SCHRIFTEN DER GESELLSCHAFT FÜR WIRTSCHAFTS- UND SOZIALWISSENSCHAFTEN DES LANDBAUES E.V.

Ander, S.: Measuring Market Power in German Food Retailing: Regional Evidence. In: Bahrs, E., von Cramon-Taubadel, S., Spiller, A., Theuvsen, L., Zeller, M.: Unternehmen im Agrarbereich vor neuen Herausforderungen. Schriften der Gesellschaft für Wirtschafts- und Sozialwissenschaften des Landbaues e.V., Band 41, Münster-Hiltrup: Landwirtschaftsverlag (2006), S. 95-105.

Schriften der Gesellschaft für Wirtschafts- und Sozialwissenschaften des Landbaues e.V., Bd. 41, 2006: 95 - 105

MEASURING MARKET POWER IN GERMAN FOOD RETAILING: REGIONAL EVIDENCE

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1 Introduction

High and rising concentration as well as increased vertical dependencies in food processing and distribution are evident in most industrialized countries. On the other hand, agriculture is facing fluctuating and decreasing product prices in many product markets. In particular, the example of meat marketing in rural Germany with mostly unfavourable production conditions throughout the marketing channel, demonstrates the weak market position of farmers and processors. Producers are constrained to be price-takers in both output and input markets and face an environment of potential market power exertion primarily by leading German retailers. This trend has both caused concern for competition authorities and increased policy-makers` attention. Moreover, agricultural economists have increasingly concentrated on the measurement of imperfect competition and development of new and more elaborate techniques of estimating market power. Although the topic has been widely discussed mainly in the U.S. MCCORRISTON (2002) and more recently DOBSON, WATERSON and DAVIES (2003) points out that empirical tests of retail market power in European food marketing are still very rare. This seems hardly justifiable, since the retailing industry's – especially in Germany – are the dominant market stage in food marketing.

The objective of his study is twofold. First, following the procedure of the theory of new empirical industrial organization this paper estimates retailers oligopsony and oligopoly power exertion based on a simultaneous modelling framework. As the methodological approach proposed by a previous study of GOHIN and GUYOMARD (2000) has some limitations this basic modelling framework is widely extended and including a more complete representation of the underlying retail cost structure. Additionally the impact of the German BSE crisis on meat marketing – especially beef marketing – is investigated. This food crisis has caused a major shock to the entire meat sector in the country and is crucial for a precise determination of retailers competitive behaviour and therefore market power.

SHELDON and SPERLING (2001) emphasise, that, although retailers operate at the national market it is more likely that market power is exerted at the regional or local level. Hence, the theoretical model in this study is applied to aggregate monthly data on a regional segment of the German markets for beef and pork, respectively. Earlier results by PFAFF (2001), based on time series methods, indicated that regional meat marketing in Germany is competitive at the producer stage but appears to be less competitive at the processors` and, in particular at the retailers´ market level. Empirical evidence indicates that the German retailing sector is highly concentrated. This offers opportunities to exert market power both in factor input and in consumer output markets.

This paper is organized as follows. A review of the relevant literature and classification of the study is given in Section 2. Thereafter, the topic of vertical meat marketing with a strong focus on the selected regional market segment of the meat market is presented in Section 3 followed by the theoretical model and its empirical implementation in Section 4. In section 5 an

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empirical analysis of the exertion of market power in German meat marketing is conducted followed by the discussion of major results. Conclusions are summarized in the last section.

2 Overview of the Literature

With the prominent trend of measuring market power in new empirical industrial organization (NEIO), there are many contributions with different methodological applications in food marketing. Numerous applications of conjectural variations models emerged in processing industries, with the majority of empirical applications focusing on the highly concentrated meat-processing industry in the USA. Although few methodological advances to determining market power have emerged in recent years there are still a limited number of applications in retailing indicating the disparity between the extend of concern about retail market power and the level of analytical refinement to measure it. Only a few studies have been reported on food retailing in the U.S. while ignoring the potential differences of the European food sector (MCCORRISTON 2002). This is hardly justifiable, since high levels of retail concentration and merger activity have raised concern about the consequences, in particular, the potential welfare implications of retail market power in Europe. However, economic analysis has viewed the retail level as lacking market power for a long time.

