et al., 2010). Hence, we question the impact of the initiative along the supply chain and want to discuss the following economic rationales for founding the initiative:

- Does the initiative enhance vertical coordination and thus impede market coordination via spot-market prices?
- Does the initiative affect the distribution of bargaining power along the supply chain?
- Is it the initiative's purpose to improve the participants' image rather than to improve animal welfare?

First, we give a short introduction to the organization of the animal welfare initiative in Germany in order to show the balance of power within the supply chain. We will discuss the first two rationales in this section. Afterwards, literature on buyer power as well as restrictive practices and especially restrictive farming practices imposed by retailers is reviewed. In section 4, we develop our model and focus on the third question. We adapt a model which is used by SAITONE et al. (2015). We show the profit-maximization model for the sellers and derive implications for demand as well as for the sellers' profit. The paper ends with a conclusion and discussion.

2 Organization of the Animal Welfare Initiative

The participants of the initiative are located along the value chain for meat. The chain features different competitive structures that are described in short in the following sections.

In 2014, livestock products accounted for 55.7% of the sales revenues of the German agricultural sector (BMEL, 2015: 163). 17,200 of the 285,000 German farms were specialized in pig and poultry farming (BMEL, 2015: 48). Their demand for participation was higher than the offered capacity of the initiative: 4,700 farmers applied but only 2,900 (16.9%) of them were accepted due to limited financial resources (INITIATIVE TIERWOHL, 2016d). The initiative offers welfare standards above the legal regulation. The standards cover the following areas: available space, collection of diagnostic data, animal health, climate in the shed, shed equipment, animal hygiene, drinking water, use of antibiotics and input of daylight (INITIATIVE TIERWOHL, 2015a). Farmers can register at the initiative via a bundler (INITIATIVE TIERWOHL, 2016d). The measures in pig and poultry farming are split into obligatory basic requirements and (compulsory) optional measures. After admission, the compliance with the requirements is checked in a first audit. The remuneration scheme is shown in Table 1.

A participating pig farmer is paid a basic payment (500 euros per year) plus an individual payment per hog based on the implemented measures. The amount of money is limited to 3 euros per piglet in piglet rearing, 6 euro per piglet in sow keeping farms

Table 1. Remuneration scheme within the initiative for pig and poultry farmers

	Pig farmers	**Poultry farmers**
Basic payment	500 euros	-
Maximum payment	3 euros per piglet 6 euros per piglet in sow keeping 9 euros per fattening pig	3.6-4 cents per kilogram, depending on the species

Source: INITIATIVE TIERWOHL (2015a, 2015b)

and 9 euros per fattening pig (INITIATIVE TIERWOHL, 2015b). Poultry farms are paid per kilogram live weight, 3.6 to 4 cent depending on the species (INITIATIVE TIERWOHL, 2015c). A certification authority monitors the implementation of measures. Slaughterhouses can register as well if they participate in a quality assurance system. They record data on delivered animals and forward them to the animal welfare initiative (INITIATIVE TIERWOHL, 2016c). Bundlers and certification authorities are external and behave according to the guidelines of the initiative (INITIATIVE TIERWOHL, 2016a). The initiative itself works as a coordinator and manages the fund.

The downstream slaughtering and meat processing sector is the largest sector in the German food manufacturing industry, accounting for 25.9% of its sales (BMEL, 2015: 284). In 2012, 1,141 companies with at least 30 employees were processing meat. The sector was characterized by a CR6 of 20.4% (BMEL, 2015: 302). According to the initiative, 12 million pigs and 255 million poultry already "benefited" from the initiative. The overall number of commercially slaughtered pigs in 2015 amounted to 60 million[2] (GERMAN FEDERAL STATISTICAL OFFICE, 2016b). As the initiative's measures for pigs also included sows and piglets, the market share is below 20%. In 2014, 634 million broilers and 37 million turkeys were slaughtered (GERMAN FEDERAL STATISTICAL OFFICE, 2016a).[3] The initiative's market share for poultry would thus be 38%. The vast majority of slaughterhouses prefer spot-market or informal, long-term transactions with the farmers. In some cases, the animals are first sold at the spot market to private livestock traders, trading cooperatives as well as producing and marketing organizations. They, in turn, sell them to slaughterhouses (THEUVSEN and FRANZ, 2007). In comparison to other sectors, the market shares of cooperatives in the pig meat sector are rather low in most EU countries (PYYKKÖNEN et al., 2012).

