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Spatial Price Differentiation and Regional Market Power. The Case of Food-Retailing in Austria

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WORKING PAPERS

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The Case of Food-Retailing in Austria

Dieter Pennerstorfer, Franz Sinabell

458/2013

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Abstract

A small number of firms have a large market share in the Austrian food retailing market. Market concentration has been growing over the last years which has raised concerns about market power. Previous studies on price setting behaviour in the food retailing market were at the national level and regional price setting has not yet been analysed. We use a panel data set of over 2,000 households with monthly food purchasing data and the number of outlets of the nine biggest food retailers in 120 districts to explore regional price setting behaviour. The analysis shows that only a small number of retailers seem to regionally differentiate prices extensively. It cannot be confirmed that spatial price differentiation is a way to exert market power in the Austrian food retailing market.

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Spatial Price Differentiation and Regional Market Power — the Case of Food-Retailing in Austria

Abstract A small number of firms have a large market share in the Austrian food retailing market. Market concentration has been growing over the last years which has raised concerns about market power. Previous studies on price setting behaviour in the food retailing market were at the national level and regional price setting has not yet been analysed. We use a panel data set of over 2,000 households with monthly food purchasing data and the number of outlets of the nine biggest food retailers in 120 districts to explore regional price setting behaviour. The analysis shows that only a small number of retailers seem to regionally differentiate prices extensively. It cannot be confirmed that spatial price differentiation is a way to exert market power in the Austrian food retailing market.

Keywords Market power • Food retailing • Spatial price differentiation • Austria

JEL classification D43 • L81

Räumliche Preisdifferenzierung und Regionale Marktmacht — der Lebensmitteleinzelhandel in Österreich

Zusammenfassung Im österreichischen Lebensmitteleinzelhandel deckt eine kleine Zahl an Handelsketten einen Großteil des Marktes ab. Eine in den letzten Jahren zunehmende Marktkonzentration führte zu Bedenken über die Existenz von Marktmacht. Frühere Studien über das Preissetzungsverhalten im Lebensmitteleinzelhandel untersuchten lediglich die gesamtstaatliche Ebene, während regionale Aspekte unbeachtet blieben. Wir verwenden monatlichen Paneldaten über die Ausgaben für Nahrungsmittel von über 2,000 Haushalten sowie die Zahl der Niederlassungen (Geschäfte) der neun größten Einzelhandelsketten in den 120 österreichischen Bezirken, um das regionale Preissetzungsverhalten der Unternehmen zu untersuchen. Die Analyse zeigt, dass nur sehr wenige Einzelhandelsketten ihre Preise in einem nennenswerten Ausmaß räumlich differenzieren. Es kann keine Evidenz gefunden werden, dass räumliche Preisdifferenzierung von Einzelhandelsketten dazu genutzt wird, Marktmacht ausüben.

Schlüsselwörter Marktmacht • Lebensmitteleinzelhandel • Räumliche Preisdifferenzierung • Österreich

1. Introduction

A commodity price surge in 2007 generated a rapid and strong increase in food consumer prices throughout the EU, but the subsequent pronounced fall in agricultural prices only triggered a slight decline in the consumer price of most food products by the end of 2009. Such asynchronous price adjustments have been observed in previous periods of price changes as well, and there is a growing literature on exploring this phenomenon (e.g. CEC, 2009a; BAUMGARTNER et al., 2009). There are several explanations for asynchronous price transmissions, the most cited ones are a lack of competition and the exertion of market power in the food processing and food retailing sectors.

In order to increase transparency and thus to promote competition and in the food market, the Commission of the EU established a price monitoring tool (available at the Eurostat website[1]). The primary aim of this tool is to bring together the available data on price developments in the different steps of the supply chain, comparing price developments for the relevant agricultural commodities, for the relevant food industries as well as for the chosen consumer goods. Currently the monitoring covers only price indices and price changes for aggregated food items, but it is planned to cover prices of individual products as well (EUROSTAT, 2009).

Easily available price information at a national level is certainly an improvement over the situation so far, however price data aggregated at the national level lack two important dimensions: the significant variance of prices of the same or very similar products offered by different food retailers, and the regional dispersion of prices. Studies on the gasoline market show that the same product is offered at different prices at different locations in order to exert market power at local markets (PENNERSTORFER, 2009) and recent findings from the UK (COMPETITION COMMISSION, 2009) suggest that retailers in grocery markets use similar strategies.

