First filter test of market power in Finnish food retailing sector

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Abstract— **Buyer power and competition policy in food supply chains has emerged as an important economic issue and a highly sensitive item on the policy agenda all around the world. Claims that large retailers and food companies are depressing farm prices because of their market power have been made in many countries around the world (Swinnen and Vandeplas, 2009). Arising concentration of retailer sector increases the concern of existence and gradual growth of buyer power in this sector. The key reason is that the growing buyer power may have the effect of considerably distorting both retail and producer competition, and eventually it may damage economic welfare. In Finland, the increased concentration of the retail sector, with fewer outlets and the growth of the large supermarket chains, has been particularly fast. The two leading Finnish retail chains of food and daily goods increased their market share from 55 per cent in 1990 to nearly 75 per cent in 2008 (Niemi and Ahlstedt 2009)..**

The purpose of this paper is to investigate the possible existence of buyer power in Finnish food retail food industry. In details, we follow an approach used by Lloyd et al (2009) to measures oligopoly and oligopsony market power in the Finnish food retail industry. This offers a 'first-filter' test of price data that may be used as part of the preliminary analyses into the presence of buyer power in food markets. In practice, we apply a vector error correction mechanism (VECM) to perform two-stage tests: First is to test the hypothesis of cointegration between the supply and demand price indices with expected signs for the coefficients irrespective of the degree of retail competition; second is to test the null hypothesis of the perfect competition. The model also serves as a useful device for characterising how prices are transmitted in food market, albeit in simplified form.

Keywords— **concentration, market power, VECM**

I. INTRODUCTION

Buyer power and competition policy in food supply chains has emerged as an important economic issue and a highly sensitive item on the policy agenda all around the world. Claims that large retailers and food companies are depressing farm prices because of their market power have been made in many countries around the world (Swinnen ans Vandeplas 2009). Arising concentration of retailer sector increases the concern of existence and gradual growth of buyer power in this sector. The key reason is that the growing buyer power may have the effect of considerably distorting both retail and producer competition, and eventually it may damage economic welfare.The Committee of Experts on Restrictive Business Practices defined buyer power as "a situation which exists when a firm or a group of firms, either because it has a dominant position as a purchaser of a product or service or because it has trategic or leverage advantages as a result of its size or other characteristics, is able to obtian from a supplier more favourable terms than those available to other buyers" (OECD, 1981)

Clearly, the food industry, and the retail sector in particular, have consolidated through mergers and acquisitions and strategic alliances. Retail buying is becoming more and more concentrated, in part because retailers have become very large sellers and in part because retailers combine their buying activities. As a consequence, concentration is higher on the buyer side than the seller side throughout Europe (Dobson et al. 2003). In Finland, the increased concentration of the retail sector, with fewer outlets and the growth of the large supermarket chains, has been particularly fast. The two leading Finnish retail chains of food and daily goods increased their market share from 55 per cent in 1990 to nearly 75 per cent in 2008 (Niemi and Ahlstedt 2009).

Abuse of a dominant position in the market is frequently mentioned as an explanation for the decreasing producer price margins. Yet, proving the claims of abuse of market power is rather difficult because a large market share does not directly imply a large market power. According to the theory of

contestable markets (e.g. Baumol et al., 1982), a market characterized by a small number of sellers – or even a monopoly – can exhibit competitive pricing if has low barriers of entry and exit. Retail consolidation may also lead to lower retail prices because high buyer power can lead to better bargaining power vis-à-vis the main suppliers, which may feed through to lower consumer prices eventually (e.g. Chen 2003, Dobson and Waterson 1997). Efficiency will also increase if transaction costs are substantially lower as a result of high market power (Shervani et al. 2007).