In 2013, the downstream retailing sector consisted of 38,600 stores (HANDELSVERBAND LEBENSMITTEL, 2016). The sector is highly concentrated (GERMAN FEDERAL CARTEL OFFICE, 2014; LEBENSMITTEL ZEITUNG, 2015): The four largest retailers account for the bulk of the procurement volumes. They were considered as "market leaders" in a sector inquiry run by the GERMAN FEDERAL CARTEL OFFICE (2014). It was found that in negotiations with the food industry, the group of leading retailers is able to use their market positions to their advantage and has a strong bargaining position. The MONOPOLIES COMMISSION (2012), an independent expert committee advising the German government and legislature, considers that buyer power is likely to be present. Especially in the production of meat and meat products, retailers already show a high degree of vertical integration. They produce some of their meat products in vertically integrated companies (GERMAN FEDERAL CARTEL OFFICE, 2014). Nearly 85% of the German retailers are part of the animal welfare initiative (INITIATIVE TIERWOHL, 2016e). As already mentioned, food retailers pay 4 cents per kilogram of sold pig and poultry meat, whether produced within the initiative or not, into a fund.

The market structures along the supply chain are summarized in Table 2. The balance of power in terms of market concentration points to market imbalances in favor of retailers. The initiative is questionable from an antitrust point of view. According to a trade journal, the Federal Cartel Authority stressed that the retailers are not allowed to coordinate regarding the question of how to shift the increased costs to consumers and suppliers (LENDERS, 2015). Another journal cites a draft paper from the Cartel Authority which was sent to the initiative's lawyer and is not publicly available: according to this, each kind of competition-restricting information exchange within the initiative is forbidden. Information includes prices, quantities, customer information and sources of supply (TOPAGRAR, 2014). It may therefore be assumed that the increased costs do not correspond to an equivalent increase in meat prices.

[2] preliminary results

[3] Figures for 2015 are not available so far.

Table 2. Market structures along the supply chain for pig and poultry meat

	Livestock production	Slaughtering and meat processing	Retailing
Number of enterprises	17,200	1,141[1]	30[2]
Market concentration (CR 6)	unknown	20.4%	78%
Share of participants in the initiative	16.9%	unknown	85%

[1] with at least 30 employees, [2] with at least 450 million euros turnover

Source: own presentation based on German Federal Cartel Office (2014), BMEL (2015), Handelsverband Lebensmittel (2016), German Federal Statistical Office (2016a, 2016b), Initiative Tierwohl (2016d), LZ (2016)

Vertical coordination tends to increase as farmers commit themselves to delivering their meat to the initiative since the premium is not paid within other marketing channels. Furthermore, the initiative was only planned to run for three years.[4] The limited runtime could possibly generate a hold-up problem as information about the prolongation of the program is not available and depends crucially on the retailers' funding. Moreover, risk is shifted towards farmers as they have to undertake the major investments. The increase in vertical coordination through the initiative and a possible strengthening of the retailers' already critical market position illustrate the need for further investigations. The following literature review is intended to deepen the understanding of the initiative's effects on the distribution of bargaining power along the supply chain. Therefore, the retailers' role and incentives for implementing (animal welfare) standards are examined and restrictive practices are analyzed from the farmers' perspective.

