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The Influence of Clusters on the Competitiveness of Hog Production: The Example of Northwestern Germany

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ABSTRACT

In recent decades the northwestern part of Germany (Weser-Ems region) has come to focus on intensive pork production. This has led to public outrage about the disposal of biological waste, farmers' complaints about the high cost of leasing land, soaring risks of animal diseases, and the decreasing popularity of intensive animal husbandry. However, despite these problems, due to a beneficial cluster structure, the region is a successful market participant. To shed some light on the relationship between network relationships in clusters and competitiveness, an empirical survey was undertaken to compare this pork-intensive region with non–pork-intensive regions. Bi- and multivariate analyses reveal a better access to knowledge and information on the part of farmers in the Weser-Ems region as well as a higher regional competitiveness. As a result, the cluster region characterized by intensive hog production is economically more successful

Keywords: pork production, cluster structures, competitiveness

1 Introduction

When considering the development of agriculture over recent decades, the change in northwestern Germany is particularly prominent. This region, which formerly consisted of self-sufficient farming businesses cultivating unfavourable land (Campos, 1993; Klohn and Windhorst, 2001a), has become known throughout Europe as an outstanding centre of intensive meat production. The production of pork, in particular, is integrated into a dense network composed of producers, processors, specialized distributors, buyers and service providers, as well as private and public consultants (Windhorst and Grabkowsky, 2008). This nourishes the hypothesis that the region under analysis can be considered a cluster of meat production. Regarding primary production, especially of fatted animals, studies point out the high performance of northwestern agricultural businesses; nowadays they produce one-third of all German fattened pigs (Vallan, 2009; Windhorst and Grabkowsky, 2008).

Disregarding the economic success story of northwestern Germany, recent agricultural publications have tended to concentrate on the negative aspects of the geographical proximity of animal husbandry and meat producers. The critical aspects include, but are not limited to, public outrage about the disposal of biological waste, the high cost of leasing land, soaring risks of animal diseases, and the decreasing popularity of intensive animal husbandry (Spandau, 2008; Thiering and Bahrs, 2010). These pressures frequently stifle business growth and the generation of potential economies of scale in the pork-intensive region under analysis.

The concentration of meat production in northwestern Germany is, therefore, both a blessing and a curse. On the one hand, the proximity of agricultural businesses is disadvantageous for operations since these agglomerations can induce problems that often spur political debate regarding the decentralization of animal husbandry in northwestern Germany. On the other hand, there are strong indications that the

close proximity of producers is beneficial to the agricultural production of hogs. Particularly for those production systems that strongly depend on the division of labour as it occurs in pork production, recent literature has indicated that cooperative participation in specialized regional networks (clusters) enhances companies' competitiveness (Deimel et al., 2009; Porter, 2000).

However, several points have been neglected in agricultural research up to now. These shortcomings include the questions of how agricultural businesses are integrated into a network, what kinds of relationships exist between different business partners and how these relationships affect the access to information and knowledge that is relevant for efficient production and competitiveness. This paper attempts to shed light on these issues by surveying 195 operators of agricultural hog farms. The results from a typical area of intensive production, such as the Weser-Ems region, are compared with results from regions characterized by less intensive production in order to evaluate the influence of geographical proximity and network relationships in clusters on the access to information and knowledge and the competitiveness of farm businesses.

2. Theoretical Foundations

Porter (2000; p. 253) defines clusters as "…geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (universities, standards agencies, trade associations) in a particular field that compete but also cooperate". Current cluster theory comprises various research approaches, most of which have in common that they address the existence of regional networks. The concept of industrial districts is one of the early theoretical approaches (Marshall, 1927). It characterizes clusters as networks of specialized small or medium-sized firms within a region that operate within the same or related industries. In addition, a cluster is also distinguishable by its flexible productive capacity (Dannenberg, 2007; Piore and Sabel, 1989). The strong specialization of the enterprises in a cluster results in the development of particular competencies within each firm (Bathelt and Glückler, 2003). It also leads to a fine-grained division of labour between the various industrial players. This is accompanied by the formation of relatively stable long-term cooperations. In this context, both horizontal and vertical networks develop within supply chains, in which not only tangible goods, but also the specialized knowledge of the players is exchanged (Dannenberg, 2007). Trust is a crucial factor for the exchange of information between network partners (Bathelt and Glückler, 2003). The emergence of trust is greatly facilitated when the players are geographically near each other; share common values, habits and traditions; and have frequent personal contact. As a result, transportation and transaction costs are reduced, and the productive capacity of the network is increased.

Another variation of cluster theory is the concept of innovative milieus. Camagni (1991; p. 123) defines an innovative milieu as "…the set, or the complex of mainly informal social relationships [in] a limited geographical area, often determining a specific external 'image' and a specific internal 'representation' and sense of belonging, which enhance the local innovative capability through synergistic and collective learning processes." This concept is based on the assumption that innovations are generated neither solely within nor exclusively outside enterprises, but primarily in both formal and informal networks (Schuler, 2008; Walter, 2004).

Without referring to specific cluster concepts, Granovetter (1985) has pointed out that economic activities are frequently embedded in personal networks and that this "embeddedness" has consequences for the exchange of information. For example, when confronted with information that is hard to verify, actors put their trust in people they know rather than in impersonal information sources. Agricultural research has shown that agricultural businesses tend to rely on various formal, but especially informal sources of information within their networks when doing business (Öhlmér et al., 1997). The amount of information actors have access to is, in turn, determined by their position within the network. This is referred to as "network centrality" because central positions provide many more opportunities for the interactions essential to decision making in comparison to positions on the periphery (Boje and Whetten, 1981). The concepts of innovative milieus and industrial districts both include the idea that innovative enterprises are not studied in isolation. Instead, the main focus is on firms' embeddedness in their local environments, which are characterized by specific socio-institutional structures (Bathelt and Glückler, 2003). Taken together, existing cluster theories largely concur in their assumption that not only geographical but also cognitive proximity promotes the exchange of information and knowledge (Harrison, 1992; Van Dijk et al., 2003). Common values and traditions as well as a firm's reputation within a regional network influence the relationships between actors (Bathelt and Glückler, 2003; Maskell and Malmberg, 1999; Storper, 1997). According to a widely shared opinion, such regional networks can hardly be replaced by modern communication technologies (Dannenberg, 2007).