Widening price spreads between retail and producer prices of food are not themselves indicative of imperfect competition, since competitive factors, such as rising marketing costs may be responsible. The analysis by Kuosmanen and Niemi (2009) suggests that there are many plausible reasons for the common declining pattern of producer price margins, which is worth keeping in mind when interpreting the price spread calculations. Reasons listed for the observed growth in price spreads include 1) increased degree of processing, 2) better food hygiene, 3) differences in productivity growth across sectors, 4) agricultural policy reforms, 5) international trade, and 6) imperfect competition.

Generally two approaches have been taken in identifying and estimating oligopoly (or oligopsony) market power: structure-conduct-performance (SCP) studies and new empirical industrial organization (NEIO) studies. SCP studies have mainly used cross-sectional data to estimate the relationship between price-cost margins and concentration ratios to draw inferences about the presence of market power, while NEIO studies have generally tended to find some statistical evidence of market power by focussing on the determinants of the gap between price and the marginal cost (Wohlgenant 2001).

There are number of empirical studies relating retail prices to concentration ratios of retailers. However, they arrive at very diverging conclusions. On the one hand, Hall et al. (1979), Marion et al. (1983), and various studies by Cotterill (Cotterill 1986; Cotterill and Harper 1995; Cotterill 1999) find that there is a positive correlation between retail concentration and food prices. On the other hand, Kauffmann and Handy (1989), and Binkley and Connor (1998) find a

negative or insignificant correlation between concentration and food prices. Likewise, Binkley et al. (2002) find "little compelling evidence that consolidated markets engage in non-competitive pricing behaviour."

In this paper, we follow an approach used by Lloyd et al (2009) to measures oligopoly and oligopsony market power in the Finnish food retail industry. It offers a 'first-filter' test of price data that may be used as part of the preliminary analyses into the presence of buyer power in food markets. The model also serves as a useful device for characterising how prices are transmitted in food market, albeit in simplified form. Furthermore, it forms the basis for determining the appropriate econometric approach and the interpretation of the key variables used to identify the existence of possible oligopsony power.

II. RECENT TRENDS IN FINNISH FOOD RETAILING

The operating environment of Finnish food economy changed radically in 1995 when Finland joined the EU. The commitment to the Common Agricultural Policy (CAP) of the EU led to unprecedented upheaval of the economic environment of the Finnish food chain. It was no longer possible to regulate the market price level of agricultural products through national border protection and export subsidies. The minimum prices of agricultural products guaranteed by the EU are much lower than the producer prices paid in Finland before the EU membership, and the prices also vary more than before.

The retail price of food fell, on average, by 11 % in 1995 when Finland joined the EU even though the value added tax was raised. The reduction was caused by the decrease in the producer prices to the same level as in the other Member States and liberalisation of imports from the EU countries. The prices of cereal and meat products fell the most dramatically. As a result, from 1995 until 2008 the food prices in nominal terms rose by 25.2%. During the same period the general consumer price index rose by 24.4%, which means that the real price paid for food in 2008 was on about the same level as in 1995 (Niemi and Ahlstedt

2009). In other words, the long-term trend in food prices has followed the general consumer price trends.

The EU membership also clearly reinforced the position of retail sector in the food chain relative to the domestic raw material production and food industry. The retail sector is able to take advantage of the competition between the domestic food companies and foreign ones. Structural changes in the retail trade are directly influencing the market opportunities of food producers in four ways: through (1) concentration, (2) chaining, (3) discount stores and (4) private labels. As a result of the concentration in the retail trade sector, very large units, hypermarkets, have conquered market shares from smaller units (Koistinen and Vesala 2006). The concentration is reflected both in the rapid decrease in the number of retail outlets and in the market shares of the leading chains. From 1995 until 2007 the share of hypermarkets in the sales grew from 15 to 25 % and the share of large supermarkets from 20 % to as high as 33 %. In the beginning of 2008 the total number of retail outlets selling groceries and daily goods was 3,922 and 58% of the sales took place in the 673 largest stores. The introduction of euro in 2002 speeded up the disappearance of village and local shops.

