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More Vertical Coordination in Pork Production Supply Chains?: The German Experience

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It is often argued that contracts and vertical integration are paramount for the future competitiveness of food supply chains. In this paper we critically review empirical evidence and theoretical reflections underlying this argument by referring to pork production in Germany. We confront the often opined contract and integration hypothesis with transaction cost considerations taking into account current technological and structural developments and results from a survey of German hog farmers. It is concluded that more trust and commitment in non-contractual long-term relationships may be an efficient alternative to stricter vertical coordination in meat supply chains in developed markets.

1. Introduction

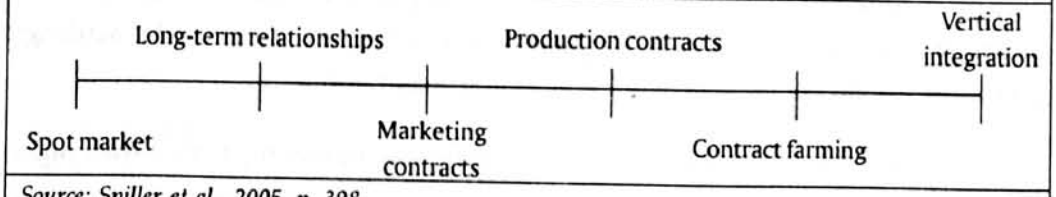
In recent years vertical cooperation and integration in meat supply chains were among the most vividly discussed topics in agribusiness (Bijman *et al.*, 2006). This discussion

is fuelled by several developments. Some authors identify increasing requirements of large buyers concerning product quality and traceability as important drivers towards more integrated food supply chains (den Ouden *et al.*, 1996; Lawrence *et al.*, 1997; Lawrence, Schroeder and Hayenga, 2001). In transition economies contracts and vertical integration help to overcome market failures and poor public institutions for governing market exchange (World Bank, 2005). Others highlight the important role stricter vertical coordination of meat supply chains may have played in the emergence of, for instance, Denmark as a leading hog producer and exporter (Windhorst, 2004). But it is also argued that consumers' appreciation of improved food traceability is often lower than expected and can in many cases easily be met without redesigning supply chains (Theuvsen and Hollmann-Hespos, 2005). In this paper we critically review the arguments and suggest improved supplier relationship management as an alternative to more vertical cooperation and integration in meat supply chains of developed countries. Our recommendations are based on a large-scale survey in German hog production as well as an analysis of the effects of recent structural and technological changes in slaughterhouses on transaction costs.

2. Stricter Vertical Coordination in Meat Supply Chains: The Effects of Structural and Technological Changes

There is a broad spectrum of organizational alternatives, farmers and slaughterhouses can choose from when designing their business relationships (Peterson, Wysocki and Harsh, 2001). Figure 1 presents some important alternatives of organizing livestock production. In spot market exchanges, hog producers and abattoirs negotiate every transaction separately and are ready to change their selling respectively and buying behaviour quickly, whereas in vertically integrated chains, there is joint ownership of resources on the farm and the slaughterhouse level.

Figure 1: Vertical Organization of Meat Supply Chains



Source: Spiller et al., 2005, p. 398

The various forms of contracts as well as repeated transactions in long-term relationships can be classified as hybrid governance structures (Williamson, 1985).

Throughout the world, very diverse hog production systems have evolved. In Germany and other Western and Southern European countries, spot markets, repeated transactions in long-term relationships and marketing contracts are dominant (Spiller *et al.*, 2005). In other countries, e.g., Denmark and the United States, stricter vertically coordinated meat supply chains have evolved. Today more than 70% of US hogs are produced under contracts or in vertically integrated systems (Martinez, 2002; Haley 2004). The continued existence of two different types of pork production chains throughout the world is rarely discussed. Most authors favour closer vertical coordination in agri-food chains and consider the still loose relationships in some European markets as an inefficient model (e.g., Windhorst, 2004).

Transaction Cost Economics (TCE) is the most commonly used theoretical framework for analyzing contracts and vertical integration in meat production. The key variables in TCE are asset specificity and the amount of uncertainty (Williamson, 1985). Empirical evidence supporting TCE hypotheses has been obtained in various studies. Den Ouden *et al.*, (1996), for instance, identify growing quality requirements in meat supply chains as a major driving force of contracts and vertical integration. In particular, product differentiation in order to meet changing consumer demands as to animal welfare and food safety is considered as a main driver of closer ties in the meat supply chain. Communicating changing consumer demands to the farm stages is considered more transaction cost efficient under contracts and in vertically integrated systems. According to Lawrence *et al.*, (1997; Lawrence, Schroeder and Hayenga, 2001), farmers and slaughterhouses save transaction costs through contracts and vertical integration. For abattoirs high quality of hogs and consistency of supply with adequate quantities are paramount. The authors argue that under these circumstances long-term contracts allow transaction cost savings compared to traditional marketing channels. Farmers may also save transaction costs, for instance, by settling a premium for higher quality with a one-time negotiation.

The underlying assumption behind the different arguments is that with higher market segmentation the need for processors to define stricter governance structures

grows. But asset specificity and market uncertainty are not premises but variables in TCE, which may change due to new technologies and structural changes. Insofar, two important developments have emerged in the European hog industry: new technologies of pre-slaughter and on-line sorting and the widespread implementation of certification schemes.

The Danish pork production is the best-known example of successful meat packing, supplying uniform animals to a slaughterhouse. Special pig genetic for the respective farms is restricted geographically in order to deliver similar qualities to one slaughterhouse (Bogetoft and Olesen, 2002). The Danish co-op Danske Slagterier uses production contracts to produce homogeneous pork products in large quantities for special market segments, e.g., the British bacon market or the Japanese meat market. During the 1980s and 1990s this production system contributed to Denmark's emergence as the leading pork exporter in the high quality segment. The emphasis on uniformity in pig phenotypes, feed, medication, and sometimes animal welfare seems to be a crucial factor of market orientation.