The topic of this paper is to analyse the spatial price setting behaviour of food retailers and to find evidence for market power in regional markets. We analyse the sales of various milk products from the major food retailer chains in 120 Austrian districts over a period from 2007 to mid 2009. The hypothesis is that food retailers use their network of outlets for spatial price discrimination and we expect relatively higher prices in districts with lower competition. Assuming that marginal costs of brand products are the same throughout the country, the extra profits generated via higher prices could be interpreted as the rents of local market dominance. Evidence for such behaviour would call for

[1] http://ec.europa.eu/enterprise/sectors/food/competitiveness/prices_monitoring_en.htm

further efforts on market transparency in order to obtain information on regional prices. Lack of evidence on such behaviour would not imply that the Austrian food market is competitive and that market power doesn't play a role. We would rather lean towards the assumption that other strategies to exert market power are more imported in the markets under consideration because evidence on lack of competition in consumer markets of milk products has been recently shown by SALHOFER et al. (2012).

The structure of the paper is as follows: In the next chapter a short introduction into the price setting behaviour of firms is provided. In the following chapter a literature survey on studies on market power in food markets is presented, which shortly summarizes the findings of previous analyses on Austrian food markets also. Data and methods are described in depth before the results are presented. The final chapter summarizes and discusses the major findings and lists directions for further research.

2. Price setting behaviour

As in many other sectors of retailing supermarkets have various possibilities to price discriminate: They often charge lower per-unit prices if volumes of products increase (2nd degree price discrimination) or label the same products differently to separate consumers according to their price elasticity (3rd degree price discrimination). But as prices in supermarkets are not negotiable, supermarket chains (to which we refer as retailers in what follows) cannot price discriminate for a single product within an outlet. However, retailers can price discriminate by charging different prices at different outlets, which is another type of 3rd degree price discrimination.

If they discriminate in this way, retailers can react to regional differences in demand and in the intensity of competition and can therefore exploit regional (local) market power by raising prices over marginal costs. As competition is highly localized it is costly for consumers to switch from one outlet to another, especially if there is little competition in this local market (e.g. due to large spatial differentiation between outlets). The disadvantage of regional price discrimination is that the development of price schedules for multi-product retailers is quite costly, especially as one has to acquire information on differences in regional price elasticities for various products. Differences in price schedules might also cause problems in marketing (advertising).

At least for some markets with spatial competition we observe regional price discrimination of retailers controlling multiple outlets (e.g. gasoline retailing). In these markets retailers react to low

competition in local markets by charging higher prices.[2] If retailers price discriminate, retailers can either determine centrally a regionally differentiated price schedule, or each outlet decides individually about prices. Retailers (are able to) account for differences in the intensity of local competition in both cases.

If a retailer opts for regional price discrimination, we expect that prices are higher if demand is high and inelastic, and if spatial differentiation to outlets of other retailers is high (and therefore the costs of consumers from switching from one supplier to another). A high degree of market concentration will only affect prices if the price schedule is set centrally. Assuming that marginal costs are the same for all outlets of a retailer, there is a direct relationship between prices and the Lerner index – i.e. market power. If a retailer sets (spatially) uniform prices, the indicators of the intensity of local competition will have no influence on pricing schedules.

3. Literature review on market power in food retailing and research questions

Several studies in the literature have found evidence that price transmission in vertically-related markets is imperfect, i.e. that farm input price changes are not fully passed-through to the final product price (see BAUMGARTNER et al., 2009, for recent findings on the Austrian milk market and CEC (COMMISSION OF THE EUROPEAN COMMUNITIES), 2009a and 2009b, for the EU food sector). Market power, notably oligopoly power, is presumed to be the principal source of imperfect price transmission. Concerns about the dominance of a small number of supermarket chains are especially strong in small high income countries. But even in some large countries concentration in retailing markets is very high as shown by LLOYD and MORGAN (2007), who find considerable evidence for market power exerted by supermarkets in the UK. The basic components of antitrust analysis for the supermarket industry were recently reviewed by COTTERIL (2006), who includes definitions of product and geographic markets and the measurement of market power. Firm and brand level New Empirical Industrial Organisation models of demand and oligopoly pricing provide insights for evaluating antitrust claims. Research on vertical pricing games and price transmission expands the analysis to market channel pricing issues, including coalescing power by supermarkets and food manufacturers. COTTERIL (2006) concludes that the analysis of prices and profits in a market structure context remains important, especially in countries with very high supermarket concentration.

[2] Many authors analyzing the retail gasoline market found a positive relationship between gasoline prices and market power (BORENSTEIN and SHEPARD, 1996; BORENSTEIN, CAMERON and GILBERT, 1997; BARRON, TAYLOR and UMBECK, 2004). HASTINGS (2004) found evidence of an increase in prices in local markets affected by a merger. PENNERSTORFER and WEISS (2013) show that prices increase with distance to rivals (spatial differentiation) and the degree of 'local clustering' (local concentration) of stations of the same brand.