In recent years significant reorganisations have taken place among the largest chains. The competition for the market in groceries and daily consumer good is more and more clearly a case between two main players. The market share of the S Group has increased rapidly over the past years. In 2008, the S Group managed to raise its market share again reaching 42.4%. The share of the K Group has been diminishing in the past few years, although this trend stopped in 2007 and there was some growth in their market share. In 2008 the sales of the K Group grew by 6%, which is less than the average. As a result, the market share of K Group decreased slightly, to 33.7% in 2008.

The share of the third largest chain Tradeka also experienced a fall in its market share from 11.9% in 2006-07 to 11.3% in 2008. The retail operations of Tradeka and Wihuri Group's Ruokamarkkinat were merged in 2005. At the end of 2008 Tradeka changed its name into Suomen Lähikauppa Oy (Finland's Local Store), which reflects the new company strategies. The control by the chain will be eased and with 550 Siwa and 187 Valintatalo stores the company aims to be perceived as Finland's leading chain of local stores.

The largest chain in the category of other companies is the German discount giant Lidl, which has spread rapidly on the Finnish market. In 2008 the share of Lidl was estimated at 5.1%, which was slightly higher than the year before, when it was 4.7%.

The large food chains consist of independent retail operators who compete on the local markets, while the wholesale and purchasing operations within the chain are strongly concentrated. Large chains take advantage of their negotiation power in their supply contracts with food processing companies. In both leading chains the share of the concentrated purchases has risen to more than 80%, leaving very little room for local purchases by the retail operators. Of local foods mainly some bakery products, fresh meat and fresh cheeses have gained access to the shelves (Niemi and Ahlstedt 2009).

III. THEORETICAL MODEL AND EMPIRICAL IMPLEMENTATION

As mentioned in the introduction, this study utilizes a theoretical approach used by McCorriston (2001) and Lloyd et al (2009) exploiting the presence of exogenous shocks in order to identify the presence of buyer power on both upstream and downstream prices. In their theoretical framework, firms are assumed to produce a homogeneous product and pursue quantity-setting strategies. In addition, the model allows us only to detect the existence of market power but not the degree of buyer power. The detection of buyer power simply depends on how the incidence of shocks affects both sets of prices. The model presented here follows the standard specification of equilibrium displacement models as in framework of Gardner (1975), Hollowway (1991), McCorriston (2001) and Lloyd's et al. (2009), which are static models of marketing firm behaviour in agriculture can be partitioned according to the assumptions made regarding the role played by the farm product in producing the finished consumer product.
The inverse retail demand form is given by:

$$R = h(Q, D) \qquad (1),$$

where R is the price of the retail price of the good and Q is food output the retailers sell to consumers and D is a exogenous demand shifter (which represents the source of the demand shock affecting the retailing sector).

The input supply functions for the agricultural input A, in inverse form, are given by

$$P = l(A, S) \qquad (2),$$

where P represents the price of A. The variable S is the exogenous supply shifter in the farm supply equation.

The food industry, for example a representative retail firm, uses the agricultural raw material maximise its profits, given by the following function:

$$\pi_i = \left[R(Q)Q_i - P(A)A_i - C_i(Q_i) \right] \qquad (3),$$

where $P(A)A_i$ represents the cost of all the agricultural inputs. In this theoretical frame work, this firm uses agricultural inputs in combination with other variable inputs to produce food product. To simplify the algebra in order to manage it, these non-agricultural inputs are subsumed into a single "other cost" input, that is C_i. In addition, constant returns to scale in distribution are assumed. Thus the first order condition for profit maximisation gives

$$\frac{\partial \pi_i}{\partial Q_i} = \frac{\partial R}{\partial Q} \frac{\partial Q}{\partial Q_i} Q_i + R - \frac{\partial P}{\partial A} \frac{\partial A}{\partial Q_i} A_i - P \frac{\partial A_i}{\partial Q_i} - \frac{\partial C_i}{\partial Q_i} = 0 \qquad (4),$$