With respect to methodological advances some critics have come up of empirical finding of market power. First, as WOHLGENANT (1989), MUTH and WOHLGENANT (1999) and SEXTON (2000) have pointed out that it is crucial whether fixed or variable proportions are assumed and input substitution is allowed for. This clearly affects the outcome of competition analyses as emphasised by WOHLGENANT (1989, 1999). This is especially evident when heterogeneous groups of products are aggregated for empirical applications of market power models. Another critique raised by SEXTON (2000) is the importance of functional forms of supply, demand and technology.

Early SCP contributions on retail market power by COTTERILL (1986) and HOLLOWAY (1991) found no major departures from perfect competition in grocery retailing nor the whole farm-retail marketing channel of different food groups. With specific regard to food retailing a common result in the NEIO literature is that market power is not prevalent per se. In fact, there are a number of studies who could not find evidence of retail market power exertion but some others do. Among the few industrial organization surveys in retailing, the studies of AILIWADI ET AL. (1995), MESSINGER and NARASIMHAN (1995), HYDE and PERLOFF (1998) and PARK and WELIWITA (1999) could not find significant evidence of market power in U.S. and Australian retailing and the latter with specific regard to meat marketing. SEXTON and ZHANG (2001), GOHIN and GUYOMARD (2000) and KOERNER (2004) are among those cases in point that confirm the market power hypothesis with GOHIN and GUYOMARD (2000) and KOERNER (2004) being applications of European origin.

The study of SEXTON and ZHANG (2001) is more comprehensive compared to most other applications in so far as the authors use a flexible simulation model of the food marketing channel to account for potential welfare effects of successive levels of market power on consumers. A major finding is that even in the case of a modest level of market power, when exercised at successive stages of a marketing channel, there are dramatic shifts in welfare distribution among the participating groups.

Apart from the few contributions in the Anglo-Saxon literature the only studies covering market power in European retailing are KÖRNER (2004), GOHIN and GUYOMARD (2000) and DOBSON and WATERSON (1997). KÖRNER applied the conjectural variation paradigm for the analyses of retailers` market power in the marketing of roasted coffee in Germany, whereas DOBSON and WATERSON ground their analysis on a game theory bargaining model originally proposed by BENNETT and ULPH (1988). On the other hand the production-theory approach to the French retail sector used by GOHIN and GUYOMARD draws heavily on the quantity-setting

oligopoly framework of SCHROETER and AZZAM (1991). This framework captures the case of the joint production of demand-related meat products. The authors go beyond the existing contributions in so far as they apply a demand system to estimate demand elasticities in the simultaneous multi-output model. Due to extensive multicolinearity, however, the authors fail to estimate the demand system and the retail first-order profit-maximization condition simultaneously. The empirical evidence of GOHIN and GUYOMARD is that the French retail sector is becoming increasingly concentrated, offering opportunities to exert market power in factor input and output markets. However, the study fails to find statistically significant results to confirm their hypothesis. Nevertheless, up to 20 percent of the price-cost margin at the retail level is found to be due to the existence of market power when compared with the perfect-competition benchmark. The authors admit that the hypothesis that French retailers exert market power at the aggregate national market level is crucial, and hence a limitation of the empirical analysis. As many food retailers operate at the national level, it is likely that market power in retailing is often exerted at the regional or local market level. Another drawback of this French example

Given the background of the cited literature, this study draws on the theoretical framework proposed by GOHIN and GUYOMARD (2000). But in contrast, the approach is modified to encompass the simultaneous estimation of the first-order profit-maximization conditions of the retail industry and linear demand relations. Hence, retailers` oligopsony power and oligopoly power are estimated simultaneously but separately for the individual product groups, in order to allow for independent measurement of conjectural elasticities. Unlike many other industrial organization surveys on market power, which apply three-stage least-squares estimators the following estimation adopts full-information maximum-likelihood estimators. Consequently the framework chosen in this paper is intended to remedy to the lack of measurement of market power in German retailing.

3 Market Structure of Vertical Meat Marketing

Empirical evidence clearly shows that food retailing in Germany is highly concentrated, offering opportunities to exert buying market power on factor input markets and selling power on consumer output markets. As a partial indicator of competition the concentration ratio CR10 at 84 percent in 2002 reflects a remarkable level of oligopolistic concentration. Previous studies by PFAFF (2001) and MÖSER (2002) provide empirical evidence of this fact. Continuous price wars among leading competitors were further intensified by the market entry of U.S. Wal-Mart in 1997 that even boosted competitive pressure within the retailing sector. The German case is of special interest among European countries as the rapid growth of Discounters has been a major factor in the competitiveness of the retail market.