3 Study Design and Methodology

The following framework (Figure 1) summarizes the essential theoretical concepts and served as a guideline for the conceptual design of the survey. It assumes that geographical proximity, access to local knowledge and embeddedness in institutional networks influence the accessibility of information in personal and business networks. A firm's access to information, in turn, affects the extent to which decision makers feel informed, the timeliness with which they are informed and the competitiveness of the company. Figure 1 will serve as guiding framework for the results presented in Section 4.

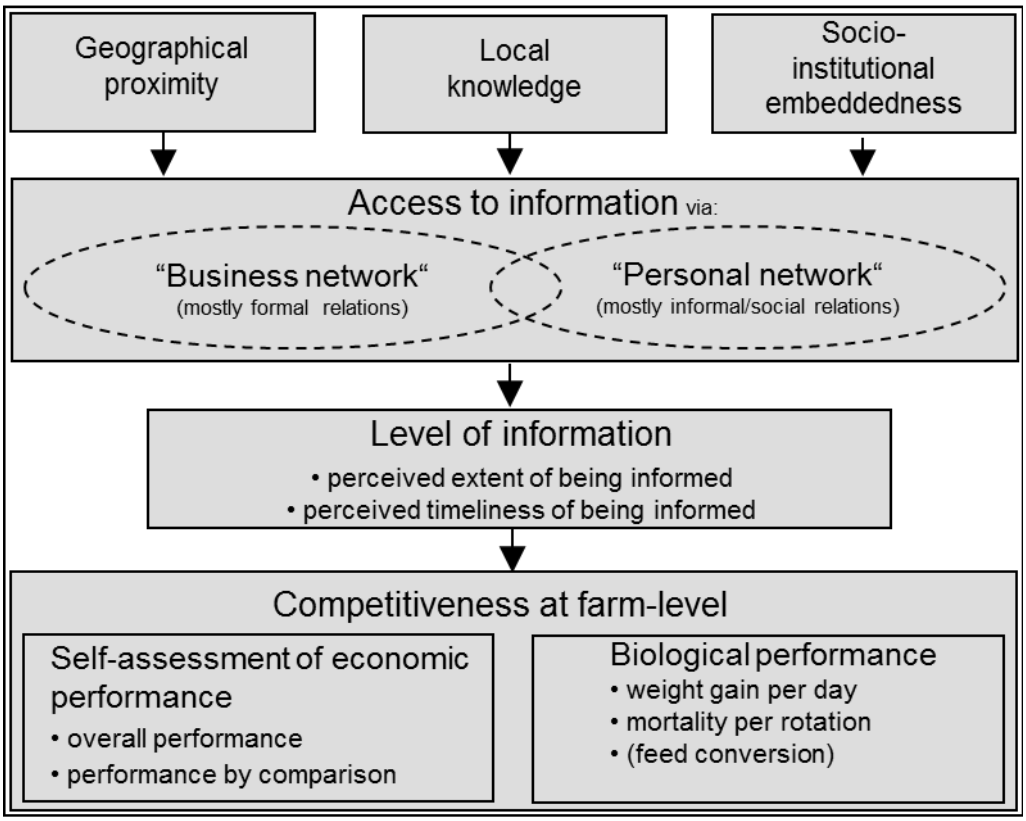

Figure 1. Conceptual model (own figure)

The relationships illustrated in Figure 1 were subject to a large-scale empirical analysis between late 2009 and early 2010, in which 195 pork producers were surveyed. The pork producers were from the Weser-Ems region, which is characterized by intensive pork production, as well as from non-intensive regions in North Rhine-Westphalia, Lower Saxony, Schleswig-Holstein, Hesse, Bavaria, and Baden-Wuerttemberg. Of the sample, 110 were from the region of intensive pork production and 85 from non-intensive regions. The classification was based on existing literature on clusters in agriculture and the food industry. There the Weser-Ems region is described as a region of intensive pork production (Klohn and Windhorst, 2001b; Windhorst and Grabkowsky, 2008). Regions that did not fulfil certain prerequisites regarding location quotient, cluster index, livestock density and other spatial aspects cannot be described as clusters and were sorted into the category "non-intensive regions" (Litzenberger, 2006; Sternberg, 2004) .

The data was collected by face-to-face interviews, postal questionnaires and online questionnaires (Globalpark EFS Survey). Besides a few open questions, the questionnaire consisted primarily of statements to be rated on a 5-pointLikert scale (from -2 = totally disagree to +2 = totally agree). The questionnaire included questions on business structure and demographics in accordance with the underlying theoretical concept. The pork producers were asked about a) their integration into socio-institutional environments, b) their information-gathering and knowledge-generation behaviour, c) the perceived importance of their main commercial networks (differentiated by suppliers, customers and service providers) and d) the perceived quality of their relationships with suppliers and customers. In addition, the farmers were interviewed about their access to relevant competitive information and asked for a self-assessment of their operational success. The sample is analysed by descriptive analysis, means comparison analysis, factor analysis and regression analysis. The competitiveness of an agricultural pig farm is measured by using biological (performance) indicators. The research software used was SPSS 18.

