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The Price Effects of an Emerging Retail Market

Jiří Podpiera and Marie Raková [*]

Abstract

In this paper we analyze the effects of changing market structure on price dynamics of final goods in the emerging Czech retail market. We estimate the extent of upstream and downstream market power and find that changing market structure was responsible for an average yearly decrease in the prices of retailed products of 0.8 p.p. during 2000–2005. At the same time, however, we anticipate that the already started period of mergers and acquisitions could cause yearly increases in the prices of retailed products of 1.2 p.p. (approximately 0.5 p.p. in the CPI) over the next ten years.

JEL Codes: L1, L81.
Keywords: Market structure, retail market, transition economy.

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Nontechnical Summary

One of the most apparent changes in the Czech Republic (one of the transition countries in Central and Eastern Europe) – one that daily influences every single inhabitant – is the change in the way people do shopping. At the start of the transition from a command to a market economy, there were chains of isolated small shops. Now, 15 years later, a small number of large retailers operate in extensive shopping centers. This development poses the question of to what extent has such a significant and quick transformation of the retail market structure affected the prices of retailed products.

The available empirical evidence on the price effects due to changing market structure is much more often in favor of the hypothesis that concentration causes price increases. There is however, no evidence so far for transition countries. In this original study, the price effects of changing market structure on retailed products are evaluated by means of the size of the downstream and upstream market power of retailers during 2000–2005 in the Czech Republic.

Our findings suggest that downstream market power was dominated by upstream market power and thus prices of retailed products declined, on average by 0.8 p.p. a year (2000–2005). At the same time, the tendency toward mergers and acquisitions among retail chains, which had already started in 2004, gradually leading toward a more standard ratio of number of retailers to market size – as observed in Western countries, would cause average extra inflation of retail prices of 1.2 p.p. (approximately 0.5 p.p. in the CPI) a year over the next ten years.

1. Introduction

The change in political and economical life in emerging markets, and especially in the transition economies of Central and Eastern Europe, can be observed in a variety of aspects. One of the most apparent, and one that daily influences the life of every single inhabitant, is the change in the way people shop. At the start of the transition from a command to a market economy, there were chains of isolated small shops. Now, 15 years later, large retailers operate in extensive shopping centers.[1] The key question analyzed in this paper is to what extent has such a significant and quick transformation of the retail market structure affected the prices of retailed products.

A by-product of this qualitative change in shopping patterns has been a significant concentration of the retail market into the hands of just a few retail chains.[2] For instance, in the Czech Republic retail chains served 7% of the retail goods market (7 chains) in 1993, but by 2005 the figure had reached 63% (the top 10 chains). The changing market structure was characterized by entries between 1990 and 2001 and exits starting from 2004, thus obeying the theory of shakeouts first described by Hopenhayn (1992) and further developed by Horvath et al. (2001) and Thompson and Pintea (2007). Moreover, since concentration is also a phenomenon of the retail business world-wide, it will probably further increase in the emerging markets as well.

For instance, the largest retail chain in the world, Wal-Mart, expanded its market share in North America, Asia, and Europe in the 1990s by taking over other retail chains (for instance Wertkauf in Germany) and has become the 8th biggest company in the world, according to the periodical survey *Top 500 Global Companies* conducted by the Financial Times (2006). In Europe, retail mergers and acquisitions took place frequently in the 1990s. According to a study by Dobson Consulting (1999), during 1992–1996 the frequency of mergers was between 1 and 5 per year, but in 1997 and 1998 it increased to 17 and 16, respectively. Consequently, the concentration within the industry increased all over the world during the 1990s. Over three years, the average of the top five firms' national market share in Europe increased by 5% to 53% in 1996. Since the tendency toward mergers and acquisitions has continued even after 1996, one can expect the current concentration ratios to be even higher.

As regards the future trend, the company Planet Retail (2007) made a prediction of the regional market shares of the top 10 retailers for 2008. According to this study, the concentration in Western Europe in 2003 was 41.5% and is projected to stagnate around 43% in 2008. By contrast, in Central and Eastern Europe the concentration is expected to increase more significantly, from 24% in 2003 to 32.6% in 2008.

Since significant concentration patterns may have effects on the prices of retailed products, the relation between greater concentration and prices of retailed products has already attracted wide attention from researchers in Western countries. Lamm (1981) was one of the first to examine the relationship between concentration and prices. He used aggregate price level data in local markets

[1] The frequency of opening of new large retail centers has been so high that it gave rise in the Czech Republic to a film entitled "Czech Dream" (by Klusák and Remunda, 2004), where the opening of a fake supermarket is advertised and a large group of customers come to shop, albeit in vain.