TADESS WELDEGEBRIEL (2004) developed a model of price transmission where both oligopoly and oligopsony power co-exist and where industry technology is assumed to be characterised by variable input proportions. It shows that taking the degree of price transmission in a perfectly competitive market as a benchmark, oligopoly and oligopsony power can, but do not necessarily lead to imperfect price transmission. Indeed, they may counteract each other's impact on the degree of price transmission. The key to these outcomes is to be found in the functional forms for retail demand and farm supply. Several recent studies explore the price setting behaviour of retailers on the food market as a whole or on specific product markets in an empirical setting. GOHIN and GUYOMARD (2008) analyse the French food retail industry and distinguish three commodities (dairy products, meat products and other food products). They estimate the degree of imperfect competition and of oligopoly-oligopsony power. They strongly reject the hypothesis that French food retail firms behave competitively. According to their results more than 20 (over 17) per cent of the wholesale-to-retail price margins for dairy (meat) products, can be attributed to oligopoly-oligopsony distortions. ANDERS (2008) finds very similar evidence of retail oligopoly and oligopsony power with retail margins ranging between 0.5% to 11% above the competitive outcome for the case of beef and pork in Germany. WILHELMSON (2006) finds that firms in the Swedish food and beverage industry do enjoy some market power, the degree of which varies significantly across the sectors of the food and beverage industry. A more recent study for the coffee market in Sweden (DUREVALL, 2007) confirms this finding.

For Austria, there are four studies which deal with market power in the food-retail market or in specific product markets. WIESER et al. (1999) conducted a survey among retailers and their suppliers exploring anti-competitive behaviour of firms. They conclude that competition policy needs to tackle the problem and make suggestions how to improve competition in the retailing sector. BADINGER and BREUSS (2005) looked at price markups of different sectors and observed pronounced markup reductions in wholesale and retail trade after the accession of Austria to the EU but still considerable room for further reductions. JUMAH (2004) examined the existence of market power in the respective pork and poultry ("white" meat) meat markets in Austria. The existence of market power in pork retail pricing is revealed by using the Johansen cointegration technique. Poultry retail pricing is, however, found to be competitive. The result for pork is attributed to tradition and to the high pre-EU border protection rates. SALHOFER et al. (2012) use a similar model as GOHIN and GUYOMARD (2008) to analyse market power of Austrian food retailers in the market of milk products. Their results are less conclusive than those for the French case described by GOHIN and GUYOMARD (2008) and for

Germany analysed by ANDERS (2008), but similar to the findings of MEREL (2009) who cannot confirm market power for the case of the French Comte Cheese market.

Our contribution to the literature is to look at the spatial dimension of market power in the food retailing industry by going beyond a mere appraisal of regional market concentration. It seems that this dimension has not yet been covered by the literature on market power on the food retailing market.

4. Data and model specification

The main data base for this article comes from RollAMA ('rollierende Agrarmarkt-Analyse'), a panel data set, owned by AMA-Marketing GmbH (http://www.ama-marketing.at/) and managed by KeyQUEST Marktforschung GmbH (http://www.keyquest.at/).

The RollAMA data set has been established in 1994 to provide food producers information on the market situation. An important use of the database is to measure the effectiveness of generic product campaigns which are co-financed by EU funds. Since its establishment, the design of the panel has undergone several changes. Approximately 2,000 households register the price and quantity of groceries and the place where the items were bought. Compared to similar data like those provided by AC-Nielsen, the RollAMA panel not only covers the outlets of retailers but also includes sales from local groceries and farmer markets.

The dimensions of the data panel set are:

- *household characteristics:* there are several socio-economic variables on the size of the household and household income;
- *products:* depending on the year, the number of products ranges between 500 and 800 items which are grouped in 13 sets; the panel covers milk products, meat, eggs, fruits, vegetables, potatoes and convenience food; per year approximately 1.2 million single sales are registered and households register quantity and expenditure; beginning with 2007 most products are identified by EAN-codes;
- *sources of supply:* there are 76 different sources of supply, among them 15 food retailers;
- *supplementary information:* in this dimension other useful information (like promotions) is registered;
- *time dimension:* data are available between January 1997 and December 2006 on a monthly basis; beginning with 2007 daily data are available.

For our analysis we use the data of 2,000 households for 20 specified milk and dairy products during the period from January 2007 to April 2009. This information includes the price of the product, the retailer where the household bought the good, the time of the purchase, and geographical information on the household (district of residence). Unfortunately we do not have access to individual data of this form, but to regional aggregated information only: Assuming that households just buy in their district of residence, KeyQUEST Marktforschung GmbH calculated an average price for each product, any district, and every retailer for each month among all purchases that occurred. The price information we investigate is therefore a regionally (each district) and temporally (every month) averaged price.