In particular, discounters gained from the competitive environment by expanding their market shares, mainly at the expense of medium and small retailers. Their share in total consumer food expenditure increased from 24.3 percent in 1992 to 40.5 percent in 2005. In the case of meat and meat products, major consumer trends led to an increase in the share of convenience and packaged meat in retail stores, which now account for 49.8 percent of all meat purchased by consumers. Since the introduction of packaged fresh meat products by leading discounters, additional shares of meat purchases are expected to move towards discounters and their leading retailers (ANDERS 2005). Certainly, the competitive position of butchers and small grocery retailers in meat marketing is decreasing. On the other hand, there has been an intensification in retail competition with decreasing price-cost margins, particularly in the case of meat. MÖSER (2002) shows that meat products are predominantly used in retail promotion activities. Moreover, the competitive environment offers limited opportunities to pass on cost increases to consumers. As a consequence, there is an extensive exertion of market power by retailers towards the upstream stages of the marketing channel while the downstream market appears more competitive due to the importance of hard discounters like Aldi and Lidl.

By comparison, concentration in German meat processing is relatively low at about 40 percent CR10, while the regional distribution of slaughterhouses in terms of their capacity varies strongly. Apart from large-scale slaughtering in northern Germany (> 50,000t capacity), only small plants with less than 10,000t slaughtering capacity operate in the region studied. Here, approximately 50 percent of slaughter is carried out by small-scale units. About 40 percent of the pork slaughtering capacity and up to 60 percent of the beef slaughtering capacity are not being utilized. Against this background, there is no evidence to support a countervailing-power argument at the meat processors market stage. Their bargaining position can rather be characterized as a distinct contest for contracts offered by retail groups. This disparity reinforces the ability of retailers` to exert regional market power.

The position of agricultural livestock farming can be clearly characterized as polypolistic, pointing to the poor competitive capacity of regional agriculture as a whole, and in particular in meat marketing.

4 Theoretical Model and Empirical Implementation

Based upon the analysis of market structure and competition, Section 4 introduces the theoretical framework and its empirical implementation. Considering a non-competitive retail industry of N firms producing homogeneous consumer meat products, retailers buy corresponding wholesale meat products from processors and employ additional factors of production z which are incorporated in the retail distribution process. The retail industry is assumed to be a price-taker in the regional factor markets but to exercise regional market power in both purchasing meat from regional processors and in selling the final goods to consumers. The production technology is presumed to be of fixed proportions, so that the processors` input and consumer output can be represented by the same quantity Q_i, (i = beef or pork). For convenience, and due to the lack of regional firm-level data, the model is conducted at the aggregate level of the retail industry [1]. The cost function of the retail industry is defined as C = c(Q,w,z). Following the procedure of GOHIN and GUYOMARD (2000) the total costs of retail distribution can then be expressed as:

$$CT_i(Q, w, z, CF) = w_i \cdot Q_i + C(Q_i, z) + CF_i, \tag{1}$$

where Q_i is total industry production of meat product i, w_i are meat prices on the processors` market level and z are additional factors in the retail distribution process.

The supply function of the upstream regional meat processing industry is given by:

$$Q_i = S_i(w_i, X). \tag{2}$$

X are additional shifters of supply. The final regional meat demand function faced by the retail industry is given by:

$$Q_i = D_i(p_i, y), \tag{3}$$

where p_i is the consumer price of the i-th final meat product good and y are exogenous demand shifters.

Assuming a profit-maximizing retail industry, the problem is to choose optimal quantities of Q_i which maximize the aggregate industry profits (4) taking into account their economic environment (2) and (3). The aggregated profit function of the retail industry considering the distribution of i meat products is then:

$$\Pi_i = \sum_{i=1}^{m} p_i \cdot Q_i - \sum_{i=1}^{m} w_i \cdot Q_i - C_i(Q_i, z) - CF. \tag{4}$$

Again p_i is the consumer price of either beef or pork and w_i the price of the meat input at the retailers` market level. C_i is the total cost function of the industry and CF a fixed cost term.