[2] A retail chain (primarily grocery oriented) is characterized by a range of retail outlets which share a brand and central management, typically with standardized business methods and practices, and retailing primarily grocery products.

(districts) in the USA and found a positive relationship between concentration and prices.[3] Barros *et al.* (2004) used Portuguese food price data for approximately 200 products, which were bundled into price indices and calculated for a set of stores located in every district of the Portuguese mainland. Their estimates showed that the concentration effect on prices depends on how the cost reductions are reflected in insiders' prices, i.e., on the pass-through rate. They concluded that a merger most probably increases consumer prices. Smith (2004) analyzed profit margins for each chain in the UK, a survey of consumer choices, and a data set of store characteristics. He concluded that a merger between the largest firms led to price increases of up to 7.4%. Further, Asplund and Friberg (2002) examined retail grocery price levels across a large panel of stores in Sweden. They explained the price variation across stores by market structure variables to capture differences in competition intensity and a number of store- and region-specific factors. They used food price data for roughly 30 items across approximately 1,000 stores across Sweden and found that most of the explained variation in prices can be attributed to store-specific factors such as size and chain affiliation. Also, Setala (2000) explored the main purpose of large grocery retail mergers and found on data for Finland that the main purpose is to gain market power and not efficiency.

Even though the available empirical evidence predominantly suggests a positive relation between concentration and price increases, the relation in an emerging retail market will be a result of downstream (in relation to the consumer) and upstream (in relation to the supplier) market power practices being affected by the changing retail market structure. Namely, if there is limited or no market power executed upstream, concentration in the retail market will lead to an increase in prices for the final consumer. However, if the upstream market power channel is active and significant, concentration might not actually result in price increases (and might eventually lead to a temporary price decline). This is due to the fact that despite an increase in mark-up due to concentration, input prices might be lowered by upstream market power. Thus, the effects the changing market structure has on prices of retailed products are unpredictable ex ante.

Therefore, in this paper we evaluate the effects of downstream and upstream retail chain market power in the emerging Czech retail market and estimate the price effects connected with the retail chain expansion period 2000–2005 (a period characterized by a stabilized number of retail chains expanding their market share at the expense of other traditional shopkeepers). Based on our estimates, we then speculate about the effects on prices stemming from the recent tendency toward mergers and acquisitions.

The rest of the paper is organized as follows. Section 2 presents some facts about the Czech retail market and Section 3 introduces the tested hypothesis. Section 4 describes the data sample and Section 5 presents the estimation results. Section 6 concludes.

[3] A recent study by Newmark (1990) finds an insignificant effect of concentration on prices of a narrowly specified index of the 35 most commonly purchased products across 14 U.S. cities in the late 1980s.

2. Some Facts about the Czech Retailing Industry

There was not a single international retail chain operating in the Czech Republic at the time of the Velvet Revolution in 1989. Under socialism, food products had been retailed in small communal stores called Jednota and Pramen. After the revolution, foreign retail chains started to enter the Czech Republic quite quickly, either by acquiring existing retail spaces or by building brand-new stores. The first foreign retail chain was Billa, which entered in 1990. The next four chains entered in 1991: Julius Meinl, Delvita, Plus, and Ahold (Ahold operates Albert supermarkets and Hypernova hypermarkets). During the late 1990s, six more chains entered: Spar, Tesco, Carrefour, Globus, Penny Market, and Kaufland. And finally, in 2000 the discount chain Lidl and in 2001 the hypermarket chain Makro started to operate. Thus, there were 13 retail chains operating in the Czech Republic in 2001 (see Table 1).