This data set was supplemented by information coming from various sources: The number of outlets of each supermarket chain in each district was collected by the Austrian Institute of Economic Research (WIFO) in June/July 2009 using Herold Marketing CD Nr. 3/2009, 1/2005 and 1/2000 (Herold Business Data Gmbh), furthermore Austrian Yellow Pages by Herold, available via Internet (http://www.herold.at/) and by general research via internet (i.e. homepages of the individual chains). Data on population ('total population at the beginning of the year 2007') and information on the number of overnight tourist stays (Jan. 2007 to June 2009) as well as the size (area) of the districts (Year 2005) come from the Austrian Statistical Office ('Statistik Austria').

Out of these 20 products we take one of each group of products (milk, butter and cheese). We picked the specific goods according to the number of observations and according to the number of retailers that sell these products (see Table 1).[3] Although we chose the products with many observations, the sample is still highly unbalanced.

Table 1. Summary statistics of prices

Product	Milk Vollmilch länger frisch (ESL) - NÖM (EAN 9019100211606)				Butter Sommerbutter - Berglandmilch (EAN 9066000106402)				Cheese Geheimratskäse - Berglandmilch (EAN 9066000284100)			
Variable	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Price overall	1.0384	0.0727	0.490	1.510	6.970	0.8504	3.160	11.160	7.1767	0.9706	3.960	13.760
Price between		0.0469	0.750	1.233		0.7308	3.160	11.160		0.8104	4.760	10.860
Price within		0.0660	0.633	1.513		0.6853	3.314	10.190		0.7149	4.062	10.452
# Observations		3,229				2,514				1,288		

Source: own calculations.

[3] Especially the largest discount shop in Austria has many private brands that are sold only in its outlets.

As we do not have individual data, one observation is a district rather than an outlet. All variables indicating the degree of regional competition are calculated on a district level. We divide the population by the number of outlets of a district as an indicator of demand. Market concentration is quantified by taking the share of outlets of one retailer.[4] Market concentration is not weighted, as we have no information on the quantity of sold products and we would run into endogeneity problems by taking the volume of sales (as prices affect sales directly). The size of a district over the number of outlets is used as a proxy of spatial differentiation. The share of tourists (i.e. the number of overnight stays within a month) over the population of the district serves as an indicator of the elasticity of demand. We consider tourists as consumers with high costs of switching from one supplier to another, as they have (in general) a bad market overview. High search costs induce a low demand elasticity of tourists. Table 2 gives an overview of these variables. One has to notice, although all variables vary across districts, only "Market Share" varies across retailers and just "Tourism" varies over time.

Table 2. Summary statistics of explanatory variables (model 1)

Variable	# Obs	Mean	Std. Dev.	Min	Max
Demand	7,031	1813.2780	461.8097	798.3333	2773.7370
Market Concentration	7,031	0.1518	0.1184	0,0069	0.5333
Spatial Differentiation	7,031	11.0123	11.1703	0,0852	78.4373
Tourism	7,031	0.6592	1.5940	0,0062	33.7376

Source: own calculations.

Figure 1 shows the Herfindahl-Hirschman-index as a measure of market concentration. The index is calculated for each district and the market shares of the retailers are approximated by taking the share of outlets of each retailer in that district.[5] We distinguish between nine different retailers, whereas all outlets of other retailers (small chains or independent grocery stores) are treated as independent suppliers. The highest concentration ratios can be observed in the south (in Carinthia), in and around Vienna and in the west (in Vorarlberg).

Figure 2 shows average prices of three butter brands and two margarine brands and Figure 3 shows a comparison of variance between prices of one margarine brand sold by different retailers: total variance of prices, variance of monthly prices of between regions at a single date and over the whole period within all regions of different retailers (see Appendix).

[4] One retailer (REWE) controls more than one brand (Billa, Merkur and Penny). In calculating market shares we regard these three brands as one retailer, but control for different strategies across these brands by including separate brand-specific effects, which are called retailer-specific effects for convenience.

[5] We take the share of outlets rather than the share in volumes or sales in the regression analysis to avoid endogeneity problems. For consistency we use the same approach here.

Figure 1. Regional Distribution of Market Concentration

Source: own calculations. Mean: 0.2200; Median 0.2124; Standard Deviation: 0.0835.

For each product *i* we estimate a reduced-form price equation (model 1):

$$\bar{p}_{idrt} = X_{drt}\beta_r + \mu_t + \gamma_r + \varepsilon_{idrt}$$

The average price in each district *d* for each retailer *r* in every month *t*, $\bar{p}_{idrt}$, is explained by the indicators of the regional intensity in competition, summarized in X_{drt}. As we do not know beforehand which retailers engage in discriminatory prices, we estimate different coefficients for each retailer (β_r). We control for differences in marginal costs over time by fixed time- (μ_t) and between retailers by fixed retailer-specific effects (γ_r).