3 Literature Review

Ensuring consumers' loyalty and increasing market shares in an era of rising consumer expectations provide constant incentives for retailers to maintain and increase quality (FULPONI, 2006). MARTINEZ (1999) assumes that the further need to improve the quality of pork products may accelerate the use of contractual arrangements in the U.S. Contracts assure a stable flow of high-quality and uniform meat. Likewise, DEN OUDEN et al. (1996) stress the need for improved control over product quality in order to supply to increasingly discriminating markets. MACDONALD (1985) as well as CAVES and BRADBURD (1988) find that vertical integration (as a type of vertical coordination) occurs especially in industries characterized by high buyer or seller concentration. The presence of large buyers can erode the value of suppliers' outside options. Retailers may have an additional source of buyer power as they can also stock private-label goods (INDERST and WEY, 2007). HAUCAP et al. (2013) show that the introduction of private labels is an important strategy for retailers to strengthen their bargaining power. With the introduction of the animal welfare initiative, retailers also stock a kind of private label in this market. In contrast to a "traditional private label" created by retailers to counter market power of national brands, these private standards related to production practices are focused on quality improvement (CODRON et al., 2005). Furthermore, building an initiative with farmers may prevent more regulation (BOCK and VAN HUIK, 2007; SEGERSON, 1999) and hinder other initiatives from entering the market (HAMMOUDI et al., 2010; HARVEY and HUBBARD, 2013).

DOBSON et al. (2003) describe the retailers' role as gatekeepers due to their control of shelf space and the limited competition in this sector. Their position enables them to "dictate terms and conditions to producers" (DOBSON et al., 2003: 121), for example by de-listing tactics and use of auctions. DOBSON et al. (2003) distinguish two kinds of buyer-induced restraints. The first kind aims at further extracting rent by listing charges, shelf-space fees, promotion support payments and retroactive discounts. The second kind aims at limiting producers' freedom or incentives to supply elsewhere. It includes exclusive supply obligations as well as "non-compete" contract clauses and most-favored nation type clauses. As possible consequences, DOBSON et al. (2003) describe the suffering of small producers which are unable to resist buyer power as well as threats made to the viability of even efficient producers. Producer innovation may be retarded. In our case, retailers go even further and engage in the restriction of farming practices.[5]

[4] In the meantime, participants signaled their willingness to prolong the initiative until 2021 (KÜHLCKE, 2016).

[5] Even though the initiative is described as a sector initiative, one retailer's successful prevention of an increase in funding suggests that retailers' are the driving force (DETER, 2015).

In a competitive environment without subsidies, producers face incentives to adopt profit maximizing rather than animal welfare-maximizing production systems and practices (BOCK and VAN HUIK, 2007; LUSK and NORWOOD, 2011). Retailers' restrictions on farmers' production practices increase farm costs (SAITONE et al., 2015). Higher production costs apply to the entire animal whereas the product sold to grocery retailers may be small. Thus, additional costs must be compensated completely by the portion sold through grocery retailers (SAITONE et al., 2015). Incentives for participation arise from the possibility to escape from the pressure for scale enlargement and from the possibility to stabilize the relationship with buyers (BOCK and VAN HUIK, 2007). In light of the associated sunk costs, some farmers will not invest at all and may be excluded from the market as the cost of fulfilling the standard may be too high (GIRAUD-HÉRAUD et al., 2012). Moreover, retailers may refuse to pay for the initiative once it has expired and profit from the higher level of animal welfare created so far. As the participating farmers were drawn by lot, the emergence of production inefficiencies is possible. The most efficient producers of animal welfare may not be part of the initiative (BOGETOFT and OLESEN, 2004).

According to SAITONE et al. (2015), the offering of selected food items produced using specified processes rather than a selection of alternative products can limit consumer choice and increase costs. The imposition of a single animal welfare standard may generate lower social benefits than the possible expression of diverse preferences in the market (HARVEY and HUBBARD, 2013). A strong differentiation from the norm and the guarantee of significantly higher food quality standards are accompanied by higher costs and prices while targeting a restricted consumer segment. A little qualitative differentiation will cause lower costs and prices and affect a larger volume of sales (CODRON et al., 2005). Besides demands of final-product consumers, external pressures from other groups might be a reason for the increasing specification of production and marketing practices by grocery retailers. Animal products comprise a relatively small share of retailers' sales. However, impacts on sales of their other products can be relevant for the decisions regarding the implementation of restrictive production practices as they may improve a retailer's image (SAITONE et al., 2015). As AW meat is not labeled in retail stores, consumers are not able to differentiate between conventional meat and meat produced under restrictive practices. The consumers can find out about the contents of obligatory basic requirements and optional measures by visiting the initiative's website (INITIATIVE TIERWOHL, 2015a). They cannot find out which optional measures were chosen by the farmer who produced a particular piece of meat. The complexity of the measures and of the organization may make it difficult for consumers to understand the benefits of the initiative. Nevertheless, it may be rational for the participating retailers to implement the animal welfare initiative, even if there is no demand impact for meat.