1 The complete theoretical model itself is affiliated at the firm level.

With respect to (4), it is assumed that the meat products i are demand-related but naturally not supply-related. Taking the first order condition of the maximization problem and applying additional algebra leads to (5) [2]:

$$p_i - w_i - \frac{\partial C}{\partial Q_i} = -\left(\frac{\theta_i}{Q_i}\right) \cdot \left[\sum_{i=1} \varepsilon_i \cdot p_i \cdot Q_i - \eta_i \cdot w_i \cdot Q_i \right], \tag{5}$$

where $\varepsilon_i = (\partial Q_i/\partial w_i)*(w_i/Q_i)$ is the elasticity of supply measured at the meat processors market level and $\eta_i = (\partial Q_i/\partial p_i)*(p_i/Q_i)$ is the price elasticity of final demand at the retail level.

From equation (5) it becomes clear that the coefficient of conjectural variation θ_i is the crucial conduct parameter. As we know from theory, the conjectural elasticity as shown in (5) provides a useful benchmark to test for market power versus price-taking behaviour or the degree of competitiveness (APPELBAUM 1982). As widely emphasised in the literature, the plausible range of θ_i lies between zero and 1. In the case of θ_i being zero, the right-hand side of (5) is equal to zero, and the equation is reduced to the fact that the consumers` price equals marginal costs. At the other extreme of $\theta_i$ being one, equation (5) represents the retail industry`s optimal condition of a simultaneous monopsony-monopoly situation. Here, total marginal costs of distribution are equal to the perceived net marginal revenues. In other words, if θ_i is zero we assume price-taking behaviour of the retail industry in both the upstream and downstream regional meat markets. If θ_i is different from zero, this indicates that retailers exert market power at the regional meat market level, being monopolistic and monopsonistic in the case of $\theta_{beef} = \theta_{pork} = 1$. For the special case of COURNOT competition, θ_i is equal to the individual market share of each competitor and therefore $\theta_i = 1/N$ [3].

To test empirically for retail market power in the regional market segments for beef and pork, empirical functional forms of the above simultaneous model have to be specified. The issues of aggregation of simultaneous equation models have been largely discussed by, for example, SCHROETER and AZZAM (1991) and WANN and SEXTON (1992). Hence, additional assumptions concerning the conjectural variation as well as the cost function have to be maintained. The aggregate industry cost function is specified in the Gorman Polar form with constant and identical marginal costs with but fixed costs possibly varying among retailers [4]:

$$CT\ \ (Q, w, z, CF) = \sum_{i=1}^{m} w_i \cdot Q_i\ + G_i(z) + \sum_{i=1}^{m} H_i\ Q_i\ + CF\ \ , \tag{6}$$

where H_i are additional factors in the retail marketing of meat products.

From equation (7) it is evident that the marginal costs of the final meat product i are constant. The next aggregation issue concerns the parameter of conjectural elasticity in equation (5). According to APPELBAUM (1982), it is assumed that in equilibrium θ is identical across all retail firms. The latter assumption, as shown by SCHROETER and AZZAM (1991), can be achieved without loss of generality if constant and identical marginal costs are assured with the aggregation procedure. Applying this aggregation procedure to equation (5) leads to:

$$p_i = w_i + H_i(z) - \sum_{i=1} \sum_{i=1} \eta_i \cdot \theta_i \cdot p_i \cdot \left(\frac{Q}{Q_i}\right) + \sum_{i=1} \varepsilon_i\ \cdot \theta_{ii} \cdot w_i \cdot \left(\frac{Q}{Q_i}\right). \tag{7}$$

2 Cross-conjectural elasticities between the market segments i of beef and pork are assumed to be equal to zero and therefore are eliminated from the theoretical derivation.

3 A comprehensive discussion of possible interpretations of the parameter of conjectural variation in the industrial economics literature is found in, among others, Sexton and Lavoie (2001), Gasmi and Vuong (1991) and Gasmi, Laffont and Vuong (1992).

4 For an extensive discussion of the questions of market power measurement, cost economics and different cost-function specifications, in particular the Gorman Polar cost function, see Morrison-Paul (1999).