In a second version of our model we calculate weighted average prices among different retailers within a time period and within a district. The weights ω_{idrt} of the price for each chain depend on the number of outlets of that retailer within a district and can be defined as:

$$\omega_{idrt} = number\ of\ outlets\ of\ retailer\ r\ in\ district\ d\ if\ \ \bar{p}_{idrt} > 0$$

If we do not have a price information at a point in time, the weights associated with this chain is 0:

$$\omega_{idrt} = 0\ if\ \ \bar{p}_{idrt}\ is\ missing$$

The average price in a district across chains can be calculated as:

$$\bar{\bar{p}}_{idt} = \sum_{r=1}^{10}\left(\frac{\omega_{idrt}}{\sum_{f=1}^{10}\omega_{idrt}}\bar{p}_{idrt}\right)$$

This gives the specification of model 2:

$$\bar{\bar{p}}_{idt} = X_{dt}\beta + \mu_t + \varepsilon_{idt}$$

Summary statistics of the average price and the exogenous variables are given in Table 3 and Table 4. As retailer-specific variables (as the market share) are wiped out due to aggregation we include the Herfindahl-Hirschman-index (HHI) as a measure of market concentration. We again take the share of outlets as a proxy for market share to avoid endogeneity problems.

Table 3. Summary statistics of average prices

Product	Vollmilch länger frisch (ESL) - NÖM (EAN 9019100211606)				Sommerbutter - Berglandmilch (EAN 9066000106402)				Geheimratskäse - Berglandmilch (EAN 9066000284100)			
Variable	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Price overall	1.0410	0.0701	0.490	1.500	7.0076	0.8287	3.160	10.360	7.1963	0.9759	3.960	13.760
Price between		0.0544	0.750	1.150		0.4499	4.760	8.360		0.5364	4.760	8.360
Price within		0.0667	0.711	1.499		0.7815	3.410	9.926		0.8994	3.931	12.811
# Obs	1,314				1,678				998			

Source: own calculations.

Table 4. Summary statistics of explanatory variables (model 2)

Variable	# Obs	Mean	Std. Dev.	Min	Max
Demand	3,990	1737.1390	456.3512	798.333	2773.737
Market Concentration	3,990	0.2262	0.0795	0.066	0.379
Spatial Differentiation	3,990	12.6391	11.7267	0.085	78.437
Tourism	3,990	0.7741	1.9299	0.006	33.738

Source: own calculations.

5. Results

The results of model 1 for three different products (Table 5) show that, by and large, discount shops (Penny, Zielpunkt) are cheaper on average (Billa serves as the reference category). Products offered by these chains are not sold by the retailers Hofer and Lidl, which are considered to be discount shops as well. We cannot derive a systematic relationship between the variables indicating local competition and the prices of milk, butter and cheese.

Price differences for milk are very small. We observe the lowest prices at Penny, Spar, Lidl and other retailers, but the difference to the reference category is below 5 Euro cents and not significantly different from zero. The largest differences in prices (absolute and relative to the price level) can be observed for butter. Penny and Spar are significantly cheaper than Billa. ADEG on the other hand is 2.20 Euro more expensive than the reference category. For cheese we derive significant results for one retailer only: Zielpunkt is 1.34 Euro cheaper than the reference category. Surprisingly, ADEG is the most expensive brand for butter, but the cheapest for cheese, but the difference for cheese is not statistically different from zero.

We expected positive coefficients for the variables indicating the intensity of competition (demand, market share, spatial differentiation, and tourism) for retailers that are engaged in regional price discrimination and insignificant results for other retailers. Out of these 96 parameters, we derive only 6 significant results at the 5-percent-level, whereas only two results (out of the significant ones) have the expected sign: The prices of milk and cheese at other retailers are influenced positively by their market share. An increase in demand and higher spatial differentiation has a negative impact on prices for butter and cheese at Billa and ADEG. Out of the large number of estimated coefficients one cannot oppose the claim that these are spurious results.