Respondents were on average 41 years old. Of the persons surveyed, 74.9 % were farm managers or owners, and 18.2 % were young farmers destined to succeed the current owner-managers; therefore, in

more than 93 % of the cases the opinions of one of the principal decision makers were surveyed. For 95.2 % of the respondents, farming is the main source of income. On average, 54.5 % of farm income comes from hog production. A mean value of 1,620 fattening pens (median 1,300) as well as the high percentage of farms willing to expand (56.1 % planned additional fattening capacity averaging 1,237 pens; median: 1,000 pens) indicate that most of the farms in the study are future-orientated. Among those surveyed, 31.6 % operate closed production systems, which integrate production of piglets and pig fattening.

4 Empirical Results

4.1 Access to and Level of Information in Intensive and Non-Intensive Regions

For analyses of the effects of clusters, the sample was divided into two sub-samples: farms located in the intensive Weser-Ems region and farms located in other, non-intensive regions. Table 1 shows that there are no significant structural differences at the farm level between the farms in intensive and non-intensive production regions with regard to such factors as fattening capacities, income structure and production methods, which might otherwise distort the analysis of cluster effects. The differences between intensive and non-intensive regions therefore result only from the regional density of farms.

Table 1.
Farm characteristics (Source: authors' calculations)

	Weser-Ems-region (n=110)	**Non-intensive regions**(n = 85)
Full-time farmers	92.7 %	98.7 %
Pens (mean / median)	1,745 / 1,350	1,447 / 1,300
Share of farm income from pig fattening	59.8 %	47.4 %
Farms with closed production systems	33.6 %	28.8 %
Companies with expansion plans	60.0 %	50.7 %
Planned additional pens (mean / median)	1,102 / 950	1,427 / 1,000

This first section focuses on results from a descriptive as well as a means comparison analysis regarding farmers' access to information and level of information (see the conceptual model in Figure 1). As shown in Figure 2, there are significant differences with regard to socio-institutional embeddedness. Respondents in the Weser-Ems region benefit greatly from business information received during events in their region. They also perceive the exchange of information with other farmers as more important than farmers in other regions. Both differences are statistically significant at a 0.05 level. The differences in Figure 2 indicate that the geographic proximity of farmers in production-intensive region affects their informal and personal networks. It is particularly noteworthy that farmers in such a region have a significantly higher percentage of business partners located in their local (same township or county) or regional neighbourhood. This finding is supported by research showing that the specialization of business in clusters leads to a spatial binding of valuable knowledge (Bathelt and Glückler, 2003) and that the geographical proximity of actors could promote the company´s access to information and innovation (Harrison, 1992; Van Dijk et al., 2003).

Information access through socio-institutional embeddedness	Group I		Group NI		Totally disagree ⟷ Totally agree
	μ	σ	μ	σ	-2 -1 0 1 2
Regional events are a very important source of business information**	0.49	0.919	0.07	0.985	
I feel very integrated in my region*	1.27	0.728	0,99	0.809	
The exchange of experiences with other farmers is very important for my business decisions*	0.93	0.673	0.67	0.793	
Decisions of neighboring farmers do not affect mine*	0.19	0.953	0.44	0.879	

μ=mean σ=standard deviation
significance: p ≤ 0.05 *; p ≤ 0.01**; p ≤ 0.001 ***

Group I: intensive region
Group NI: non-intensive region

Figure 2. Information access through socio-institutional embeddedness (Source: authors' calculations)

In line with the theoretical proposition that geographical proximity improves the exchange of information among firms, Figure 3 shows a more intense exchange of information with supply chain partners in the Weser-Ems region. For example, farmers in the Weser-Ems region communicate significantly more frequently with feed suppliers.

Information access through supply chain partners	Group I		Group NI		Never ⟷ Very often
	μ	σ	μ	σ	-2 -1 0 1 2
Livestock technology providers	-0.07	0.965	-0.43	1.597	
Piglet or gilt suppliers	0.51	1.031	0.30	1.107	
Feed companies***	1.01	0.784	0.54	1.018	
Slaughterhouses	-0.15	1.229	-0.20	1.152	

μ= mean σ= standard deviation
significance: p ≤ 0.05 *; p ≤ 0.01**; p ≤ 0.001 ***

Group I: intensive region
Group NI: non-intensive region

Figure 3. Information access through supply chain partners (Source: authors' calculations)

Farmers in the intensive region also interact more frequently with service providers; only communication with private business consultants takes place less frequently (Figure 4). This could be due to the high quality of alternative providers of consulting services in the Weser-Ems region, for instance, the Chamber of Agriculture. Whereas farmers in the intensive production region can take of advantage of the amply available specialized expert knowledge, farmers in other regions have to rely on private business consultants. Of course, regions without a chamber of agriculture can still access information through lectures or through the homepages of chambers of agriculture from other states. Additionally one can find similar institutions in these regions. The findings of Illeris (1994; 1989) regarding the communications intensity between business clients and service providers support the results of the mean comparison analysis. Interesting significant differences between the levels of information exchange regarding the use of private consultants are also discussed in the literature (Bryson, 1997; Bryson and Daniels, 1998).