Table 1: Chronology of Retailer's Entry

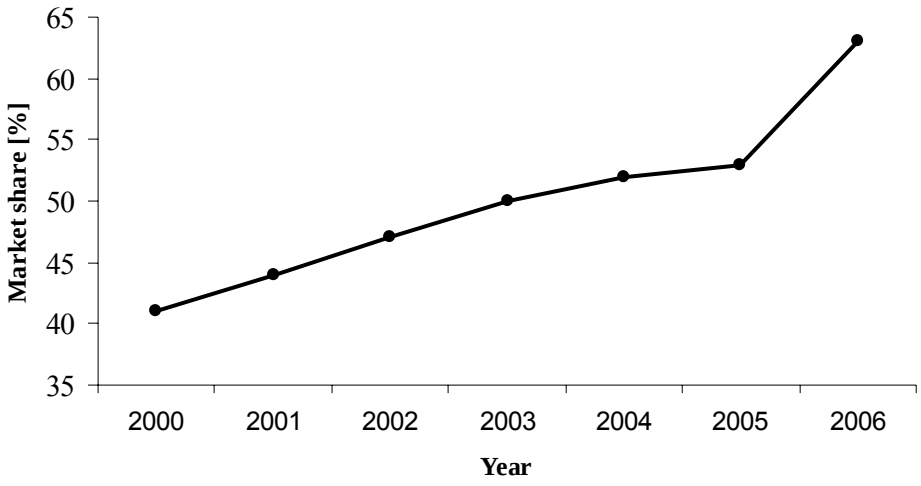
Name of retail chain	Entry date
Billa, spol. s r.o.	November 9, 1990
Julius Meinl, a.s.	May 31, 1991
Delvita, a.s.	June 3, 1991
Plus Discount, spol. s r.o.	August 5, 1991
Ahold Czech Republic, a.s.	October 16, 1991
CS Edeka s.r.o.	December 31, 1991
Spar Invest CZ, s.r.o., group member of Spar	March 17, 1992
Tesco Stores Czech Republic, a.s.	March 23, 1992
Carrefour Czech Republic, s.r.o.	December 12, 1994
Globus Czech Republic, k.s.	July 27, 1995
Penny Market, s.r.o.	January 25, 1996
Kaufland Czech Republic, v.o.s.	March 10, 1997
Lidl Czech Republic, v.o.s.	June 5, 2000
Makro Cash & Carry Czech Republic, s.r.o.	June 1, 2001

Source: Database Magnus.

By Western standards, the number of active retail chains appears quite excessive. For instance, in Austria, where the market is similar, there are three chains. In Germany, where the retail market is approximately eight times larger, there are 11 retail chains. This observation would suggest that the formation of the retail business is far from finished.

The retail chains struggled to acquire market share, and in 2004 those that had not established a sufficient position in the market started leaving. Julius Meinl was the first chain to exit the market, followed by Carrefour, Edeka, Delvita, and Plus Discount (in 2008). Their stores were taken over by other retail chains (Julius Meinl was sold to Ahold, Edeka and Carrefour to Tesco, and Delvita and Plus Discount to Billa/Rewe Group). Thus, the market is consolidating and the concentration in food retailing has increased further since 2000. In 2006, the top 10 retailers supplied 63% of the retail market – see Incoma Research (2007). This means an increase of 22% since 2000 (see Figure 1 below).

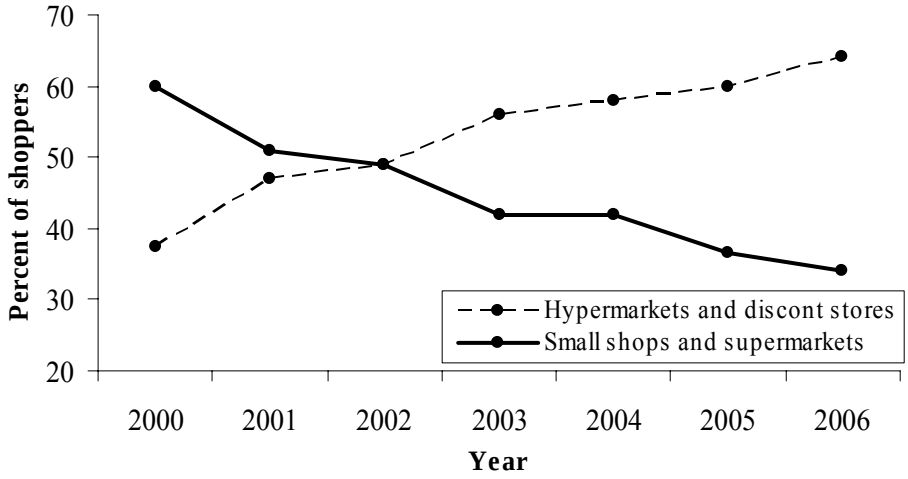
Figure 1: Market Share of Top 10 Retailers



Source: Incoma Research.

According to Euromonitor (2007) the Czech grocery retail network is characterized by dynamic expansion of discount stores and hypermarkets. According to Euromonitor's data, there were only 94 hypermarkets at the end of 2000, but the number had grown to nearly 180 by 2005. The number of discount stores nearly doubled as well: from 250 in 2000 to 476 in 2005. According to Incoma Research (2007), most people do their monthly spending in hypermarkets (nearly 40% of all shoppers), followed by discount stores (around 23%). On the contrary, shopping in small shops and supermarkets is on a declining trend (see Figure 2). The failure of Delvita, which operated primarily supermarkets, is obviously a result of the declining demand (sentiment) for shopping in supermarkets.

Figure 2: Monthly Spending of Czech Families by Type of Shop



Source: Incoma Research.