The literature review demonstrates the importance of restrictive practices imposed by retailers in the light of stricter quality requirements of consumers. Their influence on buyer power reveals their relevance for the balance of power in the value chain. Farmers have different incentives for participation, but there may also be disadvantages due to participation. The level of the standard determines which consumer segments are addressed. Retailers could also benefit from an improved image.

SAITONE et al. (2016) examine the consequences of restrictive farming practices required by food marketers. In our case too, restrictive practices are required by marketers. However, there is a special feature, because the customers cannot recognize AW meat as such. In order to understand the impact of the initiative, the model has to be adapted accordingly. In order to show the initiative's impact on the value chain, the model of SAITONE et al. (2015) is applied to AW meat in the following section.

4 Model

In the model of SAITONE et al. (2015) demand impacts depend on the amount of consumers who are willing to pay a premium for pork produced under restrictive practices (R) as well as on the distribution of the willingness to pay. In our case, consumers have no possibility to pay a premium because they cannot distinguish between R meat and conventional meat (N). Consumers can only buy AW meat, which can be either R or N meat. AW meat can be interpreted as a mixture of both kinds of meat. We first differentiate consumers according to their valuation of AW meat and then according to their demand for meat.

The AW meat's property as a mixture of N and R meat raises the question of how consumers value this mixture. PENNERSTORFER and WEISS (2013) provide different possibilities for determining the quality of a final product based on the qualities of the inputs delivered by individual farmers. We apply these possibilities to the consumers' valuation. (1) Consumers

could value AW meat as the weighted average of N and R meat. These consumers attribute the highest welfare attributes to R meat and the lowest ones to N meat. AW meat lies between both. (2) Furthermore, even though it is a mixture of N and R meat, consumers could perceive AW meat as the minimum of the quality levels of its component: as N meat. This might be the case for consumers who are strongly involved and well informed. (3) Another possibility is the valuation of AW meat as R meat. Retailers' advertisements could suggest that the whole meat sold was produced under AW standards and consumers' might not perceive differences between R and AW meat. We assume that most of the consumers belong to the first category. This assumption may be released in further research.

SAITONE et al. (2015) distinguish three kinds of consumers that are costumers of a seller *j* in a subset S_j of the total population, S, of consumers in a given geographic market. Each consumer $I \in S_j$ has a demand for the animal product *x* and for a second product *y* (the seller's other products). Some consumers (i) do not distinguish between conventional meat and meat produced under restrictive practices, some consumers (ii) will not consume N but R meat or (iii) eat both types, but are willing to pay a premium for R meat. The AW meat sold under the animal welfare initiative is considered as the weighted average of N and R meat (see (1)). Consumers (i) and (iii) will consume AW meat, consumers (iii) may be willing to pay a premium. For the same reason, it is assumed that consumers (ii) will not consume AW meat.

Consumers in (i) have a single demand function $x_i(P_k^j, Z_i)$ for meat with P_k^j as the per unit price for meat of the type *k=N, AW, R* in the store j and Z_i as individual shift factors of demand. The shift factors can include the seller's reputation or perceived social responsibility.