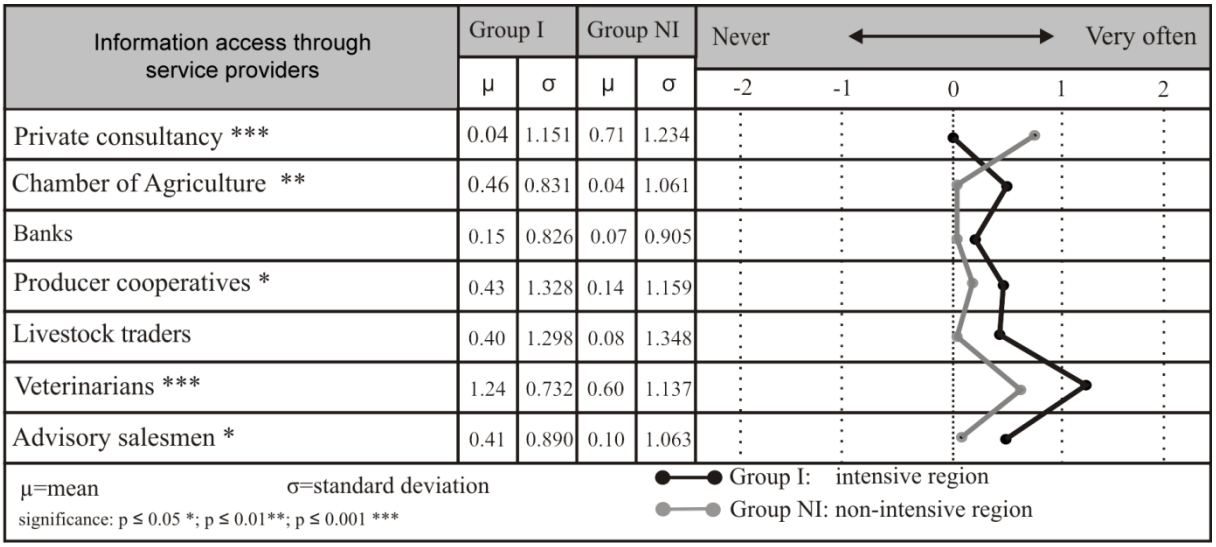

Figure 4. Information access through service providers (Source: authors' calculations)

According to the discussions in Sections 2 and 3, the geographical proximity of and intensive communication between farmers in the production-intensive region should result in a higher level of acquired knowledge and information. In order to operationalize this variable, respondents were asked to assess their level of being informed about developments that are important for the competitiveness of their farm operations and the timeliness of the information they have access to (Figure 5). The significant differences between the two groups confirm the theoretically derived assumption. Respondents from the intensive region feel better informed about matters relevant to the competitiveness of their farms; even more important, the probability of getting information in time is higher in the Weser-Ems region. The higher level of knowledge or being informed can be found in various studies as a typical sign of business cluster structures (Bathelt et al., 2004; Rosenfeld, 1997).

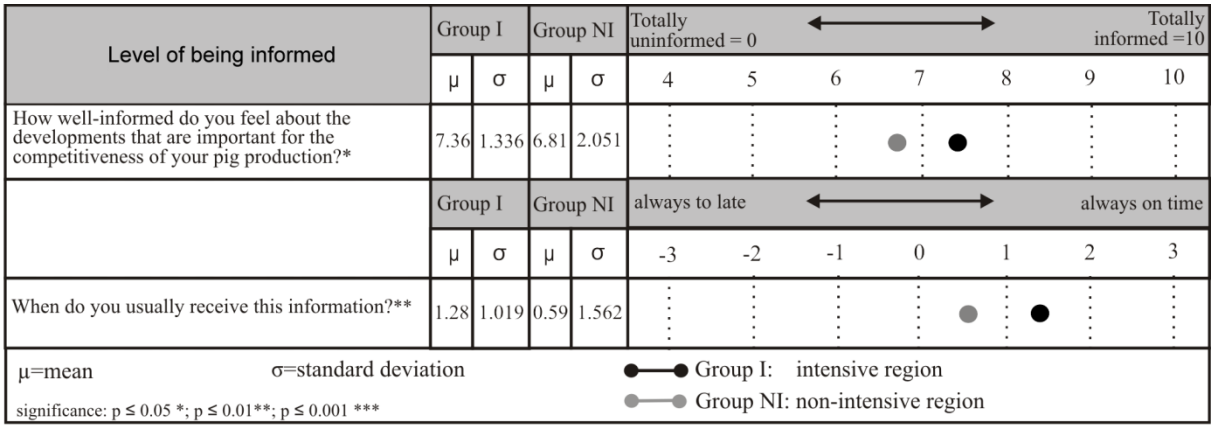

Figure 5. Level of being informed (Source: authors' calculations)

4.2 Competitiveness of Farms in the Regions Studied

This section focuses on competitiveness at the farm level regarding the conceptual framework in Figure 1. The more highly developed networks of farmers in the Weser-Ems region may improve not only access to business knowledge, but also competitiveness. Competitiveness is a multi-facetted phenomenon that can be measured by setting up an index. An index is employed when a single indicator does not provide accurate measurement results. In this case, several indicators can be consolidated into a new variable Here, the index "Competitiveness" was calculated (Table 2), and its mean value analysed for significant differences between regions. A Cronbach's Alpha of 0.544 reflects the reliability of the compilation of the variables used.

Table 2.
Competitiveness index with variables

Index competitiveness
How do you rank the economic success of your pig fattening business in the last three years?[1]
How do you rank the economic success of your pig fattening business in comparison to the success of similar enterprises?[2]
What was the average daily weight gain for your pigs over the last three years?[3]
What was your average loss ratio per batch over the last three years?[4]

[1] 0 = "not at all successful" to 10 = "really successful"

[2] 0 = "pretty less successful" to 10 = "pretty much successful"

[3] "Under 600g/d" = 2, "600 to 700g/d" = 4, "700 to 800g/d" = 6, "800 to 900g/d" = 8, "over 900g/d" = 10

[4] "Over 8 %" = 2, „6 to 8 %" = 4, "4 to 6 %" = 6, "2 to 4 %" = 8, "under 2 %" = 10

Figure 6 shows that the competitiveness of farms in non–production-intensive regions (25.18 index points) was significantly (p = 0.000) lower than the competitiveness of farms in the production-intensive region (averaging 28.11 index points).