here we assume a fixed proportions technology, i.e. $A_i = \rho Q_i$, where ρ is the input-output coefficient. Then (4) could be transformed to:

$$\frac{\partial R}{\partial Q} \frac{\partial Q}{\partial Q_i} Q_i + R = \frac{\partial P}{\partial A} \frac{\partial A}{\partial A_i} \rho A_i + P\rho + \frac{\partial C_i}{\partial Q_i} \qquad (5),$$

using linear functional forms for both demand[1] and supply function with exogenous demand shifter D, we get:

$$Q = h - aR + bD \qquad (6)$$
$$P = l + kA \qquad (6a),$$

and A, representing the supply input could be determined by food output to the retailers Q and the exogenously determined supply shifter S:

$$A = Q + S$$

Setting up $\rho = 1$ in order to get the explicit solution, we could rewrite equation (4) as:

$$R = k \frac{\partial Q}{\partial Q_i} Q_i + \frac{1}{a} \frac{\partial Q}{\partial Q_i} Q_i + P + \frac{\partial C_i}{\partial Q_i} \qquad (7)$$

"A key feature of any model of imperfect competition is the manner in which rival firms respond or react to one another" Sexton and Lavoie (2001)[2]. Empirically, most authors of static structural market models of imperfect competition in agriculture have used the paradigm of conjectural variations. (Holloway, 1991; Mccorriston $et.al$,2001; Lloyd $et\ al$. 2009). With n equal-sized firms with identical cost structures, we could rewrite (7) by using aggregate conjecture elasticity[3] that is $\theta = (\sum_i \left[\frac{\partial Q}{\partial Q_i} \right] \left[\frac{Q_i}{Q} \right]) / n$,

as

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[1] Empirically, the linear and the log-linear forms are among the most common as demand curve the demand cuve could be expressed by a general Box-Cox transformation given by $(Q^\xi - 1)/\xi = h - a(R^\xi - 1/\xi)$, when $\xi = 1$ we have the linear demand case.

[2] Sexton R.J. and N. Lavoie 2001, Handbook of agricultural economics, Volume 1B, chapter 15, 888.

[3] $\theta_i = \partial Q / \partial Q_i$ is the conjectural variation parameter for firm i, Assuming n equal-sized firms with identical cost structural as is common with industrial organisation models of this type, there are certain assumptions underlying this process of aggregation, in aggregating the conjectural elasticities, it is assumed that the conjectural variation parameters are identical across all firms. (Cowling and Waterson, 1976)

$$R = k\theta Q + \frac{\theta}{a}Q + P + M \qquad (8),$$

where M is a composite variable that represents all other costs that affect the retail-farm price margin. More generally, θ may be thought of as an index of buyer power. If $\theta = 0$, then we have competitive behaviour, and if $\theta = 1$, then we have collusive behaviour. Therefore, if there is buyer power in a market, then the equation (8) could be reduced to:

$$R = P + M \qquad (9),$$

To allow for changes in marketing cost M, M could be explained by a linear marketing cost function form depending on a constant x and a cost of inputs γE as follows:

$$M = x + \gamma E \qquad (10)$$

Thus the equation (9) becomes:

$$R - P = x + rE \qquad (11),$$

clearly, the spread between the retailing price and producer price in a perfectly competitive industry is attributed solely to marketing costs under competitive conditions. In this case, the exogenous shifters from both demand side and supply side have no impact on determining the spread. However, when $\theta \neq 0$, the function of (8) will be transformed in relation to demand and supply shocks provided by equation 6 and 6(a) in the following form:

$$R - P = \frac{\theta(1/a + k)(h + bD) + (1 + ak)(x + \gamma E - \theta kS)}{(1 + \theta)(1 + ak)}$$
$$(12)$$

of perfect competition is whether the coefficients on the remaining variables in the retail-producer spread equation are statistically significant.