Consumers in (ii) have no demand for N and AW, and the demand function $x_i^R(P_R^j, Z_i)$ for R meat. Consumers in (iii) perceive meat as a vertically differentiated product. Their demand for N meat is $x_i^N(P_N^j, Z_i)$, for AW meat $x_i^{AW}(P_{AW}^j, \rho_i, Z_i)$, and for R meat $x_i^R(P_R^j, \mu_i, \sigma_i, Z_i)$ with ρ_i, μ_i, σ_i as taste parameters. The taste parameter ρ_i with $\frac{\partial x_i^{AW}}{\partial \rho_i} > 0$ indicates the intensity of a consumer's preference for AW meat relative to N meat. The taste parameter μ_i with $\frac{\partial x_i^R}{\partial \mu_i} > 0$ indicates the intensity of a consumer's preference for R meat relative to AW meat. The parameter σ_i with $\frac{\partial x_i^R}{\partial \sigma_i} > 0$ indicates the intensity of a consumer's preference for R meat relative to N meat.

The demand of consumer i for the composite good sold by the retailer j is $y_i(P_y^j, V_i)$ with P_y as the price and V_i as demand-shift variables. A consumer is assumed to buy a market basket containing x_i and y_i. Depending on the sale of N, AW and R meat, the demand facing seller j is:

$$\sum_{i=1}^{S_j^N}[x_i^N(P_N^j, Z_i) + y_i(P_y^j, V_i)]$$

if j sells N meat,

$$\sum_{i=1}^{S_j^{AW}}[x_i^{AW}(P_{AW}^j, \rho_i, Z_i) + y_i(P_y^j, V_i)]$$

if j sells AW meat,

$$\sum_{i=1}^{S_j^R}[x_i^R(P_R^j, \mu_i, \sigma_i, Z_i) + y_i(P_y^j, V_i)]$$

if j sells R meat,

with $S_j^k = S_j(P_k^j, P_y^j, Z, V)$ for k =N, AW, R.

The profit-maximization problems for a seller carrying either R, AW or N meat[6] is

$$\max\{P_k^j, P_y^j\}\pi_k^j = (P_k^j - c_k)\sum_{i=1}^{S_j^k} x_i^k(P_k^j, \rho_i, \mu_i, \sigma_i, Z_i) + (P_y^j - c_y)\sum_{i=1}^{S_j^k} y_i(P_y^j, V_i) \qquad (1)$$

with c_k as unit acquisition costs for meat and c_y as unit acquisition cost for *y*.

If $\{\tilde{P}_k^j, \tilde{P}_y^j\}$, *k=N, AW, R* are the solution for the problems and $\tilde{\pi}_k^j(\tilde{P}_k^j, \tilde{P}_y^j)$ represents the optimized profit, the profit-maximizing decision rule for the seller is to adopt R meat if $\tilde{\pi}_R^j > \tilde{\pi}_{AW}^j \cap \tilde{\pi}_R^j > \tilde{\pi}_N^j$, adopt AW meat if $\tilde{\pi}_{AW}^j > \tilde{\pi}_R^j \cap \tilde{\pi}_{AW}^j > \tilde{\pi}_N^j$, and to sell conventional meat if $\tilde{\pi}_N^j > \tilde{\pi}_{AW}^j \cap \tilde{\pi}_N^j > \tilde{\pi}_R^j$.

From Equation (1), SAITONE et al. (2015) derive several ways that require restrictive production practices R can impact demand and profit for a seller. They are also applicable to our research.

(i) The unit cost of R meat for the retailer is higher than the unit cost of AW meat as there are no costs for labeling and as the costs for restrictive practices are spread among the whole meat range. The unit cost for AW meat is higher than the unit cost for N meat: $c_R > c_{AW} > c_N$.

(ii) When introducing R meat, the price of meat products will rise due to higher costs, that is

[6] We assume that the retailer offers only one kind of meat. This assumption is particularly true for discounters.

$P_R^j > P_N^j$ for all j. The movement along the demand curves, x_i, reduces sales of x to all consumers in (i) and may also reduce sales to category (iii) (SAITONE et al., 2015). In the case of AW meat it is unclear if and how the prices for the meat products will rise. As the costs are distributed among the product portfolio and the value chain, the following constellations are possible: $P_{AW}^j > P_N^j$ or $P_{AW}^j = P_N^j$. Therefore, the sale of AW meat may not necessarily represent a movement along the demand curve and a reduction of sales to category (i) and possibly to category (iii) consumers, as is the case for R meat.