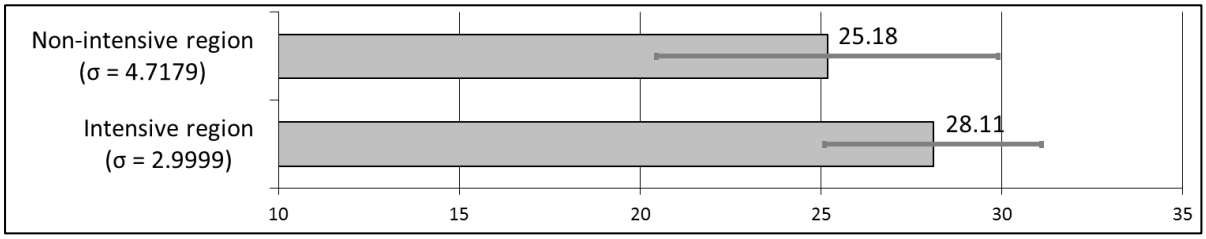

Figure 6. Competitiveness index (Source: authors' calculations)

Altogether, the results confirm the theoretical assumptions concerning the impact of information access in clusters on competitiveness as set out in Section 3 above. Thus, the results reflect the positive influence of proximity and social-institutional embeddedness in clusters not only on access to information, but also on the competitiveness of farms within the cluster area.

4.3 Networking Factors: Results of a Factor Analysis

The explorative study sought to determine the influence of clusters on the level of being informed and the competitiveness of agricultural hog farms. Therefore, a considerable number of manifest variables were included in the survey. In order to reduce the complexity of data and identify overlaps, a factor analysis was performed (Hüttner and Schwarting, 1999; Stevens, 2002). In total eight factors were identified.

Table 3.
Factors identified (Source: authors' calculations)

Extracted factors	Cronbach's Alpha
Quality of business relationship with the slaughterhouse	0.816
Quality of business relationships with suppliers	0.811
Agricultural topics among acquaintances	0.775
Access to information through regional embeddedness	0.734
Cooperation with other farmers	0.500
Influence of relatives once living on the farm	0.648
Location affinity	0.600
Level of being informed concerning swine production	0.669

Method of extraction: principal component analysis; KMO =0.694; Total variance explained =69.51%

Table 3 shows the factors identified by the factor analysis as well as the results of reliability analyses. All Cronbach's Alpha values exceed 0.5, which is often suggested as a minimum value in the literature (Pedhazur and Pedhazur Schmelkin, 1991; Peterson, 1994; Schnell et al., 2005). The KMO value (Kaiser-Meyer-Olkin criterion) for validation of sampling adequacy was 0.694; in light of the explorative nature of the study, this can be evaluated as "quite good" (Kaiser and Rice, 1974). The eight factors identified account for almost 70 % of the total variance. The spider-web graphic (Figure 7) visualizes the characteristics of the identified factors in both sub-samples by using the mean values of the factor scores.

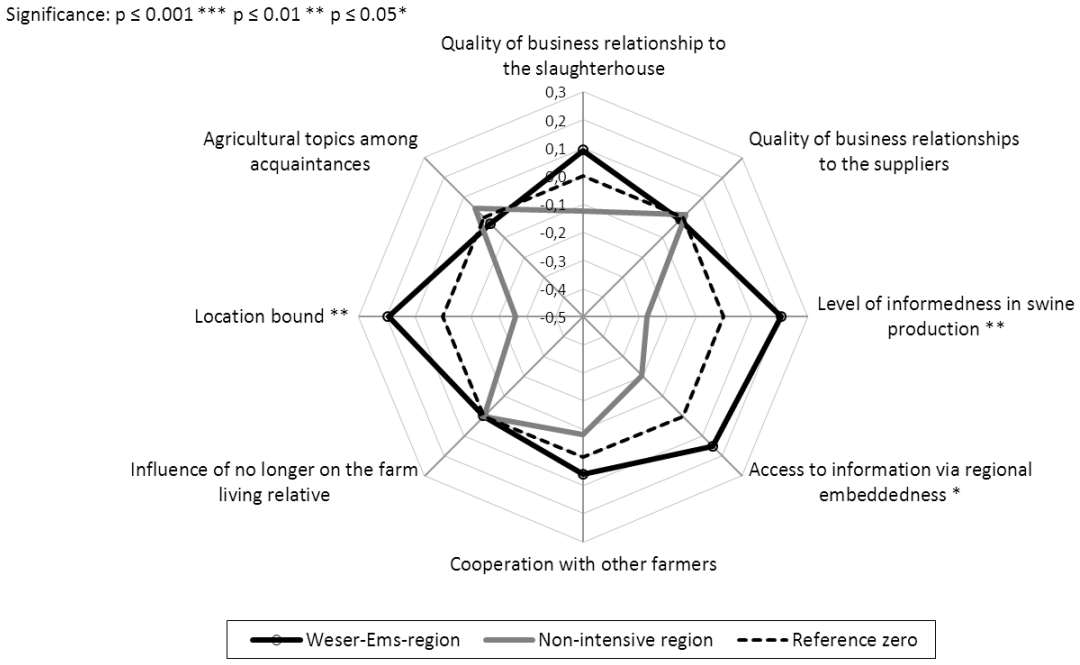

Figure 7. Comparison of production-intensive and non–production-intensive regions (Source: authors' calculations)

4.4 Determinants of Level of Information and Competitiveness

In order to discover which particular characteristics of clusters actually influence the levels of being informed and competitiveness, the study used multiple regression analysis. For the total sample, the factors extracted through the factor analysis (Table 3) were first incorporated into the regression model. In addition, single statements were added as independent variables because previous analyses had demonstrated correlations with the dependent variables. In the first model, the influence of various independent variables on "Perceived level of being informed" was measured (Figure 8). A total of six independent variables, including three factors (Fac), with significant beta-values were identified. The

tolerance and VIF (variance-inflation factors) values in the context of the collinearity diagnostics used on both regression models did not reveal significant distortions due to multicollinearity (Norušis, 2008).