Consolidation is also taking place through cooperation between the fragmented stores of the former Jednota in small towns. Their "cooperative association", established in 2007, is benefiting from united bargaining power and a single marketing policy. It will operate under the COOP brand and will consist of 3,000 stores. In 2006, CZK 26 billion was spent in COOP supermarkets, which would rank it in fifth place among the retail chains.

3. Testing for Downstream and Upstream Market Power

We consider a retail chain that faces its residual demand function in the retail market. At the same time, we assume that it resells products purchased from suppliers and possibly also produces its own products for sale.

A representative consumer has utility *u(Q)* from consuming a composite basket *Q*. The demand for the products of supermarket *i* is given by the results of the consumers' utility maximization problem. The standard result implies that the retailer faces the following residual demand:

$$q_i = f\left(\frac{p_i}{P}, Q, n_i\right), \tag{3.1}$$

where *P* denotes the aggregate price index of the corresponding basket of retailed products, p_i is the price charged for a composite good by retailer *i*, and n_i is the number of stores of the retail chain *i*. The retail chain maximizes its profit and thus solves:

$$p_i q_i - C(q_i, n_i) \rightarrow \max_{q_i, n_i}, \tag{3.2}$$

where *C(.)* is the cost function. After substituting for prices from the demand equation, we get:

$$q_i g\left(\frac{q_i}{Q}, P, n_i\right) - C(q_i, n_i) \rightarrow \max_{q_i, n_i}. \tag{3.3}$$

The first-order conditions dictate:

$$g'\left(\frac{q_i}{Q}, P, n_i\right)\frac{1}{Q}q_i + p_i - C'(q_i, n_i) = 0, \tag{3.4}$$

$$g'\left(\frac{q_i}{Q}, P, n_i\right)q_i - C'(q_i, n_i) = 0. \tag{3.5}$$

Starting with the cost function, it is assumed that the marginal cost increases with the quantity retailed (purchased by the retailer and resold) and that the marginal cost curve is shifted by the effect of the number of shops in the retail chain. This shift is likely to be negatively related to the number of retail shops, as, in general, a product that is offered in a larger chain of retail shops is better established in the market and thus the retailer can get a discount from its suppliers, i.e., it executes upstream market power.

From the downstream market power point of view, it is market share that is at stake. The retailer can pass part of the benefit gained from its upstream power to customers in order to gain greater market share. Consequently, the effect of an increase in the number of stores within a retail chain may decrease the prices of the retailer's products. At the same time, however, an increase in a retailer's market share creates market power downstream and thus leads to a premium mark-up. An increase in mark-up due to an increase in a retailer's market share might lead to an increase in prices of retailed products after the upstream power is exhausted.

3.1 Downstream Market Power

In order to test the relation between market structure and price dynamics in the retail sector, we perform a panel regression in which the retail chains are observed over time. In particular, we test the effect of changing market share and number of retail shops in a chain (as a proxy for market structure) on prices for final consumers, while we keep the prices of purchased products, wages, and material inputs unchanged. In formal terms we can write:

$$lnP_{i,t} = \alpha_i + \sum_{j=1}^{n} \beta_j \ln C_{i,j,t} + \gamma\, ln(MKTS_{i,t}) + \delta ln(N_{i,t}) + \varepsilon_{i,t} \qquad (3.1.1)$$

The dependent variable is the change in the price of the composite good sold by the retailer i, i.e., $lnP_{i,t}$, and is regressed on the input price $lnC_{i,j,t}$ (where j stands for wages, the price of material inputs, and the price of products purchased for retail), on the market share of the retailer $ln(MKTS_{i,t})$, and on the number of stores of the retailer $ln(N_{i,t})$. The random error $\varepsilon_{i,t}$ is i.i.d.

If volume data were used to estimate 3.1.1, due to the availability of volume data (revenues and costs), i.e., $ln(P_{i,t}Q_{i,t})$ and $ln(C_{i,j,t}Q_{i,t})$ instead of $lnP_{i,t}$ and $lnC_{i,j,t}$, the error term ε_t would contain, in addition to a random error, a term $(\sum_{j=1}^{n} \beta_j - 1) lnQ_{i,t}$. It follows that if $\sum_{j=1}^{n} \beta_j$ were not different from unity, then the volume and price data would yield the same results (and γ and δ would equal zero). However, this holds only in the case of perfect competition, which is unlikely for the retail business, since the retail market is presumably closer to monopolistic competition. Thus $\sum_{j=1}^{n} \beta_j < 1$ and the remaining volatility in prices is due to changing market power under imperfect competition.