In the empirical section, it is assumed that the data may be approximated by a VAR (p) model,

If buyer power exists then the spread between retail and producer supply prices behaves differently since price setting by the sector with buyer power will be reflected in the mark down that the firms can earn, and so affects the spread. Hence, where buyer power exists, market shocks have a differential impact at each stage in the marketing chain and thus determine the behaviour of the spread between prices at different vertical levels in addition to marketing costs. In effect, shocks to the underlying supply and demand functions are mediated through buyer power parameters and thus give rise to predictable effects on the spread. In the absence of buyer power, the effect of shocks is common at all vertical market levels so that the spread is simply determined by marketing costs.

Lloyd et al. (2009) have developed a model of price transmission in a two-level (i.e. retail and farm-gate) vertical market that explicitly allows for shocks in both the demand and supply functions for a food product. The theoretical framework delivers an equation for the determination of the price spread in which the impact of these shocks appears with definite sign in the presence of oligopsony power. This provides the theoretical basis for a simple empirical test of the presence or otherwise of perfect competition. Writing the margin equation in unrestricted form (i.e. in terms of prices), an empirical testable equation given by Lloyd et al. (2009) is following:

$$R = \beta_0 + \beta_1 P + \beta_2 M + \beta_3 D + \beta_4 S \qquad (13),$$

where R is the retail price and P is the producer price of the good under consideration, M is a composite variable that represents all other costs that affect the retail-farm price margin, D is a general demand shifter, and S is the exogenous shifter in the farm supply equation. The expected signs for the coefficients are $\beta_1 > 0$, $\beta_2 > 0$ irrespective of the degree of retail competition. The test for the rejection

$$X_t = \psi_1 X_{t-1} + \cdots + \psi_2 X_{t-2} + \cdots + \psi_m X_{t-m} + \Phi Z_t + v_t \qquad (14),$$

where x_t is a ($k \times 1$) vector of jointly determined I(1) variables, Z_t is a ($d \times 1$) vector of deterministic terms (constants, trends and centred seasonals) and each i Φ (i = 1,K, p) and each ψ (I = 1, …, m) Φ are ($k \times k$)

and (k × d) matrices of coefficients to be estimated using a (t = 1, . . .T) sample of data. v_t is a (k ×1) vector of n.i.d. disturbances with zero mean and non-diagonal covariance matrix, Σ.

The presence of a price transmission relationship between retailer and producer is indicated by the detection of cointegration among the variables in x_t. Rearranging (12) into its error correction form,

$$\Delta X_t = \alpha \beta^{'} X_{t-m} + \sum \Gamma_i \Delta X_{t-1} + \Phi D_t + v_t \quad (15),$$

we test for cointegration using Johansens's (1988) maximum likelihood procedure in which attention focuses on the (k × r) matrix of co-integrating vectors, comprising β , that quantify the 'long-run' (or equilibrium) relationships between the variables in the system and the (k × r) matrix of error correction coefficients, α , the elements of which load deviations from equilibrium (i.e. $\beta'x_{t-m}$) into Δx_t, for correction. The Γ_i coefficients in (3) estimate the short-run effect of shocks on Δx_t, and thereby allow the short and long-run responses to differ.

When a single cointegrating relationship is detected between retail and producer prices, formal testing of the significance of the supply and demands shocks is undertaken to investigate whether buyer power is present. If the vertical market for a product is perfectly competitive, retail and producer prices may be expected to form a cointegrated relationship with at most marketing costs. Where retailers exert buying power, the supply and demand shifters also enter the pricing relationship. This then gives rise to a null hypothesis of perfect competition which can be evaluated empirically by a standard likelihood ratio test of the exclusion restrictions on the shifters in the cointegrating relation.

In addition, given that the theoretical model signs the parameters in the pricing relation (1), we can offer some additional evidence on the possible rejection of perfect competition by comparing the estimated signs of the shifters in the cointegrating relation with that predicted by the theoretical model.