(iii) When introducing R meat, some consumers in (i) and (iii) will cease to patronize the seller because of the price increase. S_j is decreasing in P^j_k, *ceteris paribus* (SAITONE et al., 2015). As opposed to the original model, a lower amount or even none of category (i) and (iii) consumers will cease to patronize the seller because there is a lower or even no increase in prices. Moreover, 85% of the retailers participate in the initiative. Price increases may likely affect alternative retailers in the relevant geographic market.

(iv) In the original model, existing consumers in (ii) and (iii) face a shift in their x demand functions. Consumers in category (ii) have a positive willingness to pay where they previously had none. Depending on the price differences between R and N pork and the taste parameter, consumers in (iii) will purchase more or less pork (SAITONE et al., 2015). Consumers in category (ii) will not have a positive willingness to pay for AW meat. Consumers in category (iii) may purchase more or less pork depending on their taste parameters and the price difference. If the price difference is zero, an increase in the purchased amount of category (iii) consumers is likely. The changes in demand of category (iii) may be lower as compared to R meat, depending on category (iii) consumers' taste parameters.

(v) Consumers in categories (ii) and (iii) may purchase more y because they perceive the seller as having a higher quality (SAITONE et al., 2015). This may also be the case when introducing AW meat, even though category (ii) consumers will not buy it.

(vi) In the model of SAITONE et al. (2015), some consumers of categories (ii) and (iii) may now patronize seller j due to the supply of R meat. This may also be the case for category (iii) if AW meat is supplied. S_j as well as the demand for x and y will increase. As the majority of retailers participate, this effect is supposed to be small.

The following table (Table 3) contains a comparison between the introduction of R meat in the original formal model of SAITONE et al. (2015) and the introduction of AW meat according to the information given above with regard to their unit cost, prices, impact on meat sales as well as impact on non-meat sales.

Table 3. Comparison of the impact of introducing R meat according to SAITONE et al. (2015) and AW meat

	R meat SAITONE et al. (2015)	**AW meat Animal welfare initiative**
Unit cost	$c_R > c_N$	$c_R > c_{AW} > c_N$
Price	$P_R^j > P_N^j$	$P_{AW}^j > P_N^j$ or $P_{AW}^j = P_N^j$
Impact on meat sales	Reduced sales to category (i) consumers	Lower or no impact on sales to category (i) consumers
	Category (iii) consumers purchase more or less.	Category (iii) consumers purchase more rather than less.
	Some consumers in categories (i) and (iii) will cease to patronize the seller.	A lower amount of or even no consumers in categories (i) and (iii) will cease to patronize the seller.
	Some consumers in categories (ii) and (iii) will start to patronize the seller.	A lower amount of consumers in category (iii) may start to patronize the seller.
	Increased sales to category (ii) consumers	No increase in sales to category (ii) consumers
Impact on non-meat sales	Some consumers in categories (i) and (iii) will cease to patronize the seller.	A lower amount of or even no consumers in categories (i) and (iii) will cease to patronize the seller.
	Consumers which perceive the "quality" of the seller is enhanced purchase more y.	Consumers which perceive the "quality" of the seller is enhanced purchase more y.

Source: own research, SAITONE et al. (2015)

Profit-maximizing sellers will chose the AW meat if the net effect of the demand-side impacts outweighs the higher costs. In comparison to the R meat in SAITONE et al. (2015), AW meat will likely be available at lower cost and can thus be sold at lower price levels. As 85% of the retailers are taking part in the animal welfare initiative and as the increase in prices is low or even non-existent, a lower amount of consumers in the categories (i) and (iii) will cease to patronize the retailer. Category (iii) will purchase more rather than less meat. Even if category (ii) consumers will not patronize the retailer, retailers may face higher profits than in the case of implementing R meat. The magnitude of the effects on profits depends on the taste parameters, the price differences between AW and N meat as well as the share of consumers in the categories.