Nevertheless, if one assumes that the sales volume responds with the same elasticity to changes in the relative prices of retailed goods as well as to changes in the retailer's real market share, we can consistently estimate parameters in a volume equation of the following form:

$$ln(P_{i,t}Q_{i,t}) = \alpha_i + \sum_{j=1}^{n} \beta_{v,j} \ln(C_{i,j,t}Q_{i,t}) + \gamma\, ln(NMKTS_{i,t}) + \delta ln(N_{i,t}) + \varepsilon_{i,t} \qquad (3.1.2)$$

where $ln(NMKTS_{i,t})$ represents the nominal market share of retailer i at time t.[4]

In other words, the results derived using volume data are equivalent to the price data (relation 3.1.2 would hold for an arbitrary quantity), conditional on the sum of the elasticity to cost volumes and nominal market share not being different from unity. This can be formally tested by:

$$\sum_{j=1}^{n} \beta_{v,j} + \left(\frac{\partial NMKTS}{\partial Q}\right)\gamma = 1. \qquad (3.1.3)$$

[4] $NMKTS_{i,t} = \dfrac{P_{i,t}Q_{i,t}}{P_tQ_t}$, where P_tQ_t stands for total sales of retailed products in the market.

If $\gamma = 1 - \sum_{j=1}^{n} \beta_{v,j}$, then $(\sum_{j=1}^{n} \beta_{v,j} - 1 + \gamma) lnQ_{i,t} = 0$. Thus, the equivalence between (3.1.2) and (3.1.1) holds.

From the regression (3.1.2), we can further obtain the sum of the parameters β_j, i.e.,

$$\sum_{j=1}^{n} \beta_j = 2\sum_{j=1}^{n} \beta_{v,j} - 1. \qquad (3.1.4)$$

The statistic (3.1.4) indicates the type of competition in the sense of the Rosse-Panzar model (Panzar and Rosse, 1987), since it represents the sum of the elasticity of the output price to input prices – more precisely the elasticity of the output price to the average input price.

Apart from the elasticity of the output price to input prices, the regression relation (3.1.2) contains additional terms. The intercept represents a premium (constant part of the mark-up) associated with fixed specific characteristics of the particular retailer chain. Among these specifics we might recognize the style of presenting goods, other qualities of services, and exclusivity of location of the retail stores. Furthermore, however, the mark-up is also determined by the market structure, i.e., the number of retail stores and the market share of a monopolistic retailer.

Whereas an increase in market share is likely to lead to strengthening downstream market power and to a rise in the retail mark-up and consequently to an increase in the prices of retailed goods ($\gamma > 0$), an increase in the number of retail stores within one chain might have an ambiguous effect on the prices of final goods, as it is simultaneously a source of upstream market power.

3.2 Upstream Market Power

A retail chain operates in three markets for inputs. Two markets (labor and material inputs) are generally quite competitive and thus the retail chain is a price taker there. However, the third market (wholesale) is obviously imperfectly competitive, because the demand for wholesale is covered mostly by the retail chains themselves, which are large and limited in number, and so this naturally creates an opportunity for the utilization of upstream market power. Therefore, the costs of products purchased by the retail chain would be determined as follows:

$$ln(C_{i,t}Q_{i,t}) = \omega_i + \theta ln(SIZE_{i,t}) + \varphi ln(NMKTS_{i,t}) + \psi ln(ER_t) + \chi ln(N_{i,t}) + \xi_{i,t} \qquad (3.2.1)$$

where $C_{i,t}Q_{i,t}$ denotes the costs of products purchased for resale in retail chain i, ω_i labels the retail chain specific pseudo-price elasticity, $ln(SIZE_{i,t}) = ln(P_{i,t}Q_{i,t}) - ln(N_{i,t})$, $N_{i,t}$ denotes the number of stores, and $NMKTS_{i,t}$ is the nominal market share of retail chain i. ER_t denotes the exchange rate, whose inclusion is justified by the fact that approximately 30–40% of retailed products are imported. The letter $\xi_{i,t}$ denotes the disturbance term, which is i.i.d.

The logic of the regression relation (3.2.1) is based on the intention to analyze the effects of market structure (upstream market power) on the price of products purchased for retailing, conditional on the final consumer price and the quantity of retailed goods. The conditionality can be inferred from the variable $SIZE_{i,t}$, since it is constructed from the revenues of the retailer. In addition, since we propose to include in the regression a separate variable $N_{i,t}$, the effect of the

number of stores of the retailer is equal to $\chi - \theta$, and is expected to be negative, since the retailer is exercising upstream market power.