However, supplying uniform animals by contract farming is only one way to produce homogeneous products in high quantities. During the last few years, new sorting technologies in combination with the fast growth of slaughterhouses have been allowing the same output with pre-slaughter and on-line sorting instead of stricter vertical coordination. Toennies, one of Germany's market leaders in packed pork, applies this new strategy by creating over 70 different internal classification categories into which the animals are sorted using an automatic classifying technology. Then the different batches are divided by automated sorting technologies to produce about 1,000 different products tailor-made for special market destinations. Processing capacities of about 20,000 pigs a day enable the company to produce sufficient quantities of uniform meat without defining homogeneous input factors through contracts with farmers. Whereas many other German abattoirs still strongly rely on uniform slaughter pigs, Toennies uses new sorting technologies in combination with large-scale slaughtering to meet market demands and strongly encourages farmers to procure diverse animals (Jaeger, 2006). This lowers the degree of asset specificity between hog producers and processors and favours spot-market transactions.

Besides new sorting technologies, the implementation of certification schemes in European agriculture and food industry also enforces spot market transactions in the meat industry. Certification schemes create standards for the whole industry thus reducing the imperative for company-specific quality approaches on a contract basis. A key feature of certification schemes is that inspections of farms and firms are carried out by independent bodies (third-party audits) beholden to standards laid down by external organizations (Luning, Marcelis and Jongen, 2002). The supplier provides a certificate serving as a quality signal to potential buyers. In the meat industry well-known examples of certification schemes are the Dutch IKB standard, the Certus system in Belgium and the German Quality and Safety (QS) system. In most cases certification schemes focus on assuring minimum quality and safety standards, for instance by enforcing compliance with legal requirements. Hence, these schemes reduce the degree of quality uncertainty in the market and enforce arm's length relationships in meat supply chains (Schramm and Spiller, 2003).

All in all, the introduction of certification systems and automated sorting technologies in large-scale slaughterhouses reduce the need for contracts and vertical integration in meat supply chains and support more flexible market structures characterized by strong pricing pressures.

3. Farmers' Attitudes towards Contracts and Vertical Integration: Results of a Survey in Germany

The previous section provided some theoretical support for the model of a less integrated pork supply chain. An important but often neglected factor of choosing the right governance structure is farmers' acceptance of stricter coordinated chains, which is crucial at least for short-term changes. In Germany, the concentration ratio at the processor level is growing but with an overall number of 247 slaughterhouses there are still enough alternative buyers of slaughter animals. The leading companies, Vion (20.3% share of total slaughters), Toennies (17.0%) and the co-operative Westfleisch E G (10.8%) follow different sourcing strategies, although marketing strategies and served markets are similar: Westfleisch introduced marketing contracts with farmers in 2001, whereas Toennies and Vion work with private livestock dealers and marketing cooperatives and only rarely with individual farmers. Transportation of slaughter pigs is also provided by these

traders, whereas Westfleisch owns a logistics centre. However, the marketing contracts of Westfleisch do not go very far. Farmers are allowed to choose from several breedings, which only have to be evaluated positively in a test program, the same applies for the feed. Thus, we state that these contracts only aim at ensuring a certain percentage of the quantities required.

Most of the remaining German slaughterhouses neither apply contracts, nor are they vertically integrated, except for some farmer associations which operate their own slaughterhouses. This freedom of German farmers to choose between alternative marketing channels and organizational forms has led us to the assumption that farmers' attitudes have to be taken into account when designing food supply chains in developed countries with a considerable number of marketing alternatives. Before presenting the results of survey effected by us, we briefly review the existing literature in the field of contracting behaviour.

3.1 Research Framework

Farmers' contracting behaviour has been researched by a number of economists. The contributions can be categorized into econometric and behavioural approaches. The first category comprises studies modelling contract decisions as a function of structural variables, e.g., personal and farm characteristics, which are based on statistics about actual contract behaviour (Katchova and Miranda, 2004; Key and McBride, 2003; Key, 2004). Key (2004), for example, states that contracting is highly correlated with farm size. Other variables explaining the adoption of marketing contracts are education, the use of advisory services and the use of marketing plans and futures (Katchova and Miranda, 2004). All in all, the authors resume that adoption of contracting by farmers stands a little bit behind the theoretical advice.

There are only a few studies that apply behavioural approaches, thus addressing farmers' attitudes towards contracting (Guo, Jolly and Zhu, 2005) or contract attributes (Lajili *et al.*, 1997; Roe, Sporleder and Belleville, 2004) and farmers' contract motivations (World Bank, 2005). These studies work with stated preferences, typically in simulated experiments or surveys. Guo, Jolly and Zhu (2005) find evidence that Chinese farmers have a rather positive attitude towards contracts, as 21.2% out of 1,036 surveyed farmers already had contracts and

another 76% said that they would accept contracts if they were offered. According to these results, low participation in contract farming is mostly due to a lack of opportunity (52.2%), interest of buyers (24.5%) or obvious benefits (20.7%). Lajili *et al.*, (1997) reveal that asset specificity and uncertainty influence farmers' preference for stricter contracts in line with TCE considerations. Boger (2001) argues that production contracts in the Polish pork market are applied as an instrument to establish high quality markets without appropriate grading systems. According to a World Bank report (2005), higher prices, avoidance of price uncertainty and guaranteed product sales are the most important arguments for contracts in Hungary, the Czech Republic and Slovakia.

The mainstream conclusion in agricultural economics is that contracts are a highly preferable option for farmers to reduce (price) risks, to safeguard specific investments, and to overcome market failures and poor public institutions for governing market transactions. The main problem of farmers is not to be excluded from contractual relationships. From this viewpoint, the relevant question is whether contract farming bypasses small scale producers especially in developing countries and transition economies (World Bank, 2005).

