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Abstract

It is often hypothesized that contracts and vertical integration are paramount for the future competitiveness of meat supply chains. In this paper we review empirical evidence and theoretical reflections underlying this argumentation. We confront the contract and integration hypothesis with transaction cost considerations taking into account current technological and institutional developments and results from a survey in German pig production. It is concluded that more trust and commitment in non-contractual long-term relationships may be a viable alternative to stricter vertical coordination in meat supply chains.

Keywords: *pig-pork-chain, transaction cost economics, supplier relationship management*

1 Introduction

In recent years, contracts and vertical integration in meat supply chains were among the most vividly discussed topics in agriculture and the food industry. This discussion is fueled by several developments. Some authors identify increasing requirements of large buyers concerning product quality and traceability as important drivers towards stricter coordinated food supply chains (den Ouden *et al.*, 1996; Lawrence *et al.*, 1997). Others highlight the important role contracts and vertical integration may have played in the emergence of the United States and Denmark as leading pig producers and exporters (Windhorst, 2004). It is also argued that buyers' appreciation of improved food traceability is often lower than expected and can in many cases easily be met without redesigning supply chains (Theuvsen & Hollmann-Hespos, 2005). In this paper we critically review the arguments and propose improved supplier relationship management as an alternative to more vertical cooperation and integration in meat supply chains. Our recommendation is based on a large-scale survey in German pig 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: Some Critical Remarks

There is a broad spectrum of alternatives farmers and abattoirs can choose from when designing their business relationships (Peterson *et al.*, 2001). Figure 1 presents some important alternatives of organizing livestock production. In *spot market* exchanges, pig producers and slaughterhouses negotiate every transaction separately and are ready to change their selling respectively buying behaviour very quickly, whereas in *vertically integrated* chains, there is

joint ownership of resources on the farm and the slaughterhouse level. In the terminology of Transaction Cost Economics (TCE), the various forms of contracts as well as repeated transactions in long-term relationships are hybrid governance structures (Williamson, 1985).

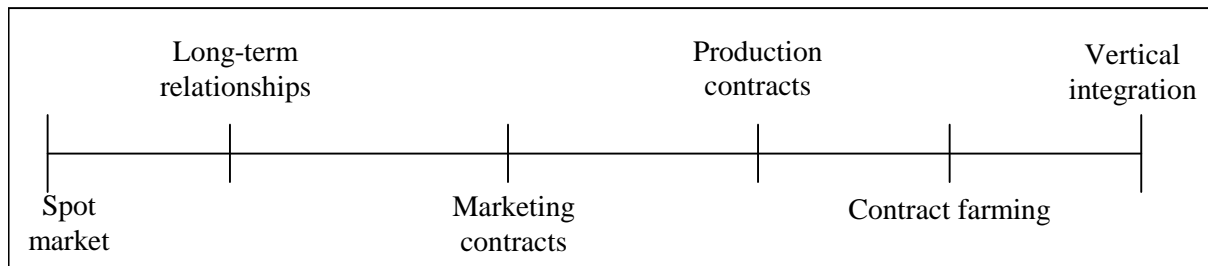


Figure 1. Vertical Organization of Meat Supply Chains (Spiller *et al*, 2005, p. 398)

Throughout the world, very diverse pig production systems have evolved. In Germany and other European countries, spot markets, repeated transactions and marketing contracts are dominant (Traupe, 2002; Spiller *et al*, 2005). In other countries, e.g. the United States and Denmark, more integrated supply chains have evolved. Today more than 70 % of U.S. pigs 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 a trend towards closer vertical coordination and consider the loose relationships in some European markets as an obsolescent model (e.g., Windhorst, 2004).

TCE provides the most common theoretical framework for contracts and vertical integration in livestock 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 of buyers as a major driving force of contracts and vertical integration. In particular, product differentiation in order to meet changing consumer demands regarding credence attributes such as animal welfare and food safety is considered a main driver of closer ties in the meat supply chain. Transmitting the changing demands to the farm stages is considered more transaction cost efficient under contracts and in vertically integrated systems. Lawrence *et al* (1997) offer a similar explanation. According to their empirical studies, farmers and slaughterhouses save transaction costs through contracts and vertical integration. For abattoirs high quality of pigs and consistency of supply with adequate quantities are paramount. Lawrence *et al* (1997) argue that under these circumstances long-term contracts allow transaction cost savings compared to traditional marketing channels. Farmers may also save transaction costs, e.g., 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 institutional innovations. Insofar, two important developments

have emerged in the pig industry: new technologies of pre-slaughter and on-line sorting and comprehensive quality management metasystems.