Also, an increasing sales volume $P_{i,t}Q_{i,t}$ will have an impact on the costs of purchased products $C_{i,t}Q_{i,t}$. This is a result of price re-negotiation: a higher quantity sold could imply either a request for a decrease in the price of purchased products – the market power of the retailer – or vice versa the classical demand effect: an increase in price due to increased demand for the product. In fact, one might expect that an increase in quantity sold would rather lead to an increase in the price of purchased products, since the negotiating power of the producer increases with increasing demand. The dominating direction and extent of this mechanism can be inferred from the summation of the coefficients φ and θ. At the same time, however, decreasing nominal market share due to a growing reference market leads to a decrease in the price of purchased products by φ.

And finally, since a significant proportion of the retailed products are traded internationally, the price of purchased products could be influenced by fluctuations in the exchange rate. This effect can be measured by the parameter ψ.

4. Data Description

The entire dataset was downloaded from a single data source, the *Magnus* database. *Magnus* contains data at annual frequency for financial statements, number of stores, and number of employees of Czech companies and companies operating in the Czech Republic. We thus work with the entire set of retail chains, as listed in Table 1, except for Edeka owing to its small revenues (CZK 1.5 billion in 2002), focusing on a specific region (close to the German border). The data forms an unbalanced panel over 2000–2005 for 13 retail chains. The average number of observations is 4.2, with a minimum and maximum of 2 and 6, respectively. The selected period 2000–2005 is characterized by a stabilized number of retail chains expanding their market share at the expense of other traditional shopkeepers.

Table 2 below displays basic data descriptive statistics for the variables used in the analysis.

Table 2: Data Descriptive Statistics

	Mean	Std.	Max/Min
Revenues (bln. CZK)	13.6	7.9	33.2/3.1
Wages (bln. CZK)	0.82	0.47	2.31/0.22
Costs of material (bln. CZK)	1.4	0.9	4.4/0.4
Costs of purchased products (bln. CZK)	8.6	5.5	26.4/1.9
Number of stores	57.6	56.2	220/5
Size of stores (bln. CZK)	0.64	0.74	3.07/0.08
Market share (%)	3.53	2.08	8.35/0.71
Number of employees	3608.6	2638.8	13000/230

In particular, the revenues of the average retailer in the period 2000–2005 amounted to CZK 13.6 billion, although there were quite significant differences between the retail chains (std. dev. of CZK 7.9 billion). Naturally, wages and the costs of material and purchased products vary across retail chains quite significantly. The average retail chain operates approximately 58 stores of a size of CZK 0.64 billion, employs roughly 3,609 employees, and supplies to 3.53% of the market for retailed products. The low value and especially the low volatility in market shares across retailer chains (std. dev. of 2%) suggests that the market is not yet settled, as this is very unusual by international standards (in the UK, for instance, the largest four chains in 2000 served 71.2% of the market, according to Smith, 2004).

5. Estimation Results

In Table 3, we present the results for the downstream and upstream market power tests, i.e., the estimation results for (3.1.2) and (3.2.1), respectively. These were derived using the fixed effects IV estimator (due to endogeneity of revenues and the cost of purchased products), since, as follows from the presented Hausman tests in both cases, the fixed effects estimator was favored (at the 1% significance level) over the random effects model. Lagged values of the instrumented variables and the remaining independent variables in the respective regressions were used as instruments.[5]

The results of the test for equivalence of the price and volume data in regression 3.1.2 can be found in the Downstream column. As follows from the results, the assumption of homogeneity of revenues in quantity (tested by 3.1.3) cannot be rejected at conventional significance levels (p-value of 0.13).

Starting with the downstream market power test (see the Downstream column in Table 3), input costs are responsible for a large portion of the variation in revenues, but some part is still explained by market structure. Thus, the market is found to have a monopolistic structure. In particular, the elasticity to average input prices and, more precisely, the Rosse-Panzar statistic (0.91 and 0.88, respectively) are significantly distant from unity (the perfect competition case) and thus indicate imperfect (monopolistic) competition.

The Rosse-Panzar statistic computed using (3.1.3) is very close to the elasticity to input prices, which is confirmed by the test for homogeneity of revenues in quantity. This implies that a change in quantity on the right-hand side does imply a change of the same magnitude on the left-hand side. Therefore, the relation between revenues and average input prices remains unaffected by using the volume data and specification (nominal market shares) instead of input price data.

[5] The results are robust to the exclusion of Macro Cash & Carry – a specific chain that operates wholesale-type stores in large cities, but nevertheless has a significant market share.