According to Roe, Sporleder and Belleville (2004) in contrast, US farmers prefer contracts, which are rather short-term and include only minimum delivery requirements. Co-ops are preferred over private processors. Furesi, Martino and Pulina (2006) reveal similar results for the contractual choice of Italian poultry farmers, which they investigate with regard to the processors' food safety strategies.

For Germany, anecdotic evidence shows that many farmers still strongly reject stricter vertical coordination of food supply chains. In the German pork industry, for instance, "free entrepreneurs don't need contracts" is still a very popular slogan (AgraEurope, 2004). These findings imply some barriers to the adoption of stricter forms of governance by farmers, at least in developed markets, whereas in developing and transformational countries farmers might need contracts to get market access or have more price security. We hypothesize that farmers in developed countries who are forced into contractual arrangements will show resistance, which leads to inefficiencies in the supply chain. Contracts based on persuasion and oppression thus are threatened by a low level of involvement and intrinsic motivation on the farmers' side.

Due to lack of empirical studies about German pig producers' attitudes towards contracts, we conceptualized a farm survey. Our hypothesis is that it is at least to some part a question of attitudes whether pig producers engage in contracts or not. This is supported by the above-mentioned quotation from AgraEurope, which indicates that the attitude towards contracts is especially related to the fear of losing entrepreneurial freedom. For processors, this is important to know because of the previously discussed motivational implications, which can be associated with emotional barriers against contracting.

Figure 1 demonstrates that besides contracts, long-term relationships between farmer and processor provide an opportunity to safeguard supply and to enhance chain management. Thus, it is important to scrutinize, if a strong rejection of contractual bonds is associated with an equally strong rejection of cooperation in general. If that were the case, contracts would probably be necessary for all processors, irrespective of the served market, be it standard mass or premium niche markets. We thus distinguish two different aspects of vertical coordination, the attitudes towards contracts on the one hand and the general willingness to cooperate more closely with a processor on the other hand.

The perception of structural bonds, which cause coercion to supply a certain slaughterhouse due to lack of alternatives, might play a role for the farmers' attitudes, too. If there are no relevant marketing alternatives, a farmer might "accept his fate" and be more willing to cooperate or to engage in contracts. Such causality between attitude and behaviour, postulating that behaviour causes attitudes, can be explained by the theory of cognitive dissonance (Festinger, 1957). According to Aronson (1968, p.23), dissonance "is the result of cognitions inconsistent with the self-concept". Thus, once the decision to engage in a contract has been made, a very positive attitude towards contracting is claimed in order to not to contradict one's personal behaviour.

3.2 Data and Empirical Methods

The survey was conducted among 357 large-scale pork producers in North-Western Germany, i.e., the Westfalen-Lippe and the Weser-Ems regions, the centres of German pork production, where many larger farms and slaughterhouses are located. Interviews took place in the spring of 2005. In Table 1, the main

characteristics of the sample are reported. Among the 357 interviewees, there are 17.1% farmers who have contracts for all of their production, and another 1.7% who have contracted their production only partially. Farm and herd sizes are far above German average.

Table 1: Sample Description (Mean Values)

	Total	Westfleisch	Toennies	Vion
Sample size	357	66	58	30
Farm size (ha)	93.24	88.43	94.04	95.53
Lease land (ha)	46.86	45.72	48.52	45.48
Herd size (feeder pigs)	1,406.38	1,220.76	1,088.98	1,976.33
Age of respondents (years)	40.80	40.50	41.91	40.03
% Weser-Ems	48.01	13.64	19.30	96.67
% Westfalen-Lippe	51.99	86.36	80.70	3.33
% Contractees	17.1	63.6	1.7	3.3
% Contractees (partial)	1.7	9.1	-	-
% Share of pig production in total farm income	61.3	60.9	64.6	63.4

In the sample we find 66 suppliers of Westfleisch, 58 of Toennies and 30 of Vion, which we assume to be sample sizes big enough to analyze separately, even if the results have to be interpreted with caution. Besides the already mentioned differences in contract use, the most important distinction is the regional distribution of the farmers: while 86% of the Westfleisch and 81% of the Toennies suppliers are situated in Westfalen-Lippe, there is only one of the Vion suppliers in this region, the main part is from the Weser-Ems region. Among the latter, we also find the highest average herd size, while farm sizes do not differ significantly. The high degree of specialization of the farms in our sample can be deduced from average shares of pig production in total farm income, which farmers had to estimate in the survey.

According to our hypothesis, we investigate farmers' general attitudes and the perceived advantages of contracts, their willingness to collaborate and preferences for entrepreneurial freedom, and also their risk aversion, in order to identify reasons for differences in attitudes. The measurement is mostly based on seven point Likert scales ranging from "strongly disagree" (scale = -3) to "strongly agree" (scale = +3).

The next section first gives a short overview over attitudes of farmers towards contracts, long-term relationships and closer cooperation. Via correlation analysis, we also provide some hints at the correctness of our hypotheses about relationships between different attitudes. The importance of socioeconomic characteristics is tested through correlation analysis, too. All correlations are listed in the appendix.

To test the hypothesis of differences in attitudes towards contracts and willingness to cooperate with the buyer, we carry out mean comparisons first between contractees and "free suppliers", and second between suppliers of the three biggest slaughterhouses who are subject to different forms of vertical coordination, as indicated above. Finally, we conduct a cluster analysis.