$\theta_i = \theta_{ii} = \Sigma(\partial Q/\partial q_i)*(q_i/Q_i)$ are average elasticities of conjectural variation with respect to the final good output (θ_i) and the wholesale factor input (θ_{ii}) as downstream consumers and upstream meat processors. Equation (7) is the basis for testing the hypothesis of retail market power in the regional market segments for beef and pork. Due to the fact that tests for market power either in beef or pork marketing might be carried out separately, the monopsony and monopoly coefficients of conjectural variation are not constrained to be identical. To identify the various parameters, the empirical estimation has to combine the information in equation (7) with the supply functions in equation (2) and the demand functions in (3). For each processor`s meat input, this paper specifies double-logarithmic supply functions to account directly for the price elasticity of supply ε and to ensure for the simultaneous character of the modelling approach. GOHIN and GUYOMARD fail to estimate a simultaneous equation system due to the multicolinearity problems in applying an inverse linear demand system. In contrast, this paper specifies double-logarithmic consumer demand functions within the simultaneous equation system to avoid such estimation problems.

The estimation of the simultaneous equation system (2), (3) and (7) uses aggregated monthly data for the period 1995-2000. Covering the vertical market stages of meat processing, retail distribution and consumer demand, the dataset includes quantitative information, prices and cost factors of different stages of meat production and distribution. Other exogenous shift factors, e.g. per capita income, are also available. It is assumed that the retail industry additionally applies the competitively priced input factors labour, energy and the costs of capital, following PARK and WELIWITA (1999) in this point. Due to the excellent small-sample properties of full-information maximum-likelihood estimators (FIML), this consistent estimation procedure is favoured over iterative three-stage least-squares (i3SLS) (HAUSMAN 1975). Like many other empirical studies which apply simultaneous equation systems GOHIN and GUYOMARD mostly rely on i3SLS estimators due to their simpler empirical implementation (AZZAM 1997). To accommodate the large number of coefficients in the case of a joint estimation of the equation system and to account for the problem of multi-colinearity, the following analysis presents a separate estimation procedure for beef and pork.

The empirical model of retail oligoposony-oligopoly behaviour in meat marketing at the regional level contains the simultaneous estimation of a supply function (Q^S) and a consumer demand function (Q^D) as well as the profit maximization relation for the identification of the important parameters $\theta^S{}_i$ and $\theta^D{}_{ii}$.

5 Result and Discussion

Table 1 presents selected full-information maximum-likelihood parameter estimates, t-ratios and R-squared measures for the retail industry equilibrium condition, factor input supply and consumer retail demand functions. The simultaneous equation model also highlights both oligopsony and oligopoly market power estimates for the regional distribution of beef and pork by German retailers. In view of the importance of the conduct parameters constant coefficients θ_i and θ_{ii} as outlined in equation (7) would be somewhat restrictive. Rather than impose this restriction, the variability of the conjectural variation parameters is tested as a function of the retail industry`s ratio of concentration (CR10). With a $\chi 2$ statistic of 3.914 for the pork model and 2.444 for the beef model the hypothesis that $\theta_{i,ii}$ are constant could not be rejected at the 5 percent level of significance ($\chi^2_{(1;\ 0,01)} = 6.63$). Re-estimation of the simultaneous model treating θ_i and θ_{ii} as constant resulted in the following findings. Before interpreting the market power results, it should be noted that nearly all model coefficients were found to be different from zero at a statistically significant level. Against the background of the common difficulty of estimating supply relations, the results in the supply functions are remarkable. Both elasticities are theoretically consistent. The supply elasticities are upward sloping in the factor prices of pork and beef, with parameter values of 0.419 and 1.706 respectively. Like-

wise, the demand curves are downward sloping in the prices of pork and beef. The estimated demand elasticity for beef is -2.74. The estimated elasticity parameters is this case have to be viewed against the background of the German BSE crisis, which is covered by the dataset. Consumers showed a considerable uncertainty in meat consumption in general and reduced their beef consumption almost to zero. The German meat market as a whole showed dramatic responses to price changes, as the elasticities indicate. At -0.588, the demand elasticity for pork clearly lies in the expected inelastic section of the demand curve.

Table 1: Retailers´ Oligopsony-Oligopoly Market Power in Regional Meat Marketing and Selected Supply, Demand and Cost Elasticities (FIML)