As in the case of R meat, requiring AW meat may even be profit-maximizing if it causes a decline in the volume of sales of meat. If this is the case, AW meat may reduce profits in the farm sector and consumption of pork products. Yet, our model shows that the consequences for the supply chain will probably not be as strong as in the case of R meat.

5 Conclusion and Discussion

In the introduction, we have noted that consumers find the supply of animal-friendly products insufficient. This is the case despite the sector initiative for animal welfare. It is, however, little surprising, since the products of the initiative are not labeled as such. In doing so, the initiative prevents consumers from expressing their preferences for improved welfare by setting its own standard for AW meat. This raises the question why the whole supply chain is involved in the standard. Three different rationales were discussed.

The review of market structures within the supply chain for meat in section 2 points to market imbalances in favor of retailers. The initiative increases vertical coordination as the participating farmers have lower incentives to supply elsewhere. When leaving the initiative, meat produced within the initiative can only be sold as conventional meat. The prices paid for conventional meat may not cover the higher production costs. Therefore, the retailers' buyer power towards farmers is likely to increase.

Adopting the model of SAITONE et al. (2015), we show under what conditions implementing AW meat will result in higher profits in comparison to R and N meat. By introducing AW meat instead of R meat, retailers face lower unit costs as AW meat is a mixture of R and N meat. Therefore, prices for AW meat will likely be lower than for R meat. Accordingly, the introduction of meat has less impact on demand. At the same time, purchases of category (iii) consumers will likely increase and category (i) consumers will not reduce their purchased amount. However, category (ii) consumers will not buy meat at all. The introduction of the meat also affects the image of the sellers. As a side effect, they can also increase sales with their other products. Some consumers claim to attach importance to animal welfare but do not pay the higher price (BOCK and VAN HUIK, 2007). Especially this kind of consumers may prefer the retailers participating in the initiative because they provide a slightly higher level of animal welfare without imposing higher costs.

Most retailers participate in the initiative. The introduction of the animal welfare initiative reduces competition between the retailers based on animal welfare. This is likely to affect the model results. There will be fewer customers who are attracted through the newly introduced meat. AW meat may also serve as a rival product to R meat provided by NGOs. Thus, it may dampen their incentives to provide higher levels of animal welfare. Besides being part of the initiative, the majority of retailers are conducting their own programs for improving animal welfare (RÖTTIG, 2016). Moreover, they are already integrated backwards in the production of meat and meat products (GERMAN FEDERAL CARTEL OFFICE, 2014).

Moreover, the initiative may prevent regulation and guarantees retailers a chance to determine the level and forms of animal welfare. According to a report by the scientific advisory board of the German federal ministry of food and agriculture (WISSENSCHAFTLICHER BEIRAT AGRARPOLITIK BEIM BMEL, 2015) which deals with strategies for socially accepted livestock farming, 2 to 3 billion euros are necessary for a nationwide implementation of selected welfare enhancing measures in pig and poultry farming. In 2015, only a fraction of this sum, 85 million euros, were gathered within the initiative (INITIATIVE TIERWOHL, 2016b).

BOCK and van HUIK (2007) stress the differences between the national characteristics in the size and organization of the pig sector, in animal welfare legislation, policy arrangements as well as in the structure and organization of markets. Due to these differences,

the transferability of our results may seem limited. However, further retailers may decide to impose restrictive production practices on some agricultural producers without labeling the final good due to the advantages mentioned above.

The impact of the AW initiative on animal welfare represents a further research field. LUSK and NORWOOD (2011) provide further ideas on evaluating the overall welfare impact of increased animal welfare based on an utilitarian point of view. Furthermore, they stress distributional issues among different types of producers, consumers and animals. They add that animal welfare can be considered as a public good, as it is non-rival as well as non-excludable. Free-riding on the contributions of others is possible. As a result of improved animal welfare, they consider a price decrease in animal welfare friendly products as likely. This would harm the producers which already provide the practices.

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