3.3 Results and Discussion

Attitudes towards Contracts and Cooperation with Buyers

The overall attitude towards contracts is measured through the statement "Contractual arrangements are only favourable for the slaughterhouses, farmers do not benefit from them at all". Farmers tend to agree to this point of view and slightly reject the item "Contracts provide me with more planning security" (see total average in Table 2), which stands as an example for perceived advantages of contracts. We also added two items concerning the necessity of their own future contract use and their opinion about the best development for the whole sector. In both cases the majority of farmers prefers spot markets.

Despite the strong rejection of contracts, there is a clear willingness to cooperate more closely with a buyer, if the latter turns out to be a good business partner, which is shown by 42.5% of farmers (strongly) agreeing and another 27.5% rather agreeing to the statement. This willingness is positively correlated with the farmers' age and also with their attitude towards contracting.

In the previous section we already saw that the interviewees are mainly free suppliers. However, only 14.6% of these say that they often or very often switch between the different processors available in their region; the great majority switches seldom (24.6%) or rarely (46.6%) their buyers. Thus we can assume that the degree of vertical coordination in German pork production is quite low but that there is nevertheless a strong focus on long-term relationships.

To check whether this orientation is forced by structural bonds, which might exist in some regions, even if in Germany as a whole there are still a lot of slaughterhouses, we asked farmers, how they perceived the number of alternative buyers for their pigs. We can show that the frequency of buyer switching is positively correlated with this question ($r = 0.20^{**}$), but also negatively correlated with the item "My buyer relies on me as a supplier" ($r = -0.13^{*}$). From this we can conclude that the orientation towards long-term relationships is to some degree forced by market circumstances, but sometimes also in a mutual way, so that farmers do not necessarily suffer from one-sided dependence.

There is a slight correlation with the perception of structural bonds (number of marketing alternatives) – those who still have a high number of alternative buyers have a more negative attitude towards contracts ($r = -0.13^{*}$) and do not think that they will have to sign contracts in the long run (-0.26^{***}).

There are only some correlations between the attitude towards contracts and socioeconomic characteristics. The item "In the long run I will have to sign a contract in order to produce pigs profitably," is correlated with age of the farm manager ($r = 0.11^{*}$). The age is also an important moderating variable concerning the preference for entrepreneurial freedom: the older the farmers, the less important is this aspect ($r = -0.15^{**}$). The item "I do not want to give up my entrepreneurial freedom due to contractual arrangements," is also strongly related to the contracting attitudes.

Comparison of Contractees and "Free" Suppliers

The mean comparisons presented in Table 2, reveal whether free suppliers are characterized through negative attitudes towards contracting and a low willingness to cooperate with their buyer. For the comparison of contractees and free suppliers, full and partial contracts are subsumed in the category contractees, due to the small number of partial contractees.

Answers of the two groups differ significantly as to general attitudes towards contracting (Table 2). The statement "Contractual arrangements are only favourable for slaughterhouses, farmers do not benefit at all," is rejected by contract farmers whilst farmers without contracts clearly agree. Benefits of contracts in terms of enhanced planning are strongly recognized by contract farmers and rather

neglected by the others. Non-contractees also strongly reject the item asking whether they think they will inevitably have to use contracts in the future, while contractees agreed.

Table 2: Contractees versus "Free" Suppliers – Mean Comparisons

Item	Total (354) $\mu(\sigma)$	Contractees (67) $\mu(\sigma)$	Free suppliers (287) $\mu(\sigma)$	F(p)
Contractual arrangements are only favourable for the slaughterhouses, farmers do not benefit from them at all.	0.56 (1.60)	-0.64 (1.55)	0.84 (1.47)	53.96 (0.00)
Contracts provide me with more planning security.	-0.23 (1.55)	0.96 (1.43)	-0.51 (1.44)	55.89 (0.00)
In the long run I will have to sign a contract to produce pigs profitably.	-0.88 (1.78)	0.78 (1.86)	-1.26 (1.53)	88.96 (0.00)
In my opinion it would be better if farmers engaged in long-term contracts with slaughterhouses.	-0.39 (1.60)	0.76 (1.40)	-0.66 (1.53)	48.37 (0.00)
I do not want to give up my entrepreneurial freedom due to contractual arrangements.	1.20 (1.58)	-0.09 (1.61)	1.50 (1.41)	64.86 (0.00)
I prefer cooperation with only one processor if he has turned out to be a good business partner.	1.05 (1.35)	1.46 (1.23)	0.95 (1.36)	7.82 (0.01)
I can imagine to collaborate more closely with [slaughterhouse XY].	0.13 (1.45)	0.54 (1.51)	0.03 (1.42)	6.72 (0.01)
I am willing to consider a slaughterhouse's quality requirements in my production.	1.32 (0.91)	1.54 (0.75)	1.27 (0.94)	4.82 (0.03)
I won't let [slaughterhouse XY] influence the quality parameters of my production.	**0.07** (1.45)	**-0.16** (1.47)	**0.12** (1.44)	2.13 (0.15)
When making business decisions I prefer to play it safe.	**0.73** (1.14)	**0.63** (1.22)	**0.75** (1.12)	0.66 (0.42)
I have lots of different slaughterhouses I can deliver to.	0.68 (1.55)	0.19 (1.79)	0.79 (1.47)	8.29 (0.00)
In my region there are relatively few marketing alternatives.	-1.19 (1.49)	-0.85 (1.75)	-1.27 (1.41)	4.37 (0.04)

Note: Seven point Likert scales ranging from "strongly disagree" (scale = -3) to "strongly agree" (scale = +3) Differences not significant at least at the 5%-level are marked through bold type.

The item "I do not want to give up my entrepreneurial freedom due to contractual arrangements," is strongly agreed by free suppliers, but contract farmers slightly reject it, showing that autonomy is important even for those who have engaged in contracts. Thus, it is questionable, if the farmers who stated a positive general attitude towards contracts would engage in stricter contracts than the Westfleisch contracts, which currently are not very demanding. All in all, contract farmers have a weak positive attitude towards contracts whereas free suppliers refuse contracts categorically.