Table 5. Results Model 1

Product	Vollmilch länger frisch (ESL) - NÖM (EAN 9019100211606)			Sommerbutter - Berglandmilch (EAN 9066000106402)			Geheimratskäse - Berglandmilch (EAN 9066000284100)		
Variable	Coeff.	Std. Dev.	Sign.	Coeff.	Std. Dev.	Sign.	Coeff.	Std. Dev.	Sign.
Merkur	0.016621	0.041165		–0.996907	0.660781		–0.632799	0.646520	
Penny	–0.049948	0.036598		–1.630373	0.606440	***	–0.950440	0.606177	
Spar	–0.020891	0.033865		–1.222867	0.540691	**	–0.196566	0.582954	
Inter/Maxi	–0.005369	0.061024		–1.404038	1.070861		–0.392025	0.934879	
ADEG	–0.003916	0.062736		2.204675	1.173944	*	–1.531081	1.321421	
Hofer	.	.		.	.		.	.	
Zielpunkt	–0.043374	0.032672		–1.083717	0.676147		–1.337819	0.705835	*
Lidl	.	.		.	.		.	.	
Others	–0.046076	0.060556		–0.181105	0.870376		–0.986703	0.789113	
Demand X Billa	–0.000004	0.000010		–0.000445	0.000190	**	–0.000057	0.000208	
Demand X Merkur	–0.000012	0.000014		0.000083	0.000253		0.000049	0.000221	
Demand X Penny	–0.000002	0.000011		0.000096	0.000223		0.000106	0.000219	
Demand X Spar	–0.000002	0.000010		0.000086	0.000179		–0.000075	0.000173	
Demand X Inter/Maxi	0.000000	0.000022		–0.000038	0.000386		–0.000046	0.000335	
Demand X ADEG	–0.000006	0.000027		–0.001331	0.000505	***	0.000657	0.000561	
Demand X Zielpunkt	0.000008	0.000010		–0.000140	0.000261		0.000131	0.000269	
Demand X Others	–0.000014	0.000029		–0.000571	0.000388		–0.000142	0.000345	
Market Share X Billa	–0.028186	0.043294		0.579235	0.699069		–0.148388	0.818028	
Market Share X Merkur	–0.261751	0.199976		–1.607886	3.857742		–0.077163	3.728130	
Market Share X Penny	–0.031000	0.123150		1.180120	2.318006		–0.506192	2.098070	
Market Share X Spar	0.022579	0.049990		0.031876	0.563712		–0.311920	0.616379	
Market Share X Inter/Maxi	–0.297002	0.679800		12.432950	11.484000		–0.158012	11.010060	
Market Share X ADEG	–0.000603	0.070077		–0.989489	1.137259		1.175693	1.090130	
Market Share X Zielpunkt	0.030176	0.059014		0.508676	1.680322		1.201855	1.542250	
Market Share X Others	2.593746	0.742463	***	10.975580	8.667232		36.332250	9.426149	***
Spatial Diff. X Billa	–0.000296	0.000477		–0.016871	0.006390	***	–0.004400	0.007866	
Spatial Diff. X Merkur	–0.000318	0.000754		0.000761	0.009950		0.002148	0.008669	
Spatial Diff. X Penny	–0.000214	0.000497		0.001960	0.008729		–0.005806	0.007950	
Spatial Diff. X Spar	0.000246	0.000405		0.005598	0.006221		0.002665	0.006471	
Spatial Diff. X Inter/Maxi	–0.000347	0.001532		0.011672	0.019759		–0.012140	0.016537	
Spatial Diff. X ADEG	0.000005	0.000880		–0.044129	0.015793	***	0.005523	0.020851	
Spatial Diff. X Zielpunkt	0.000122	0.000504		0.001375	0.013326		0.014244	0.012519	
Spatial Diff. X Others	–0.000504	0.000866		0.002496	0.012859		–0.009078	0.010518	
Tourism X Billa	0.000629	0.002246		–0.002019	0.017247		–0.007303	0.030217	
Tourism X Merkur	–0.002586	0.015632		–0.010667	0.018063		0.000123	0.035141	
Tourism X Penny	–0.010000	0.005500	*	0.034407	0.035895		0.002291	0.027107	
Tourism X Spar	0.005459	0.009935		0.001681	0.016985		0.008874	0.016039	
Tourism X Inter/Maxi	–0.003639	0.028724		–0.087510	0.102340		0.034506	0.041033	
Tourism X ADEG	–0.002361	0.004096		0.040647	0.023909	*	0.020556	0.033715	
Tourism X Zielpunkt	–0.000195	0.002756		–0.079285	0.080894		–0.127369	0.113749	
Tourism X Others	–0.002962	0.001821		–0.024695	0.038500		0.043749	0.030079	
Time-specific fixed effects	Yes (27)			Yes (27)			Yes (27)		
# Observations	3,229			2,514			1,288		
R^2	0.6888			0.4675			0.5535		
R^2 within	0.6896			0.4849			0.4911		
R^2 between	0.6084			0.3462			0.5939		

Source: own calculations.

In model 2 we tested the hypotheses that retailers might price discriminate by being active in high- or low-price environments only. The results are presented in Table 6. Retailer-specific effects are wiped out due to aggregation. Again we cannot find reliable results: Out of 12 coefficients only 7 take the expected (positive) sign, and none of them is significantly different from zero. The only statistically notable result is that higher demand reduces prices for butter.