The Danish pork production is the most widely cited example of successful meat packing supplying uniform animals to a slaughterhouse. Special pig genetic is restricted geographically (Bogetoft & Olesen, 2002). The Danish coop Danske Slagterier uses production contracts to produce homogeneous pork products in large quantities for special market segments, e.g., the British bacon market. During the 1980s and 1990s this production systems 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 contracts is only one way to produce homogeneous products in high quantities. During the last years, new sorting technologies in combination with the enormous growth of slaughterhouses have been allowing the same output with pre-slaughter sorting instead of stricter vertical coordination. Toennies, market leader in packed pork in Germany, applies this new strategy by creating a number of 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. All in all, new sorting technologies in combination with large-scale slaughtering lower the degree of asset specificity between pig producers and processors and favor spot-market transactions.

Besides new sorting technologies, quality management metasystems also enforce spot markets. They build standards for the whole industry thus reducing the imperative for company-specific quality approaches on a contract basis. A key feature of certification systems is that inspections are carried out by independent bodies (third-party audits) beholden to standards laid down by external organizations (Luning *et al.*, 2002). The supplier provides a certificate serving as a quality signal. In the meat industry well-known examples of certification are the Dutch IKB standard or the German Quality and Safety System. In most cases certification systems formulate a baseline assuring minimum standards like compliance with legal requirements. Hence, comprehensive quality management metasystems reduce the quality uncertainty of buyers and enforce arm's length solutions in food supply chains (Schramm & Spiller, 2003).

All in all, the introduction of quality certification and automated sorting technologies in larger slaughterhouses reduces the need for contracts and vertical integration in food supply chains and supports more flexible market structures characterized by strong pricing pressures.

3 Farmers' Acceptance of More Vertically Integrated Meat Supply Chains

The previous section provided some theoretical support for the model of a less integrated pork supply chain. Another important factor is farmers' acceptance of new organization structures of food chains. Anecdotic evidence proves that many farmers still strongly reject stricter vertical coordination (AgraEurope, 2004). Contracting, thus, is threatened by a low level of

involvement and internal motivation on the farmers' side. There are only a few studies that apply behavioural approaches, thus addressing farmers' attitudes towards contracting (Guo *et al.*, 2005) or contract attributes (Roe *et al.*, 2004). Both studies do not focus on Western European agriculture and do not discuss in depth farmers' general attitudes towards contracts and vertical integration. Therefore, an own survey was conducted among 357 large-scale pig producers in the Westfalen-Lippe and Weser-Ems regions, the centres of German pig production. Average farm size was 93 hectares, average herd size 1,413 feeder pigs respectively 197 sows and average age of respondents 41 years. These figures demonstrate that the farms involved in the survey are much larger than the German average and future oriented companies.

The attitude model mostly consisted of seven point-Likert scales ranging from "strongly disagree" (scale = -3) to "strongly agree" (scale = +3) to evaluate farmers' attitude towards contracts, trust and commitment, their perceived number of marketing alternatives and their willingness to cooperate more closely with a processor. Concerning farmers' marketing strategies, we revealed that 17 % of the surveyed farmers have marketing contracts for their whole, 2 % for parts of their production. 81 % do not have any contractual linkages to processors at all. Among the latter group, only 15 % of farmers say that they often or very often switch between different abattoirs. Another 14 % declare a medium level of switching frequency; the great majority seldom (25 %) or rarely (47 %) switches their buyers. So the degree of vertical coordination in German pig production is quite low but with a strong focus on long-term relationships.

Farmers without contractual arrangements were asked whether they think they will inevitably have to use contracts in the future. With an average of -1.26 ($\sigma = 1.53$), this statement is strongly rejected. A correlation with farm size can only be identified for the statement "In my opinion it would be better if farmers would engage in long-term contracts with slaughterhouses" ($r = -0.13$; $p = 0.000$). Nevertheless, 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 70 % of farmers agreeing to the respective statement ($\mu = 0.96$).