As expected, the timeliness of information exerts the greatest influence on the perceived level of being informed (β = 0.519***). Another significant influence is the chosen medium of communication. Information crucial to competitiveness derived through personal contact, whether face-to-face or by telephone, greatly supports the farmers' perception of being well-informed (β = 0.155**). A reason for this could be that a personal exchange of information is a synchronic form of communication, i.e., the sender knows not only that the recipient has received the information but also how he has interpreted it (Eiden, 2004). This interpretation is supported by empirical results concerning animal health management on pig fattening farms. In this context, laboratory and other analytical results are sent by fax or email. Empirical studies show that farmers perceive an asynchronous informational relationship as being too complex a basis for making decisions on improvements in animal health management (Daft and Lengel, 1984; Deimel et al., 2009). The value of such asynchronous information is then almost completely dependent on the farmer's ability to interpret the information and use it appropriately (Bahlmann et al., 2009). In contrast, personal contact with such sources as veterinarians provides the recipient with the opportunity to provide feedback, which can be used to reduce the complexity of the message.

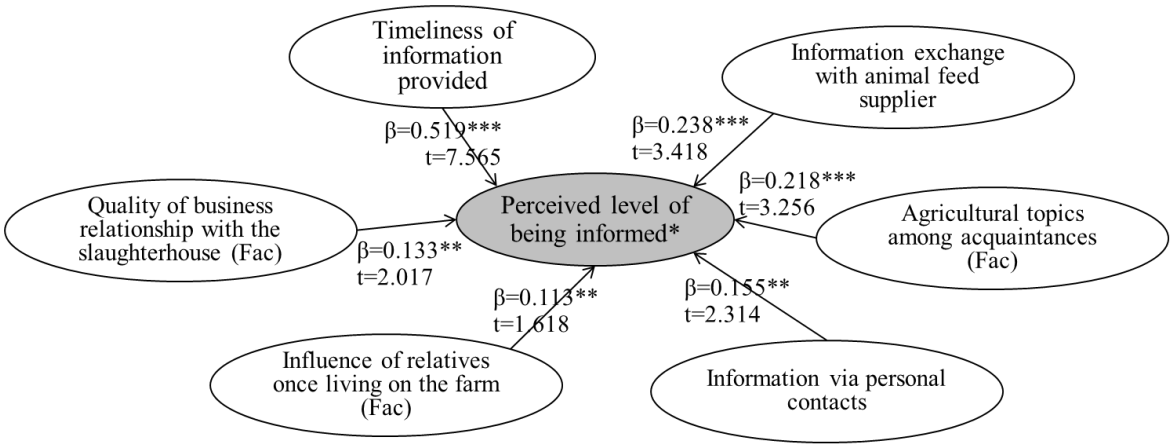

Figure 8. Regression model I (Source: authors' calculations)

Previous studies on networks in production-intensive regions show that hog farmers' perceived level of being informed depends on their relationships with their slaughterhouses (Deimel and Theuvsen, 2010). Regression model I shows that the factor "Quality of business relationship with the slaughterhouse" has a positive effect (β = 0.133**) on how well-informed farmers perceive themselves to be. Thus, feedback provided by processors on such matters as classification, laboratory data and—not to be underestimated—market prices, can play a major role in optimizing the fattening process (Meemken and Blaha, 2008; Plumeyer et al., 2008). Besides illuminating the relationship with customers (for instance, slaughterhouses), this model shows that communication with suppliers—in this case feed suppliers—significantly increases respondents' perceived level of being informed (β = 0.238***). The regression analysis also revealed that the respondents' network of personal and social contacts contributes to the level of being informed, as well; this is illustrated by the positive beta value of the influence of relatives (β = 0.113**). Furthermore, the assumption was confirmed that it is beneficial to have an overlap of knowledge gained through a generally more formal "business network", as well as a more informal "personal network" as evidenced by the beta value of the factor "Agricultural topics among acquaintances" (β = 0.218***).

Finally, a second model was calculated (regression model II, Figure 9). Here the dependent variable is the calculated index "competitiveness", which includes not only the self-assessment of the test subjects, but also the biological indicators described in Section 4.3. Figure 9 shows that the factor "Level of being informed concerning swine production" has a significant positive influence on the dependent variable (β = 0.401***).

Interestingly, this regression model shows that personal communication not only increases the farmers' perceived level of being informed (Figure 9), but also has a direct positive effect on the competitiveness of

farms (β = 0.301**). With regard to farmers' business relationships, the key actors in the network of the hog farmers are veterinarians (β = 0.264**) and representatives of producer cooperatives (β = 0.200*).

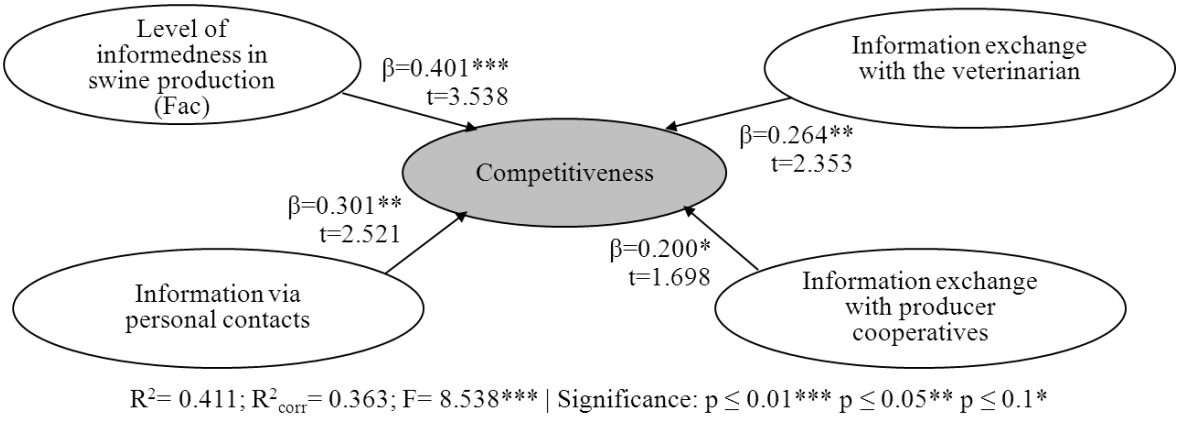

Figure 9. Regression model II (Source: authors' calculations)