There are also differences between contractees and independent farmers concerning general cooperation, but we can nevertheless state a willingness to cooperate with the buyer among the latter group, too. Furthermore, contractees and free suppliers show similar attitudes concerning the willingness to let the buyer influence quality parameters of their own production. From these findings we can conclude that the attitude towards contracts is somewhat detached from the willingness to cooperate. This offers the opportunity to keep current sourcing strategies notwithstanding future requirements of basic quality management.

Suppliers of Different Slaughterhouses: Attitudes towards Contracting and Cooperation

In the next step we repeat the previous analysis, this time comparing suppliers of different enterprises. Even if the number of suppliers is small especially for Vion (V), the comparison of means shows interesting differences between the respective farmers (Table 3). The Westfleisch suppliers are further divided into the categories contractees (W-C) and free suppliers (W-F), in order to control the impact of the slaughterhouses' current marketing strategies.

The mean comparisons reveal that the answers of free Westfleisch suppliers are much more similar to those of the other free suppliers than to the Westfleisch-contractees. In some cases, their answers deviate from both groups. Concerning their own future use of contracts, the free Westfleisch suppliers are on average irresolute, while contractees are sure they will have to use contracts in the future, and the other free suppliers strongly reject a future need for contracts. Despite the aversion against contracts, there are no significant differences concerning the

Table 3: Suppliers of Different Slaughterhouses – Mean Comparisons

Item	Total (154) $\mu(\sigma)$	W-C (48) $\mu(\sigma)$	W-F (18) $\mu(\sigma)$	T (58) $\mu(\sigma)$	V (30) $\mu(\sigma)$	F(p)
Contractual arrangements are only favourable for the slaughterhouses, farmers do not benefit from them at all.	0.40 (1.59)	-0.44 (1.67)	0.44 (1.38)	0.79 (1.36)	0.97 (1.50)	7.81 (0.00)
Contracts provide me with more planning security.	-0.14 (1.54)	0.79 (1.43)	-0.35 (1.32)	-0.72 (1.29)	-0.41 (1.62)	10.86 (0.00)
In the long run I will have to sign a contract to produce pigs profitably.	-0.62 (1.82)	0.71 (1.81)	-1.22 (1.63)	-1.24 (1.38)	-1.20 (1.63)	16.09 (0.00)
In my opinion it would be better if farmers engaged in long-term contracts with slaughterhouses.	-0.22 (1.58)	0.71 (1.54)	-0.06 (1.39)	-0.82 (1.32)	-0.67 (1.52)	11.01 (0.00)
I don't want to give up my entrepreneurial freedom due to contractual arrangements.	1.06 (1.52)	0.02 (1.66)	1.41 (1.37)	1.59 (1.08)	1.50 (1.33)	13.61 (0.00)
I prefer cooperation with only one processor if he has turned out to be a good business partner.	**1.14** (1.23)	**1.40** (1.23)	**0.89** (1.37)	**0.97** (1.08)	**1.24** (1.41)	1.40 (0.24)
I can imagine to collaborate more closely with [slaughterhouse XY].	-0.01 (1.43)	0.46 (1.34)	0.11 (1.57)	-0.22 (1.27)	-0.43 (1.63)	3.19 (0.03)
I am willing to consider a slaughterhouse's quality requirements in my production.	**1.26** (0.88)	**1.46** (0.77)	**1.06** (0.73)	**1.24** (0.78)	**1.10** (1.24)	1.48 (0.22)
I won't let [slaughterhouse XY] influence the quality parameters of my production.	**0.23** (1.45)	**0.10** (1.45)	**0.56** (1.50)	**0.21** (1.36)	**0.30** (1.60)	0.45 (0.72)
I have lots of different slaughterhouses I can deliver to.	0.42 1.54	0.00 1.76	0.11 1.49	0.50 1.42	1.10 1.16	3.62 0.01
In my region there are relatively few marketing alternatives.	-0.83 1.58	-0.71 1.69	-0.47 1.59	-0.67 1.64	-1.53 1.07	2.64 0.05

Note: Seven point Likert scales ranging from "strongly disagree" (scale = -3) to "strongly agree" (scale = +3)

W-C = contractees of Westfleisch; W-F = free Westfleisch suppliers; T = Toennies; V = Vion
Differences not significant at least at the 5%-level are marked through bold type.

willingness to cooperate with the slaughterhouses or to consider the buyers' quality requirements.

We can observe a great attitudinal difference towards contracts between the groups compared, although the willingness to cooperate is quite high in most cases. The results so far support our hypothesis that opportunities for non-contractual

ways of chain management exist. The willingness to cooperate more closely with a processor is mostly independent from the attitude towards contract systems.

Why do some farmers take part in contract approaches whereas the majority strongly rejects this solution. We propose an explanation based on the theory of cognitive dissonance (Festinger, 1957). One might think that those farmers, who entered into contracts because of a long-term tradition of the relationship and due to emotional ties, or due to a lack of alternatives, as discussed above, now will not declare this decision to be wrong. In this case attitudes are influenced through behaviour and not the other way round.

Still, high standard deviations show that there is no consensus amongst the farmers in either of the groups. All in all, attitudes towards contracts are much more complex and sceptical than has been recognized by scientists up to now. Neither farm size, nor age, nor willingness to take risks are correlated to these attitudes. Against the background of the high standard deviations it is not likely that all of the respective attitudes can be explained by current marketing strategies. Therefore, we conduct a cluster analysis to reveal homogenous groups of farmers.

Cluster Analysis

The cluster analysis was carried out based on five variables representing the most important statements towards contracting and cooperation. Euclidian Distance serves as proximity measure. The optimal number of clusters is first defined using Ward method. A four cluster solution is chosen based on scree test, dendrogram and plausibility considerations. In order to refine this solution in a second step, a K-means cluster analysis is conducted.