Table 3: Results of Fixed Effects IV Estimation

	Downstream ln(Revenues)	**Upstream** ln(Cost of purchased products)
Intercept (avg. of fixed eff.)	3.7***(0.76)	7.42***(2.68)
ln(Cost of purchased products)	0.56***(0.04)	-
ln(Personal costs)	0.14***(0.03)	-
ln(Cost of material)	0.21***(0.02)	-
ln(NMKTS)	0.15***(0.04)	0.41***(0.11)
ln(N)	-0.04**(0.02)	0.53***(0.12)
ln(SIZE)	-	0.69***(0.11)
ln(ER: CZK/EUR)	-	0.16(0.16)
R^2-overall	0.99	0.88
Baltagi-Wu LBI	2.08	2.04
Modif. Bhargawa et al. D.W.	1.41	1.25
Hausman test: fixed vs. random eff.	$\chi^2(5)$ = 13.95**(p-value: 0.016)	$\chi^2(4)$ = 15.73***(p-value: 0.003)
σ_e/ρ	0.01/0.97	0.04/0.97
Obs./Retailers	55/13	55/13
Obs per retailer (min/avg/max)	2/4.2/6	2/4.2/6
Elasticity to input prices	0.91***(0.03)	-
Rosse-Panzar statistic	0.88***(0.06)	-
Homogeneity of revenues in quantity	-0.04(0.03); p-value: 0.13	-
χ-θ	-	-0.16***(0.04)
φ+θ	-	1.09***(0.03)

Note: Standard errors are presented in parenthesis; Stars denote significance level as follows: ***1%; **5%; *10%.

The average mark-up across retail chains is 3.7%, which is quite an intuitive margin considering the area of retail – fast-moving consumer products. At the same time, however, market share played an important role in securing additional mark-up. An increase in market share by 1% yields a supplementary mark-up of 0.15%. This is unambiguously a result of downstream market power. On the other side, a 1% increase in the number of stores within a retail chain causes the mark-up to drop by 0.04%. Obviously, the retailer trades a drop in mark-up for a future benefit from an increase in market share (i.e., a benefit that is three times bigger) and thus by opening new stores pays the cost in the form of a decrease in its profit margin.

Turning to the upstream (see the Upstream column in Table 3), the autonomous size of costs of purchased products of 7.5 percent is further altered by market share, number of firms, and size of shops in the retail chain. Most interestingly, however, as can be seen from the last two rows in the table, a 1% increase in the number of stores permits the execution of upstream market power by the retailer and decreases the price of purchased products on average by 0.16%. This is related to the fact that an increase in the number of retail shops allows suppression of prices of purchased products by the retailer, who offers the benefit of accessing a larger market to the intermediate supplier. On the other side, an increase in sales and market share leads to an increase in the price of purchased products. This is also quite intuitive, since an increase in the demand for a product will result in an increase in the price of the product upstream. And finally, despite its statistical insignificance (probably due to the high price elasticity of purchased products: the import price elasticity of foods – meat, carbohydrates, fruit and vegetables, dairy products, and confectionery – in the Czech Republic is equal to -0.88, according to a study by Janda et al., 2000), the sign of the

effect of the exchange rate is in line with intuition – an appreciation of the Czech koruna lowers the costs of purchased products.

Combining both downstream and upstream market power, one can make an inference about the development of final consumer prices in the market supplied by the retail chains. In particular, a 1% increase in market share causes an increase in mark-up of 0.15% (see Table 3; ln(NMKTS) in the downstream eq.), and since it also causes an increase in the price of products purchased by the retailer of 0.05% (an increase in the price of purchased products of 0.09% (parameters $\varphi+\theta$) due to a 1% increase in demand for suppliers' products, which translates to a consumer price increase of 0.56%), the total effect on price growth is 0.2%.

Similarly, a 1% increase in the number of stores leads upstream to prices of purchased products being pushed down by 0.09% (a 1% increase in the retailer's number of stores lowers its price of purchased products by 0.16% (parameters $\chi+\theta$), which translates to consumer prices to the extent of 0.56%). At the same time, the mark-up is lowered downstream by 0.04% in response to a 1% increase in the retailer's number of stores. Thus, the effect on prices in retail shops is a decrease of 0.13%.

In our sample period, i.e. 2000 to 2005, the average change in yearly market share for the average retail chain was 3.26%, while the number of stores increased by 11.3%. Using the estimated coefficients for upstream and downstream market power derived above, we conclude that there was a negative (-0.8 p.p. a year) market structure effect on prices of retailed products during our sample period.

Given that the effect of downstream market power was dominated by the effect of upstream market power in the period of retail chain expansion, one might speculate that potential further concentration will take place via mergers and acquisitions (as the latest developments already suggest: four acquisitions between 2004 and 2008). In such case, the effect of downstream market power would dominate and prices of retailed products would inflate. Thus, if the Czech retail market were to gradually approach the standard of 3–4 retail chains (three chains currently operate in Austria's retail market, which is of comparable size to the Czech one; the four largest retailers in the UK serve more than 70% of the market; and there are 11 chains in Germany, serving a retail market that is nearly eight times larger than the Czech one) over the next ten years, the average extra yearly inflation of consumer prices of retailed products due to the changing market structure would be equal to 1.2 p.p.[6] (a 100% increase in the market share of four chains, with no additional stores being built, serving 60% of the total market for retailed products), which is equivalent to a 0.5 p.p. increase in the CPI.