Test of retail market power in…			Estimate	t-ratio	R^2	DW
pork distribution	Processor supply elasticity	ε	0.419^{*}	1.79	0.56	2.42
	Consumer demand elasticity	η	-0.588^{***}	-3.23	0.63	1.79
	Oligopsony Market Power	θ^S	0.0125^{*}	1.76		
	Oligopoly Market Power	θ^D	0.0035^{***}	3.28	0.95	1.57
	Price of Labour		$0.48 \cdot 10^{-3***}$	4.03		
	Price of Capital (index)		0.0232^{*}	1.89		
beef distribution	Processor supply elasticity	ε	1.706^{*}	1.79	0.25	1.65
	Consumer demand elasticity	η	-2.74^{***}	-6.39	0.67	1.45
	Oligopsony Market Power	θ^S	0.173	1.62		
	Oligopoly Market Power	θ^D	0.08^{***}	4.61		
	Price of Labour		$0.8 \cdot 10^{-3***}$	11.19	0.88	1.39
	Price of Capital (index)		0.246^{***}	2.68		
	Impact of BSE crisis on consumer demand at the retail level (elasticity)		-0.0172^{**}	-3.62		

*, ** and *** stand for the 90%, 95% and 99% levels of significance.
Source: Own Computations.

The equations fit the data reasonably well. The corrected R-squared measurements range from 0.56 to 0.95, with the exception of the beef supply elasticity at 0.25. Tests for autocorrelation are conducted using the Durbin-Watson statistics (DW). For the beef equation model the DW-statistics range from 1.39 for the retail industry`s optimal condition up to 1.65 for the meat processors` supply relation, both lying within the inconclusive region of the test statistics. Gujarati (1988) proposes the evaluation of autocorrelation in simultaneous equation models using the non-parametric runs-test. Additionally performed runs-tests did not reject the hypothesis of zero autocorrelation among the disturbances based on a $\chi 2$ statistic for any of the equations. The only exception is the retail equilibrium condition for beef, with a DW-statistic of 1.39. Here the runs-test confirms the existence of positive autocorrelation.

Of particular interest are, of course, the estimates of oligopsony and oligopoly retail market power in the conjectural variation coefficients θ^S and θ^D. From Table 1 it is apparent that the estimated coefficients of conjectural variation deviate in both markets, and both oligopoly and oligopsony specifications devote significantly from zero and hence perfect competition. The zero hypotheses of perfect competition and price-taking behaviour are soundly rejected. For the retail oligopsony power in beef marketing the deviation from price-taking behaviour is of a relatively high magnitude but misses the 90 percent level of significance. In any case, the alternative hypothesis of monopsonistic market power ($\theta^S_{Beef} = 1$) has to be clearly on the basis of a t-statistic of 7.74. The case of pork is different in so far as the deviation from zero is highly significant but of smaller magnitude.

Nevertheless, with conjectural variations being around 0.01, the claim that retailers exert regional oligopsony market power in the purchase of pork meat, is still somewhat exaggerated. Thus the hypothesis of $\theta^S_{Pork} = 1$ is clearly rejected with a t-statistic of 124.25.

In the case of both oligopoly specifications the picture is different. With values of the retail oligopoly conjectural elasticity θ^D ranging from 0.0035 to 0.08, the deviation from perfect competition in retailers` sales to consumers is comparatively small, although the value for beef exceeds the level of pork by far. Again the alternative hypotheses of oligopoly market power have to be rejected with t-statistics of 61.76 for beef and 924.15 in the case of pork. These findings are very stable across different model specifications. With the deviation of greater magnitude than in the case of the pork oligopoly, overall retail behaviour in the sales of beef and pork to downstream consumers finally has to be classified as oligopolistic rather than competitive.

For each meat category the degree of retailers´ oligopsony-oligopoly power may also be measured by the well-known LERNER index as the relative monopoly price distortion which AZZAM and PAGOULATOS (1990) express as $L = \theta^D/\eta$. Within the scope of a simultaneous bilateral market power measurement, SCHROETER (1988) additionally proposes the application of an index of the relative monopsony price distortion, which he defines as $M = \theta^S/\varepsilon$. Table 2 presents Lerner indices as well as monopsony price distortions as percentage distortions based on mean values of the estimated model coefficients.

Table 2: Retailers´ Monopsony and Monopoly Price Distortions [a)]

Indices of market power	Beef	Pork
Input market	0.101 (11.235)	0.030 (3.093)
Output market	0.029 (2.987)	0.006 (0.604)

a) The values in parentheses are the calculated percentage deviations of the unit margins for beef and pork compared with the perfect-competition benchmark.
Source: Own Computations.