Table 6. Results Model 2

Product	Vollmilch länger frisch (ESL) - NÖM (EAN 9019100211606)			Sommerbutter - Berglandmilch (EAN 9066000106402)			Geheimratskäse - Berglandmilch (EAN 9066000284100)		
Variable	Coeff.	Std. Dev.	Sign.	Coeff.	Std. Dev.	Sign.	Coeff.	Std. Dev.	Sign.
Demand	0.000005	0.000009		–0.000138	0.000062**		0.000031	0.000083	
Market Concentration	0.035841	0.059504		–0.126740	0.299625		–0.160968	0.393444	
Spatial Differentiation	0.000112	0.000422		–0.004484	0.002405*		0.004207	0.002905	
Tourism	–0.002114	0.001339		0.009212	0.008482		0.002474	0.010357	
Time-specific fixed effects	Yes (27)			Yes (27)			Yes (27)		
Constant	0.953501	0.023485		6.581160	0.160405		6.071346	0.202406	
# Observations	1,314			1,678			998		
R^2	0.6963			0.4244			0.4830		
R^2 within	0.7316			0.4433			0.4902		
R^2 between	0.3893			0.3381			0.5103		

Source: own calculations.

6. Summary and Conclusions

We analyse the price setting behaviour of retailers in Austria in the market of milk products and margarine in a regional context. Our main hypothesis is that supermarket chains exert market power on local consumer markets by offering the same product in their outlets at different prices depending on the level of competition in the region. The motivation comes from the fact that such strategies have been observed in other markets and there is significant evidence of local anti-competitive behaviour in the supply of groceries in other countries.

We use data from a household panel with disaggregated data at the level of 120 Austrian districts covering the time span between 2007 and mid 2009 with monthly observations of prices of milk products sold by food retailers. The products are identified by their EAN-code so it is possible to observe the price setting strategies of different retailers for the same product. Two discount retailers primarily sell products of their own brands and none of the investigated products, and therefore drop out of the analysis. A descriptive analysis shows that there are significant and large differences between the prices of the same products sold by different retailers. Price changes over time, however, follow a very similar pattern over all retailers.

The topic of the paper is to analyse the regional dispersion of prices of the same product identified by a unique EAN-code. This article empirically tests the hypothesis of higher prices of a given retailer for the same product in regions with high and inelastic demand and low competition. The degree of competition is approximated by the market share (number of outlets) of a retailer and the average degree of spatial differentiation within a region. Given such behaviour we would conclude that a given retailer is gaining extra rents from its dominance in a given regional market. The empirical findings do not support this hypothesis in general. For most of the largest retailers we do not find that they set their prices systematically to exert differences in oligopoly power between local markets. We observe, however, different prices of the same product between different retailers.

Even if the expected spatial price setting behaviour is not confirmed, the results of our analysis are useful. It seems that spatial prices discrimination which is a frequently used strategy to gain extra profits in other markets (e.g. gasoline) does not seem to be relevant for the market of milk products in Austria at the retailing level. At least for Austria it seems to be sufficient to observe food prices at the national level in order to obtain transparency about price setting behaviour of different food retailers as done in Salhofer et al. (2012).

Our results cannot be used to refute the hypothesis that the high concentration of retailers leads to anti-competitive behaviour of food retailers as a whole, as we investigate one aspect of this topic only (i.e. whether regional differences in competition lead to different mark-ups). In order to test different aspects of this hypothesis, other research strategies are needed that analyse the price setting behaviour at different levels: One approach is to estimate the parameters of a model that captures the main characteristics of the supplier - retailer linkages. Such an analysis has been conducted by SALHOFER et al. (2012) who find evidence for the exertion of market power in the Austrian markets of milk products. Another approach would be to evaluate the entry-exit strategies of different retailers in regional markets. Evidence from the UK suggests that dominating retailers use their network of outlets in regional markets to deter the entry of competitors. Such strategies could be at work in the Austrian retailing sector, but testing these predictions is beyond the scope of this article.Based on the findings of this study, future research could go into two directions: Firstly, it may be possible that our findings in this study are not confirmed if daily observations and individual (outlet-level) data are used. The use of monthly price averages as well as regionally aggregated prices implies a loss of information. Secondly, a better understanding of the entry-exit-strategies of different retailers would allow evaluating regional competition from another perspective than provided in this analysis.

7. Bibliography

ANDERS S. M. (2008): Imperfect Competition in German Food Retailing: Evidence from State Level Data. In: Atlantic Economic Journal 36 (4): 441-454.