[6] This is also roughly in line with the tendency toward elimination of the significantly lower trade margins in the Czech retail business (by approximately 15% in 2002) as compared to Germany and Austria, as reported in a study by Král et al. (2005).

6. Conclusion

In this paper we have investigated the effect of changing market structure on the prices of retailed products in an emerging retail market. In particular, we have evaluated the size of the downstream and upstream market power of retailers during 2000–2005 in the Czech Republic. Our findings suggest that downstream market power was dominated by upstream market power and thus the prices of retailed products declined, on average by 0.8 p.p. a year (2000–2005). At the same time, the tendency toward mergers and acquisitions of retail chains, which had already started in 2004, gradually leading toward a more standard ratio of number of retailers to market size – as observed in Western countries, would cause average extra inflation of consumer prices of retailed goods of 1.2 p.p. (approximately 0.5 p.p. in the CPI) a year over the next ten years.

References

ASPLUND, M. AND R. FRIBERG (2002): "Food Prices and Market Structure in Sweden." *Scand. J. of Economics* 104(4), pp. 547–566.

BARROS, P. P., D. BRITO, AND D. LUCENA (2004): "Mergers in the Food Retailing Sector: An Empirical Investigation." *European Economic Review* 50(2), pp. 447–468.

CZECH CAPITAL INFORMATION AGENCY (2007): Magnus Database. http://www.magnus.cz/?idf=contents.

DOBSON CONSULTING (1999): "Buyer Power and its Impact on Competition in the Food Retail Distribution Sector of the European Union." European Commission, http://ec.europa.eu/comm/competition/publications/studies/bpifrs/.

EUROMONITOR (2007): "Number of Retail Outlets." http://www.euromonitor.com/World_Retail_Data_and_Statistics_2006_2007.

FINANCIAL TIMES (2006): "The World's Top Companies in 2006." *Financial Times Magazine*, June 10/11.

HOPENHAYN, H. A. (1992): "Entry, Exit, and Firm Dynamics in Long Run Equilibrium." *Econometrica* 60(5), pp. 1127–1150, September.

HORVATH, M., F. SCHIVARDI, AND M. WOYWODE (2001): "On Industry Life-cycles: Delay, Entry, and Shakeout in Beer Brewing." *International Journal of Industrial Organization* 19(7), pp. 1023–1052.

INCOMA RESEARCH (2007): "Supermarket & Diskont 2006." http://www.incoma.cz/en/default.aspx.

JANDA, K., J. MCCLUSKEY, AND G. RAUSSER (2000): "Food Import Demand in the Czech Republic." *Journal of Agricultural Economics*, January, 1(51), pp. 22–44.

KLUSÁK, V. AND F. REMUNDA (2004): "Czech Dream." Documentary, Czech, 80 min. http://www.csfd.cz/film/158202-cesky-sen/.

KRÁL, P., R. MURÁRIK, AND R. ŠNOBL (2005): "Analysis of the Structural Causes of the Low Inflation in the Czech Republic" (Analýza strukturálních příčin nízké inflace v ČR – pohled na vývoj v maloobchodě). CNB mimeo.

LAMM, R. M. (1981): "Prices and Concentration in the Food Retailing Industry." *Journal of Industrial Economics* 43(3), pp. 301–315.

NEWMARK, C. M. (1990): "A New Test of the Price-Concentration Relationship in Grocery Retailing." *Economic Letters* 33, pp. 369–373.

PANZAR, J. C. AND J. N. ROSSE (1987): "Testing For 'Monopoly' Equilibrium." *The Journal of Industrial Economics* 35(4), pp. 443–456.

PLANET RETAIL (2007): "Regional Market Shares of Top 10 Retailers in 2008." http://www.planetretail.net/.

SETALA, V. A. (2000): "The Effect of Concentration and Market Power on Food Prices: Evidence from Finland." *Journal of Retailing* 78, pp. 207–216.

SMITH, H. (2004): "Supermarket Choice and Supermarket Competition in Market Equilibrium." *Review of Economic Studies* 71, pp. 235–263.

THOMPSON, P. AND M. PINTEA (2007): "Sorting, Selection, and Industry Shakeouts." Working Papers 0702, Florida International University, Department of Economics.

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