As expected, the mean values of oligoposony-oligopoly price distortions due to retailers` exertion of regional market power are of small magnitude. The values of the monopsony market power index are 0.101 for beef and 0.030 for pork, and 0.029 and 0.006 for the Lerner index. Accordingly, about 11 percent of the retail unit marketing margin for beef can be explained by retailers` monsopony market power, whereas the corresponding value for pork, at 3.1 percent, is by far less. The percentage deviations outlined by the Lerner index are of even smaller magnitude with values of 2.9 and 0.6 percent. Based on the parameter values, the calculated percentage price distortions of beef and pork unit margins compared with the perfect-competition benchmark are of virtually the same size, again ranging from 11.235 down to 0.604 percent. From these findings it can be concluded that the regional exertion of retailers` market power in the segments of beef and pork, as well as power with respect of consumers, has been minor. The exception is the factor input market of beef. Here, especially, the impact of BSE, resulting in remarkable values of factor supply as well as consumer demand elasticity, was of major significance for the measurements of market power. GOHIN and GUYOMARD find LERNER indices, as well as relative monopsony distortions, of clearly higher magnitude (between 13 and 25 percent) for the retail categories of meat, dairy and other products. These authors themselves admit that several of the elasticities used for calculation are not statistically different from zero. Nevertheless, this is the only comparable study at the retail level for Europe. MILLÁN (1999), in a survey of the Spanish food, drink and tobacco industries, also calculates aggregate Lerner indices. The value for the meat sector is 0.21. In contrast, many other studies use the concept of the Lerner index to access market power, mostly in U.S. meat marketing. But in non of these does the analysis explicitly concentrate on the retail industry or at the regional market level.

6 Summary and Conclusions

Against the background of high levels of concentration and a rapidly changing competitive environment in many food markets, especially at the regional market level and in remote regions, the upstream market stages are expected to suffer from the exertion of retail market power. Regional agriculture, and especially livestock production in less favoured regions where small-scale marketing structures dominate, can be accurately described as being polypolistic. In particular, meat marketing in rural Germany shows considerable weakness in competitive capability. Producers are constrained to be price-takers in both the output and input markets, and they face a potential environment of market power primary in the hands of leading German retailers. In the process, consumers also will be affected.

The aim of this paper, therefore, has been to analyze explicitly the simultaneous exertion of retailers` market power in the regional factor and output markets for a segment of the German meat market and the product categories of beef and pork marketing. The theoretical framework used draws on the approach proposed by GOHIN and GUYOMARD which simultaneously parameterizes the retail industry´s oligopoly and oligopsony equilibriums. In particular, retailers´ coefficients of conjectural variation in the purchase of meat products and sales to consumers indicate significant deviations from perfect competition and therefore reflect a strong bias towards oligopsonistic-oligopolistic behaviour. The estimated values of aggregated conjectural variation at the industry level, ranging from 0.0035 to 0.1, indicate that the perfect competition hypothesis is not valid. The level of regional market power exertion by retailers is therefore limited and far from being either clearly monopolistic or clearly monopsonistic behaviour. This is also confirmed by additionally calculated relative deviation on the basis of LERNER and monopoly market power indices. However, estimates of conjectural elasticities state that the statistical evidence of retailers` upstream and downstream market power in meat marketing is limited.

References

AILAWADI, K. L., N. BORIN and P.W. FARRIS (1995), Market Power and Performance: A Cross-Industry Analysis of Manufacturers and Retailers, in: Journal of Retailing, Vol. 71, No. 3, pp. 211-248.

ANDERS, S. (2005), Industrieoekonomische Marktmachtanalyse der Fleischwirtschaft: Theorie und empirische Tests. Sonderhefte der Agrarwirtschaft Nr. 180, Bergen/Dumme: Agrimedia.

APPELBAUM, E. (1982), The Estimation of the Degree of Oligopoly Power, in: Journal of Econometrics, Vol. 19, pp. 287-299.

AZZAM, A.M. (1997), Measuring Market Power and Cost-Efficiency Effects of Industrial Concentration, in: Journal of Industrial Economics, Vol. 45, pp. 377-386.

AZZAM, A.M. and E. PAGOULATOS (1990), Testing Oligopolistic and Oligopsonistic Behaviour: An Application to the US Meat-Packing Industry, in: Journal of Agricultural Economics, Vol. 41, pp. 362-370.

BENNETT, J. and A. ULPH (1988), Asymmetries in the Gains to Firms and Unions of Alternative Bargaining Structures. Discussion Papers in Economics and Econometrics No. 8815, Department of Economics, University of Southampton, UK.