Answers of contract farmers and independent farmers differ significantly. For example, the statement "contractual arrangements are only favourable for slaughterhouses, farmers don't benefit at all" is rejected by contract farmers ($\mu = -0.67$, $\sigma = 1.55$) whilst farmers without contracts clearly agree ($\mu = 0.84$, $\sigma = 1.48$). Another question asks for the perceived benefits of contracts in terms of enhanced planning, which are recognized by contract farmers ($\mu = 0.96$, $\sigma = 1.44$) and rather neglected by the others ($\mu = -0.51$, $\sigma = 1.43$). 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. Due to high standard deviations, a cluster analysis was carried out based on five variables representing the most important statements towards contracting (*contr1-5*). Table 1 presents the four cluster solution which was chosen based on scree test, dendrogram and plausibility considerations. The clusters are described by means and standard deviations of the active (cluster building) variables and main passive variables (e.g., *trust1*, 2, statements see appendix).

Table 1. Cluster Analysis: Attitudes towards Contracting

Cluster (N)		contr 1	contr 2	contr 3	contr 4	contr 5	free	trust 1	trust 2	com 1	com 2	swit
		active variables					passive variables					
1 (103)	μ	2.15	-1.75	-2.51	-2.07	0.81	2,34	0,86	60,92	-1,02	0,03	34,83
		0.86	1.05	0.64	0.82	1.56	1,02	1,22	19,07	1,57	1,42	26,18
2 (85)	μ	0.59	-0.40	-0.55	-0.65	0.12	1,29	0,92	60,24	-0,71	0,00	37,44
		1.00	0.89	1.09	1.01	1.11	1,12	1,06	16,54	1,41	1,45	24,09
3 (82)	μ	-0.04	0.50	-1.59	0.33	1.65	1,20	1,01	64,57	-0,21	0,36	24,61
		1.20	1.18	0.83	1.03	.76	1,28	1,23	21,48	1,69	1,45	23,34
4 (73)	μ	-0.88	1.23	1.73	1.38	1.95	-0,41	1,40	71,81	0,64	0,90	12,23
		1.34	1.07	0.84	0.81	0.55	1,43	1,17	14,97	1,49	1,53	10,91
Total (343)	μ	0.59	-0.24	-0.90	-0.41	1.08	1,22	1,03	63,97	-0,39	0,29	28,10
		1.57	1.54	1.77	1.58	1.31	1,55	1,19	18,74	1,66	1,49	24,30
F-value		121.9	133,0	375.2	223.2	44.7	74,4	3,4	6,5	17,6	6,5	20,1
p-value		.000	.000	.000	.000	.000	.000	.018	.000	.000	.000	.000
Seven point Likert scales ranging from “strongly disagree” (scale = -3) to “strongly agree” (scale = +3); switching behaviour (<i>swit</i>) and <i>trust 2</i> are measured on 100-point rating scales												

The four groups can be characterized as “inveterate antagonists”, “indifferent farmers“, “cooperation-oriented farmers” and “contract supporters“. As show the F-values, the strongest differences between the clusters can be observed for the statements concerning the perceived necessity to contract with a slaughterhouse (*contr 3 and 4*). The first cluster (“antagonists”) accounts for about 30 % of the sample and accentuates the strongest rejection. The answers to the statement “I don’t want to give up my entrepreneurial freedom” (*free*) are consistent with these results and demonstrate that more than two thirds of the respondents reject contracts.

A look at current contracting behavior of the cluster members shows that cluster 4 (“contract supporters”) consists of 53 % contractees; 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”. So one third of contract farmers do not have positive attitudes towards contracting. Cross tabulations do not show significant differences between the clusters in farm size and significant differences in the age of the farmers do not reflect a linear relationship.

Significant differences between the groups can also be identified concerning perceived power imbalance and structural dependency. “Contract supporters” (cluster 4) perceive their position as more threatened by growing concentration in the slaughterhouse industry. Correspondingly, farmers in this group perceive benefits from marketing contracts, especially assured market access and planning reliability. 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 pig 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.