In Table 4 clusters are described by means and standard deviations of the active (cluster building) variables as well as important passive variables. The four groups can be characterized as "inveterate antagonists", "indifferent farmers", "cooperation-oriented farmers" and "contract supporters". As shown by the F-values, in the table the strongest differences between the clusters can be observed for the statements concerning the perceived necessity to contract with a slaughterhouse.

The rejection of contracting is very manifest for the first cluster ("antagonists") which contains 103 farmers. Notwithstanding, respondents in this group show a

Table 4: Cluster Analysis – Attitudes towards Contracting

	Total (343)	Cluster 1 (103)	Cluster 2 (85)	Cluster 3 (82)	Cluster 4 (73)	
Item	$\mu(\sigma)$	$\mu(\sigma)$	$\mu(\sigma)$	$\mu(\sigma)$	$\mu(\sigma)$	F(p)
Contractual arrangements are only favourable for the slaughterhouses, farmers do not benefit from them at all.[1]	0.59 (1.57)	2.15 (0.86)	0.59 (1.00)	-0.04 (1.20)	-0.88 (1.34)	121.99 (0.00)
Contracts provide me with more planning security.[1]	-0.24 (1.54)	-1.75 (1.05)	-0.40 (0.89)	0.50 (1.18)	1.23 (1.07)	133.02 (0.00)
In the long run I will have to sign a contract to produce pigs profitably.[1]	-0.90 (1.77)	-2.51 (0.64)	-0.55 (1.09)	-1.59 (0.83)	1.73 (0.84)	375.20 (0.00)
In my opinion it would be better if farmers engaged in long-term contracts with slaughterhouses.[1]	-0.41 (1.58)	-2.07 (0.82)	-0.65 (1.01)	0.33 (1.03)	1.38 (0.81)	223.22 (0.00)
I do not want to give up my entrepreneurial freedom due to contractual arrangements.[1]	1.22 (1.55)	2.34 (1.02)	1.29 (1.12)	1.20 (1.28)	-0.41 (1.43)	74.36 (0.00)
I prefer cooperation with only one processor if he has turned out to be a good business partner.	1.08 (1.31)	0.81 (1.57)	0.12 (1.12)	1.65 (0.76)	1.95 (0.55)	44.67 (0.00)
I can imagine to collaborate more closely with [slaughterhouse XY].	0.12 (1.45)	-0.25 (1.46)	-0.09 (1.19)	0.19 (1.51)	0.84 (1.38)	9.60 (0.00)
I am willing to consider a slaughterhouses quality requirements in my production.	1.32 (0.91)	1.14 (1.12)	1.14 (0.87)	1.41 (0.70)	1.66 (0.73)	6.36 (0.00)
I won't let [slaughterhouse XY] influence the quality parameters of my production.	0.06 (1.44)	0.21 (1.66)	0.21 (1.19)	-0.07 (1.44)	-0.16 (1.39)	1.49 (0.22)
I have lots of different slaughterhouses I can deliver to.	0.67 1.55	0.98 1.53	0.78 1.39	0.83 1.40	-0.07 1.70	7.76 0.00
In my region there are relatively few marketing alternatives.	-1.18 1.50	-1.41 1.52	-1.14 1.37	-1.28 1.33	-0.81 1.73	2.49 0.06

Note: Seven point Likert scales ranging from "strongly disagree" (scale = -3) to "strongly agree" (scale = +3)

[1] Cluster building variables

Differences not significant at least at the 5%-level are marked through bold type.

certain disposition to build stable relationships with one slaughterhouse. In contrast to this the second cluster is indifferent towards vertical contracts but with a low willingness to engage in closer business relationships. Overall, these

farmers are suitable to supply markets without higher specialties and production requirements.

Cluster 4 is the only group, which perceives some farmer benefits from marketing contracts, especially assured market access and lower price risks. Nevertheless, the group's positive attitude towards contracting is somewhat modest.

Clusters 2 and 3 are a little bit surprising. On the one hand, respondents in cluster 3 show a distinctive willingness to build closer relationships with their preferred customers; on the other hand, they perceive their market opportunities as sufficient with a lot of alternative slaughterhouses. Farmers in cluster 2 are quite indifferent but show the lowest degree of cooperative intentions. Furthermore, this group is characterized through a comparatively high switching behaviour. Altogether the amount of trust and especially of commitment in the pork chain is rather low in all segments. Contract farmers show significant higher values but regarding their long-term and ongoing relationships a weak approval is not convincing.

A look at the current contracting behaviour of the cluster members shows that cluster 4—the "contract supporters"—consists of 53.4% contractees, whilst in the other clusters there are far less farmers with contracts, as could be expected. To put it differently: 66% of all contract farmers in our sample are members of cluster 4. Another 15% belong to the group of the "cooperation-oriented farmers", 14% are in the group of "indifferent farmers", and 5% are "inveterate antagonists". The other way around, one third of contract farmers do not show positive attitudes towards contracting. It is interesting to note that cross tabulations do not show significant differences between the clusters in terms of farm size (finishing capacities and hectares) and significant differences in the age of the farmers do not reflect a linear relationship. We assume, that these probably feel forced to engage in contracts. Regrettably, the size of this sub sample is too small to conduct further analyses. However, the theory of cognitive dissonance cannot fully be approved for the example of contracting in pig production.

All in all, we state strong negative attitudes towards contractual relationships, with more than two thirds of the respondents not willing to engage in contracts

with their buyers. Nevertheless we state a broader willingness to cooperate more closely with processors if they in turn show cooperative behaviour. The decision not to engage in contracts seems to be a very emotional one, as there are only few discriminative characteristics of contract supporters and antagonists.