COTTERILL, R.W. (1986), Market Power in the Retail Food Industry: Evidence From Vermont, in: The Review of Economics and Statistics, Vol. 68, pp. 379-386.

DOBSON, P.W. and M. WATERSON (1997), Countervailing Power and Consumer Prices, in: The Economic Journal, Vol. 107, pp. 418-430.

DOBSON, P.W. and M. WATERSON (1999), Retailer Power: Recent developments and Policy Implications, in: Economic Policy, Vol. 14, No. 28, pp. 134-164.

DOBSON, P.W., M. WATERSON and W. DAVIES (2003), Patterns and Implications of Increasing Concentration in European Retailing, in: Journal of Agricultural Economics, Vol. 54, No. 1, pp. 111-125.

GASMI, F. and Q. VUONG (1991), An Econometric Analysis of Some Duopolistic Games in Prices and Advertising. In: RHODES, G. und T. FOMBY (eds.), Advances in Econometrics: Econometric Methods and Models for Industrial Organization, Greenwich, JAI Press.

GASMI, F., J.J. LAFFONT and Q. VUONG (1992), Econometric Analysis of Collusive Behavior in a Softdrink Market, in: Journal of Economics and Management Strategy, Vol. 1, pp. 277-311.

GOHIN, A. and H. GUYOMARD (2000), Measuring Market Power for Food Retail Activities: French Evidence, in: Journal of Agricultural Economics, Vol. 51, No. 2, pp. 181-195.

GUJARATI, D.N. (1988), Basic Econometrics. 2. Edition, New York, McGraw-Hill Book.

HAUSMAN, J.A. (1975), An Instrumental Variable Approach to Full-Information Estimators for Linear and Certain Nonlinear Models, in: Econometrica, Vol. 43, No. 4, pp. 727-738.

HYDE, C. E. and J.M. PERLOFF (1998), Multimarket Market Power Estimation: The Australian Retail Sector, in: Applied Economics, Vol. 30, pp. 1169-1176.

KÖRNER, J. (2004), Intertemporale Optimierung, Marktmacht und Wettbewerbsverhalten: Essays zur Preisbildung im deutschen Kaffeemarkt. Volkswirtschaftliche Forschung und Entwicklung, No. 94, Freie Universität Berlin, Berlin.

MESSINGER, P.R. and C. NARASIMHAN (1995), Has Power shifted in the Grocery Channel?, in: Marketing Science, Vol. 14, No. 2, pp. 189-223.

MILLÁN, J.A. (1999), Market Power in the Spanish Food, Drink and Tobacco Industries, in: European Agricultural Review, Vol. 26, No. 2, pp. 229-243.

MÖSER, A. (2002), Intertemporale Preisbildung im Lebensmitteleinzelhandel. Theorie und empirische Tests. Dissertation, Giessener Schriften zur Agrar- und Ernährungswirtschaft, No. 32, Frankfurt, DLG-Verlag.

MORRISON-PAUL, C.J. (1999), Cost Structure and the Measurement of Economic Performance, Productivity Utilization Cost Economics and Related Performance Indicators, Dordrecht: Kluwer Academic Publishers.

PARK, T. and A. WELIWITA (1999), Competitive Behavior in the US Food Retailing Industry., in:Canadian Journal of Agricultural Economics, Vol. 47, No. 2, pp. 45-55.

PFAFF, K. (2001), Wettbewerbsanalyse im Rahmen der Industrieökonomik: Theorie und empirische Anwendung auf den hessischen Fleischmarkt, Sonderhefte der Agrarwirtschaft, 179, Bergen/Dumme: Agrimedia.

SCHROETER, J.R. (1988), Estimating the Degree of Market Power in the Beef Packing Industry, in: The Review of Economics and Statistics, Vol. 70, pp. 158-163.

SCHROETER, J.R. and A.M. AZZAM (1991), Marketing Margins, Market Power and Price Uncertainty, in: American Journal of Agricultural Economics, Vol. 73, No. 4, pp. 990-999.

SCHROETER, J.R., A.M. AZZAM and M. ZHANG (2000), Measuring Market Power in Bilateral Oligopoly: The Wholesale Market for Beef, in: Southern Economic Journal, Vol. 66, No. 3, pp. 526-547.

WANN, J.J. and R.J. SEXTON (1992), Imperfect Competition in Multi-Product Food Industries With Application to Pear Processing, in: American Journal of Agricultural Economics, Vol. 74, No. 4, S. 980-989.