5 Summary

This study demonstrates that interactions beyond the realm of the individual farm positively influence the farm's business. The empirical results show that active participation in specialized networks (Deimel et al., 2009) improves the timely access to information, which is valuable for remaining competitive. These results confirm the theory that participation in networks fostered by cluster relationships increases farmers' level of being informed. This access to information is especially relevant to individual farmers because, as shown in the present study, it directly improves competitiveness. The results also show that social and informal networks comprised of other farmers, acquaintances, and family members play a crucial role for farmers' business decisions, which should not be underestimated.

Despite current concerns about the growing concentration of livestock production in areas such as the Weser-Ems region, a comparison of production-intensive and non–production-intensive regions underscores the definite advantage the location of pork production in northwest Germany has as a result of existing cluster structures. Farmers take advantage of the greater proximity to numerous specialized suppliers, customers and service providers in northwest Germany by increasing information exchange with all members of the supply chain. In addition, the greater "embeddedness" of farmers in intensive regions results in informal and personal networks that support farmers' access to information and knowledge. Due to the generally more intensive participation of farms in networks in northwest Germany, farmers from that area exhibit a significantly higher level of knowledge concerning developments relevant to competitive pork production. Last but not least, farms in the Weser-Ems region show significantly better performance with regard to indicators of competitiveness, such as daily weight gain, feed conversion and loss rate, than farms from non–production-intensive regions. This was confirmed by the significantly higher mean value of the calculated competitiveness index in the random sample in northwest Germany as compared to the sample from less production-intensive regions.

The study has interesting managerial implications. The results should motivate farmers to actively influence their participation in business and personal networks. Furthermore, the study proves the relevance of personal contacts and the valuable contribution of direct contacts between supply chain partners. This indicates the limited usefulness of such elements as online information systems and underscores the need to foster personal contact, for instance, with consultants and veterinarians.

The results provide numerous starting points for further research. The sample size should be enlarged in order to increase the representativeness of results. A larger sample would also allow separate regression analyses for both regions under comparison. This could help to identify independent variables that are distinct to production-intensive or non–production-intensive regions. Moreover, further studies should consider the possibility of more thoroughly operationalizing the various factors embraced by the key term "competitiveness".

References

Bahlmann, J., Spiller, A., and Plumeyer, C.-H. (2009). Status quo und Akzeptanz von Internet-basierten Informationssystemen: Ergebnisse einer empirischen Analyse in der deutschen Veredelungswirtschaft. Göttingen: Univ., Department für Agrarökonomie und Rurale Entwicklung; working paper.

Bathelt ,H., and Glückler, J. (2003). Wirtschaftsgeographie: Ökonomische Beziehungen in räumlicher Perspektive. 2. ed. Stuttgart: Ulmer. http://www.gbv.de/dms/hebis-mainz/toc/115179038.pdf.

Bathelt, H., Malmberg, A., and Maskell P. (2004). Clusters and knowledge: local buzz, global pipelines and the process of knowledge creation. *Progress in Human Geography* **28** (1): 31-56.

Boje, D.M., and Whetten, D.A. (1981). Effects of organizational strategics and contextual constraints centrality and attributions influence in interorganizational networks. *Administrative Science Quarterly* **26** (3): 378-395.

Bryson, J. (1997). Business service firms, service space and the management of change. *Entrepreneurship & Regional Development* **9** (2): 93-112.

Bryson, J.R., and Daniels, P.W. (1998). Business link, strong ties, and the walls of silence: small and medium-sized enterprises and external business advice. Government and Policy, *Environment and Planning C* **16** (2): 65-80.

Camagni, R. (1991). Local "Milieu", uncertainty and innovation networks: Towards a new dynamic theory of economic space. In: R. Camagni (eds.): Innovation networks: Spatial perspectives. London, New York: 121-144.

Campos, I. (1993). Veredelungswirtschaft in Südoldenburg: Fallstudie zum Strukturwandel in der modernen Landwirtschaft. Saarbrücken [u.a.]: Breitenbach.

Daft, R.L., and Lengel, R.H. (1984). Information richness: A new approach to managerial behavior and organizational design. In: L.L. Cummings and B. M. Staw (eds.): *Research in Organizational Behavior* Vol. **6** Homewood, IL: JAI Press: 191-233.

Dannenberg ,P. (2007). Cluster-Strukturen in landwirtschaftlichen Wertschöpfungsketten in Ostdeutschland und Polen: am Beispiel des Landkreises Elbe-Elster und des Powiats Pyrzyce. Berlin [u.a.]: LIT-Verlag.

Deimel, M., Plumeyer, C.H., Theuvsen, L. , and Bahlmann, J. (2009). Unternehmerische Netzwerkpartizipation in der Nahrungsmittelproduktion: Empirische Ergebnisse am Beispiel des Tiergesundheitsmanagements im Schweinefleischsektor. Paper presented at 49. Jahrestagung der GEWISOLA „Agrar- und Ernährungsmärkte nach dem Boom". Kiel, 30.09. - 02.10.2009.

Deimel, M., and Theuvsen, L. (2010). Networking in meat production systems: The influence of cooperative structures on farmers' participation. Paper presented at 4th International European Forum on System Dynamics and Innovation in Food Networks. Innsbruck-Igls, 08. - 12.02.2010.

Eiden, G. (2004). Soziologische Relevanz der virtuellen Kommunikation: Wie verändert sich die interpersonale Kommunikation durch Nutzung des Internets? Zürich. http://socio.ch/intcom/t_eiden.htm. [3.12.2008].