4. Discussion of Results: Supplier Relationship Management in Agri-Food Chains

The question of vertical coordination of agri-food chains is more complex than the often quoted independent farmer – contract farmer dichotomy suggests. Both theoretical considerations and results of farmer surveys nourish doubts about an ongoing trend towards more contracts and vertical integration in developed countries. In fact, for the German pork production we recommend a dominating sector of independent farming combined with an emphasis on more trust between transacting parties (i.e., farmers and slaughterhouses) and more commitment to long-term business relationships (Schulze *et al.*, 2006). Faced with the manifest rejection of contracts by most farmers, it seems to be appropriate to think more about non-contractual options of improved supplier relationship management. This is especially true in a country characterized by family farming and few opportunities to build new big pork houses. We hypothesize that closer vertical relationships in German pork production will remain limited to smaller market segments with above-average quality requirements concerning, for instance, animal welfare or region-of-origin cues.

The currently low level of trust between farmers and slaughterhouses has resulted in a number of problems in the German meat industry, e.g., failed attempts to successfully introduce advanced carcass grading and salmonella monitoring systems. These problems are not (only) due to various trade-offs between both sides but the consequence of information and communication conflicts in the food supply chain. We therefore suggest the development of relationships characterized by stability, calculability, and reliability which offer the possibility of optimizing processes, enhancing chain-wide information flows and improving product quality (Gerlach, 2006). As both transaction parties can draw advantages from this kind of relationship they are likely to sacrifice short-term advantages that arise from market changes. This option of long-term

non-contractual relationships based on improved mutual trust and commitment is often overlooked in the discussion about alternative coordination systems in food supply chains.

Growing requirements concerning meat quality in the European Union enhance the necessity to introduce more reliability into the so far rather conflictual relationships between farmers and abattoirs in the German meat industry. Better relationships cannot be developed without a minimum of trust (Galizzi and Venturini, 1999; Frentrup and Theuvsen, 2006). Game theory provides insights into the "functioning" of collaboration. As long as the game is definitely limited to a certain number of transactions, none of the players will cooperate. Only if there is a perspective for infinite collaboration, a "tit for tat" strategy becomes interesting for the players. By this, confidence in the other's behaviour can be developed so that the game ends up as a non-zero sum game in which both parties win (Axelrod, 1984). Thus, if one party goes ahead with trust-building measures, and the business partner reacts favourably, stable relationship which are resistant to short-term opportunistic behaviour can evolve over time.

Thus, building trust requires one party to make the first step. In the German pork production system, trust building instruments have to be taken by the slaughterhouses signalling farmers that their customers are trustworthy and reliable. This requires the commitment of the whole enterprise, not only of those employees who directly communicate with farmers. Thus, internal changes such as introducing a "code of ethics" (Wieland, 1994; Wieland, 1999) have to be considered in a business environment which is characterized so far by distrust and opportunism.

Trust communication is complex because it is always contested by the danger of being perceived as unbelievable public relations. Furthermore, cultural changes in a company as well as an industry are difficult to manage and may have unforeseen outcomes (Schein, 1992). For that we propose a comprehensive supplier relationship management concept, which goes beyond trust communication as it implies new internal management tools (e.g., improved supplier selection and development programs) as well as instruments to enhance vertical transparency, personal bonds, participation opportunities, complaint

management and so on (Ryder and Fearne, 2003; Stölzle and Heusler, 2003). Such a strategy is appropriate for those slaughterhouses, which aim at working closer together with their farmers. In particular, target groups for a supplier relationship management are cluster 3 ("cooperation-oriented farmers") and a part of cluster 4 ("contract supporters"), which are interested in what has become known as co-opetition without structural bonds.

5. Conclusion

Reflections based on TCE taking into account current technological and structural developments in the slaughterhouse industry and in quality assurance indicate the long-term viability of pork markets with a low degree of vertical coordination, which may have efficiency advantages over more integrated meat supply chains. This argument is supported by results of a large-scale survey in German pork production. Future research should analyze in more detail non-contractual long-term relationships, which have been prevalent so far in Germany and some other European countries. From game theory it can be deduced that trust management can be a suitable instrument to gain some of the advantages, which are usually attributed to contracts. Trust-building instruments should be integrated into a broader approach of supplier relationship management. This idea needs more in-depth analysis, too.

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References

AgraEurope (2004), Freie Unternehmer brauchen keine Verträge. 12/2004, 33-34.

Aronson E (1968), Dissonance Theory: Progress and Problems, In: R. Abelson *et al* (Eds.). Theories of Cognitive Consistency: A Sourcebook. Chicago: Rand McNally, 2-27.

Axelrod R (1984),The Evolution of Cooperation. New York: Basic Books.

Bijman J *et al* (Eds.) (2006), International Agri-Food Chains and Networks: Management and Organization. Wageningen: Wageningen Academic Publishers.

Boger S (2001), Quality and Contractual Choice: A Transaction Cost Approach to the Polish Pork Market. European Review of Agricultural Economics, 28, 241-261.

Bogetoft P, Olesen H B (2002), Ten Rules of Thumb in Contract Design: Lessons from

Danish Agriculture, European Review of Agricultural Economics, 29, 185-204.

den Ouden M. *et al* (1996), Vertical Cooperation in Agricultural Production-Marketing Chains, with Special Reference to Product Differentiation in Pork, Agribusiness, 12, 277-290.

Festinger L (1957), A Theory of Cognitive Dissonance. Stanford, CA: Stanford University Press.

Frentrup M, Theuvsen L (2006), Transparency in Supply Chains: Is Trust a Limiting Factor? In M Fritz, G Schiefer and U Rickert (Eds.). Trust and Risk in Business Networks. Pre-Prints of 99th EAAE Seminar, February 8-10, 2006, Bonn, 63-72.