Only 20 % of all suppliers are willing to participate in marketing or production contracts. The rejection of contracting is very manifest for the first cluster. Notwithstanding respondents in this group show a 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. Both clusters are characterized by a low level of trust and commitment. Overall, these farmers are suitable to supply markets without higher specialities and production requirements. Farmers, belonging to cluster 4, are supporting the idea of contracts but not as manifest as cluster 1 is rejecting it. Trust and commitment (*trust1 and 2, comm1 and 2*) are higher than in all other groups but also to a limited extent. In this case we propose expanded endeavours to build up trust in the supply chain. With reservations the same conclusions are advisable for cluster 3. But in this case trust management should not be implying marketing contracts.

All in all, we state a strong rejection of contractual relationships, but nevertheless a broader willingness to cooperate more closely with processors if they in turn show cooperative behaviour. The limited level of trust in the meat supply chain indicates unused potential in this direction.

4 Trust Management: An Alternative to Contracts and Vertical Integration

The question of vertical coordination is more complex than the simple independent farmer-contract farmer dichotomy suggests. Both theoretical considerations and results of the farmer survey nourish doubts about an ongoing trend towards more contracts and vertical integration. In fact, for the German pig production we argue for a dominating sector of independent farming combined with an emphasis on more trust between transacting parties (i.e. farmers and abattoirs) and more commitment to long-term business relationships. 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 of building new big pig houses. To our minds, closer vertical relationships in German pig production are and 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 abattoirs has led to a number of coordination problems in the German meat industry, e.g., failed attempts to successfully introduce salmonella monitoring or state-of-the-art carcass grading systems. These problems are not (only) due to various trade-offs between both sides but the consequence of information and communication conflicts in the 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 ameliorating product quality. 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 forms of coordinating food supply chains.

The new requirements of meat quality (e.g., European food hygiene regulations) enhance the necessity to introduce more reliability into the rather conflictual relationships between farmers and slaughterhouses. Better relationships cannot be developed without a minimum of trust (Galizzi & Venturini, 1999). 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, where one player does in one round exactly what the other did in the round before. By this, confidence in the other’s behaviour can be developed so that the game ends up as a non-zero sum game (Axelrod, 1984). Thus, if one party goes ahead with trust-building measures, and the business partner reacts favourably, stable relationships which are resistant towards incentives for short-term opportunistic behaviour can evolve over time.

Thus, building trust requires one party to make the first step. In our context, trust building instruments have to be taken by the slaughterhouses signalling the farmers that the enterprise is trustworthy and reliable. This requires the commitment of the whole enterprise, not only of those employees who directly communicate with farmers. Therefore, internal changes such as introducing a “code of ethics” (Wieland, 1999) have to be considered in an industry 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. For that we propose a comprehensive supplier relationship management concept which goes beyond trust communication as it implies new internal management tools (e. g., supplier selection and development programs) as well as instruments to enhance vertical transparency, personal bonds, participation, complaint management etc. (Ryder & Fearn, 2003; Stoelzle & Heusler, 2003). Such a strategy is appropriate for those processors 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 co-competition without structural bonds.

To resume: Results from a recent survey in German pig production and reflections on transaction costs taking into account current developments in the slaughterhouse industry and in quality assurance schemes demonstrate relative advantages of pig markets with a low degree of vertical coordination over more integrated meat supply chains. We argue for more research in the area of non-contractual long-term relationships which are prevalent so far in Germany and some other European countries. Trust management can be a suitable instrument to gain some of the advantages which are usually attributed to contracts and vertical integration. It should be integrated in a broader approach of supplier relationship management.

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Appendix: List of variables/statements

Contr1	Contractual arrangements are only favourable for the slaughterhouses, farmers don't benefit from them at all.
Contr2	Contracts provide me with more planning security.
Contr3	In the long run I will have to sign contracts to finish pigs profitably.
Contr4	In my opinion it would be better if farmers engaged in long-term contracts with slaughterhouses.
Contr5	I prefer cooperation with only one processor if he has turned out to be a good business partner.
Free	I don't want to give up my entrepreneurial freedom due to contractual arrangements.
Trust1	I can trust in slaughterhouse ...
Trust2	Please indicate your level of trust with regard to ...: 0 = "slaughterer pulls a fast one on me whenever possible."; 100 = "I can blindly trust in the slaughterhouse".
Com1	I feel committed to slaughterhouse
Com2	Even if something goes wrong I stick to
Swit	Please indicate your switching-behaviour: 0 = "I have supplied my pigs to ... for a long time already."; 100 = "I very often switch from one buyer to another.