BADINGER H. and F. BREUSS (2005): Has Austria's Accession to the EU Triggered an Increase in Competition? A Sectoral Markup Study. In: Empirica 32 (2): 145-180.

BARRON J.M., B.A. TAYLOR and J.R. UMBECK (2004): Number of sellers, average prices, and price dispersion. In: International Journal of Industrial Organization 22: 1041-1066.

BAUMGARTNTER J., J. CRESPO-CUARESMA and O. FERNÁNDEZ-AMADOR (2009): The Role of Asymmetries in the Price Transmission Mechanism for Milk Products in Austria. WIFO, Vienna, mimeo.

BORENSTEIN S. and A. SHEPARD (1996): Dynamic Pricing in Retail-Gasoline Markets. In: RAND Journal of Economics 27: 429-451.

BORENSTEIN S., A.C. CAMERON and R. GILBERT (1997): Do Gasoline Prices Respond Asymmetrically to Crude Oil Price Changes? In: Quarterly Journal of Economics 112(1): 305-339.

CEC (COMMISSION OF THE EUROPEAN COMMUNITIES) (2009a): Analysis of price transmission along the food supply chain in the EU. Commission Staff Working Document, SEC(2009) 1450, published 28.10.2009, Brussels.

CEC (COMMISSION OF THE EUROPEAN COMMUNITIES) (2009b): A better functioning food supply chain in Europe. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. COM (2009) 591, provisional version published 28.10.2009, Brussels.

COMPETITION COMMISSION (2009): The supply of groceries in the UK market investigation. Available at www.competition-commission.org.uk, retrieved on 12 August 2009.

COTTERILL R. (2006): Antitrust Analysis of Supermarkets: Global Concerns Playing Out in Local Markets. In: Australian Journal of Agricultural and Resource Economics 50 (1): 17-32.

DUREVALL D. (2007): Demand for Coffee in Sweden: The Role of Prices, Preferences and Market Power. In: Food Policy 32 (5): 566-584.

EUROSTAT (2009): Consumer Price Research - An experimental analysis into the measurement of indicative price levels for consumer products. Publication of the Directorate D: Economic and Regional Statistics, Unit D-4: Prices Statistics. Available at:

http://epp.eurostat.ec.europa.eu/portal/page/portal/hicp/documents/Tab/Tab/04_METH_CPR_-_FEB_2009_WEB_0.pdf (retrieved on 12 Aug. 2009).

GOHIN A. and H. GUYOMARD (2008): Measuring Market Power for Food Retail Activities: French Evidence. In: Journal of Agricultural Economics 51 (2): 181-195.

JUMAH A. (2004): The Long Run, Market Power and Retail Pricing. In: Empirical Economics 29 (3): 605-620.

LLOYD T. and M. WYN (2007): Market Power in UK Food Retailing. In: EuroChoices 6 (3): 22-29.

MEREL PIERRE R. (2009): Measuring Market Power in the French Comte Cheese Market. In: European Review of Agricultural Economics 36 (1): 31-51.

PENNERSTORFER D. (2009): Spatial price competition in retail gasoline markets: evidence from Austria. In: Annals of Regional Science 43 (1): 133-158.

PENNERSTORFER D. and C.R. WEISS (2013): Spatial clustering and market power: Evidence from the retail gasoline market. In: Regional Science and Urban Economics 43 (4): 661–675.

SALHOFER K., C. TRIBL and F. SINABELL (2012): Market power in Austrian food retailing: the case of milk products. In: Empirca 39 (1): 109-122.

TADESSE WELDEGEBRIEL H. (2004): Imperfect Price Transmission: Is Market Power Really to Blame? In: Journal of Agricultural Economics 55 (1): 101-114.

WIESER R., K. AIGINGER and M. WÜGER (1999): Marktmacht im Einzelhandel. Studie des Österreichischen Instituts für Wirtschaftsforschung im Auftrag des Bundesministeriums für wirtschaftliche Angelegenheiten. Wien.

WILHELMSSON F. (2006): Market Power and European Competition in the Swedish Food Industry. In: Journal of Agricultural and Food Industrial Organization 4 (1): 1-24.

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8. Appendix: Selected descriptive data statistics

Figure 2. Average Prices of three butter brands and two margarine brands in Euro / kg

Q: RollAMA / AMA-Marketing GmbH, own calculations; Remark: Butter A1 and Butter A2 are from the same producer, Butter B is from a second producer; Margarine A1 and Margarine A2 are from a single producer. Averages are over all retailers in all regions at the same time.

Figure 3. A comparison of variance between prices of one margarine brand sold by different retailers: total variance of prices, variance of monthly prices of between regions at a single date and over the whole period within all regions of different retailers

Q: RollAMA / AMA-Marketing GmbH, own calculations.