Furesi R, Martino G, Pulina P, (2006), Contractual Choice and Food Safety Strategy: Some Empirical Findings in Italian Poultry Sector. In M Fritz, G Schiefer and U Rickert (Eds.). Trust and Risk in Business Networks. Pre-Prints of 99th EAAE Seminar, February 8-10, 2006, Bonn, 475-483.

Galizzi G, Venturini L (Eds.) (1999), Vertical Relationships and Coordination in the Food System. Heidelberg: Physica.

Gerlach S (2006), Relationship Management in Agribusiness. Ph.D. Dissertation, University of Goettingen.

Guo H, Jolly R W, Zhu J (2005), Contract Farming in China: Supply Chain or Ball and Chain? Proceedings of the Minnesota International Economic Development Conference, University of Minnesota, April 29-30, 2005.

Haley M M (2004), Market Integration in the North American Hog Industries. USDA, Agricultural Economic Research Service, Washington, DC.

Jaeger W (2006), Der ideale landwirtschaftliche Mastbetrieb: Kriterien für den Erfolg der deutschen Schweineproduktion. Paper presented at Schweinehandelstag Burg Warberg, September 5, 2006.

James H S, Sykuta M E (2006), Farmer Trust in Producer- and Investor-Owned Firms: Evidence from Missouri Corn and Soybean Producers. Agribusiness, 22, 135-153.

Katchova A L, Miranda M J (2004),Two-step Econometric Estimation of Farm Characteristics Affecting Marketing Contracts Decisions. *American Journal of Agricultural Economics*, 86, 88-102.

Key N (2004), Agricultural Contracting and the Scale of Production. Agricultural and Resource Economics Review, 33, 255-271.

Key N, McBride W D (2003), Production Contracts and Productivity in the U S Pork Sector. *American Journal of Agricultural Economics*, 85, 121-133.

Lajili K *et al.*, (1997), Farmers' Preferences for Crop Contracts. *Journal of Agricultural and Resource Economics*, 22, 264-280.

Lawrence J D *et al.*, (1997), Vertical Coordination in the US Pork Industry: Status, Motivations, and Expectations. Agribusiness, 13, 21-31.

Lawrence J D, Schroeder, T C, Hayenga M L (2001), Evolving Producer-Packer-Customer Linkages in the Beef and Pork Industries. Review of Agricultural Economics, 23, 370-385.

Luning P A, Marcelis, W J, Jongen, W M F (2002), Food Quality Management: A Techno-Managerial Approach. Wageningen Pers: Wageningen.

Martinez S W, (2002), Vertical Coordination of Marketing Systems: Lessons from the Poultry, Egg and Pork Industries. USDA, Economic Research Service, Agricultural Economic Report No. 807. Washington, DC.

Peterson H C, Wysocki A, Harsh, S B (2001), Strategic Choice along the Vertical Coordination Continuum. In: International Food and Agribusiness Management Review, 4, 149-166.

Roe B, Sporleder T L, Belleville B (2004), Hog Producer Preferences for Marketing Contract Attributes. *American Journal of Agricultural Economics*, 86, 115-123.

Ryder R, Fearne A (2003), Procurement Best Practice in the Food Industry: Supplier Clustering as a Source of Strategic Competitive Advantage. *Supply Chain Management: An International Journal*, 8, 12-16.

Schein E H (1992), Organizational Culture and Leadership. 2nd ed., San Francisco: Jossey-Bass.

Schramm M, Spiller A (2003), Farm-Audit und Farm-Advisory-System: Ein Beitrag zur Ökonomie von Qualitätssicherungssystemen. Berichte über Landwirtschaft, 81, 165-191.

Schulze B, *et al* (2006), Relationship Quality in Agri-Food Chains: Supplier Management in the German Pork and Dairy Sector. *Journal on Chain and Network Science*, 6, 55-68.

Spiller A, *et al* (2005), Sicherstellung der Wertschöpfung in der Schweineerzeugung: Perspektiven des Nordwestdeutschen Modells. Muenster.

Stölzle W, Heusler K F (2003), Supplier Relationship Management – Entstehung, Konzeptverständnis und methodisch-instrumentelle Anwendung. In R Bogaschewsky and U Götze (Eds.), Management und Controlling von Einkauf und Logistik. Gernsbach: Deutscher Betriebswirte Verlag, 168-194.

Theuvsen L, Hollmann-Hespos T (2005), The Economics of Traceability: A Model of Investments in Tracking and Tracing Systems in Agriculture and the Food Industry. In J Boaventura Cunha and R Morais (Eds.), Proceedings of the EFITA/WCCA 2005 Joint Conference, Vila Real, 914-921.

Wieland J (1994), Organisatorische Formen der Institutionalisierung von Moral in der Unternehmung: Empirische Resultate, theoretische Reflexionen. In H G Nutzinger (Ed.). Wirtschaftsethische Perspektiven II: Unternehmen und Organisationen – Philosophische Begruendungen – Individuelle und kollektive Rationalitaet. Berlin: Duncker & Humblot.

Wieland J (1999), Die Ethik der Governance. Marburg: Metropolis.

Williamson O E (1985), The Economic Institutions of Capitalism. New York and London: Free Press.

Windhorst H -W, (2004), Qualitätssicherung in der Lebensmittelkette – wo liegen die Herausforderungen? In Dachverband Agrarforschung (Ed.). Lebensmittelqualität und Qualitätssicherungssysteme. Frankfurt/M.: VerlagsUnionAgrar, pp. 21-33.

World Bank (Ed.) (2005), The Dynamics of Vertical Coordination in Agrifood Chains in Eastern Europe and Central Asia: Implications for Policy and World Bank Operations. Washington, DC: World Bank.