Granovetter, M.S. (1985). Economic Action and Social Structure: The Problem of Embeddedness. *American Journal of Sociology* **94** :pp. 481-510.

Harrison, B. (1992). Industrial districts: old wine in new bottles? *Regional Studies* **26** (5): 469-483.

Hüttner, M., and Schwarting, U. (1999): Exploratorische Faktorenanalyse. In: C. Homburg and A. Hermann (eds.): Marktforschung. Wiesbaden: 381-412.

Illeris, S. (1994). Proximity between service producers and service users. *Tijdschrift voor economische en sociale geografie* **85** (4): 294-302.

Illeris, S. (1989). Services and regions in Europe. Aldershot, Hants, England ;Brookfield, Vt., USA: Avebury.

Kaiser ,H.F., and Rice, J. (1974). Little Jiffy, Mark IV. *Educational and Psychological Measurement* **34**:111-117.

Klohn, W., and Windhorst, H.-W. (2001a). Das agrarische Intensivgebiet Südoldenburg: Entwicklung, Strukturen, Probleme, Perspektiven. 3. ed. Vechta: Vechtaer Druckerei und Verlag.

Klohn, W., and Windhorst, H.-W. (2001b). *Die Landwirtschaft in Deutschland*. 3., aktualisierte Aufl. ed. Vechta: Vechtaer Dr. und Verl.

Litzenberger, T. (2006). *Cluster und die New Economic Geography*. Frankfurt am Main: Peter Lang Verlag.

Marshall, A. (1927). Industry and trade: A study of industrial technique and business organization and their influence on the conditions of various classes and nations. London.

Maskell, P., and Malmberg, A. (1999). Localised learning and industrial competitiveness. *Cambridge Journal of Economics* **23** (2):167-185.

Meemken, D., and Blaha, T. (2008). Die Tiergesundheit im Fokus des neuen europäischen Lebensmittelsicherheitskonzeptes: Chancen für die Bestandsbetreuung durch den praktizierenden Tierarzt. *Der Praktische Tierarzt* **89** (1): 58-63.

Norušis, M.J. (2008). SPSS 16.0 advanced statistical procedures companion. Upper Saddle River: Prentice Hall.

Öhlmér, B., Olson, K., and Brehmer, B. (1997). Understanding Farmers' Decision Making Processes and Improving Managerial Assistance. *Agricultural Economics* **18** (3): 273-290.

Pedhazur, E.J., and Pedhazur Schmelkin, L. (1991). Measurement, Design, and Analysis: An Integrated Approach. Hillsdale, NJ [u.a.]: Erlbaum.

Peterson, R.A. (1994):.A meta-analysis of Cronbach's coefficient Alpha. *Journal of Consumer Research* **21** (2): 381-393.

Piore, M.J., and Sabel, C.F. (1989). Das Ende der Massenproduktion: Studie über die Requalifizierung der Arbeit und die Rückkehr der Ökonomie in die Gesellschaft. Ungekürzte Ausg. ed. Frankfurt am Main: Fischer-Taschenbuch-Verl.

Plumeyer, C.-H., Deimel, M., and Theuvsen, L. (2008). Qualitätskommunikation und Prozessoptimierung in der Fleischwirtschaft: Recht, Zertifizierungssysteme und Informationssysteme als Einflussgrößen. Elektronische *Zeitschrift für Agrarinformatik* **3**: 1-23.

Porter, M.E. (2000). Locations, clusters and company strategy. In: G.L. Clark, M.P. Feldman and M.S. Gertler (eds.): The Oxford Handbook of Economic Geography. Oxford: 253-274.

Rosenfeld, S.A. (1997). Bringing business clusters into the mainstream of economic development. *European Planning Studies* **5** (1): 3-23.

Schnell, R., Hill, P.B., and Esser, E. (2005). *Methoden der empirischen Sozialforschung*. 7 ed. München: Oldenbourg.

Schuler, J. (2008). *Clustermanagement: Aufbau und Gestaltung von regionalen Netzwerken.* Sternenfels: Verl. Wissenschaft & Praxis.

Spandau, P. (2008). Standort macht Rendite. *DLG-Mitteilungen* **11**: 20-22.

Sternberg, R. (2004). Regional clusters in Germany--their geography and their relevance for entrepreneurial activities. *European Planning Studies* **12** (6): 767.

Stevens, J.P. (2002). Applied multivariate statistics for the social sciences. 4. ed. Mahwah, NJ [u.a.]: Erlbaum.

Storper, M. (1997). *The regional world: Territorial development in a global economy*. New York [u.a.]: Guilford Press.

Thiering, J., and Bahrs, E. (2010). Umwelt- und Fördereffekte des EEG: Eine Betrachtung des Güllebonus im Rahmen der Biogasproduktion. *Zeitschrift für Umweltpolitik und Umweltrecht* **33** (1): 109-131.

Vallan, H. (2009). Von Region zu Region Unterschiede, BZA Ferkelerzeugung und Schweinemast (2007/2008). *Land & Forst.* **162** (3). (Verlagsbeihefter „agrarforum").

Van Dijk, S.J., Duysters, G.M. , and Beulens ,A.J.M. (2003). Transparency Dilemmas in Strategic Alliances. Working Paper, s`Hertogenbosch.

Walter, S.A. (2004). Netzwerkökonomie und Kultur soziokulturelle Bedingungen innovativer Netzwerke; eine empirische Untersuchung im "Dritten Italien". Dissertation. Universität Bremen http://deposit.ddb.de/cgi-bin/dokserv?idn=975479601.

Windhorst, H.-W., and Grabkowsky, B. (2008). Die Bedeutung der Ernährungswirtschaft in Niedersachsen. Vechta. http://edok.ahb.niedersachsen.de/07/556818105.pdf.