IV. DATA

We apply test method by Lloyd et al. (2009) to assess whether we can reject perfect competition in Finnish food retailing using widely available market level data on food price indices at retail (R) and producer (P) levels. The price index series are plotted in Figure 1, and the summary of statistics of price index series are listed in Table 1. The data sample begins in January 1995 and runs until September 2009 (giving 177 monthly observations). Measures of marketing costs are not available and thus given the importance of labour costs in food retailing we use an index (base year 1995) of real average earnings in the Finnish service sector (M) to proxy for these costs. To incorporate the impact of farm-level production costs the supply shifter (S) represents a real price index (base year 1995) of all goods and services purchased on Finnish farms. Demand-side shocks is represented by general consumer price index on the basis that this represents a general demand shifter (D) affecting the retailing sector as a whole. R is the retail price and P is the producer price of the good under consideration, M is a composite variable that represents all other costs that affect the retail-farm price margin, D is a general demand shifter, and S is the exogenous shifter in the farm supply equation behaviour), it is however noteworthy if only because growing spread appear to be the norm over the sample period.
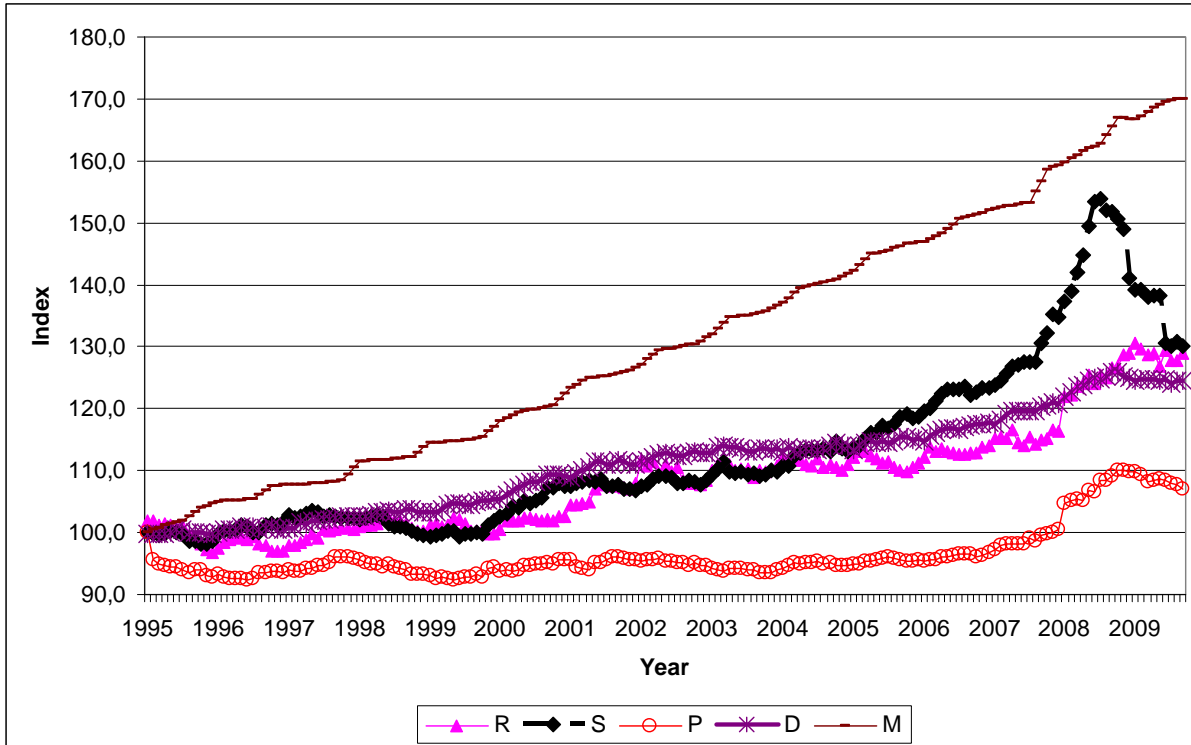
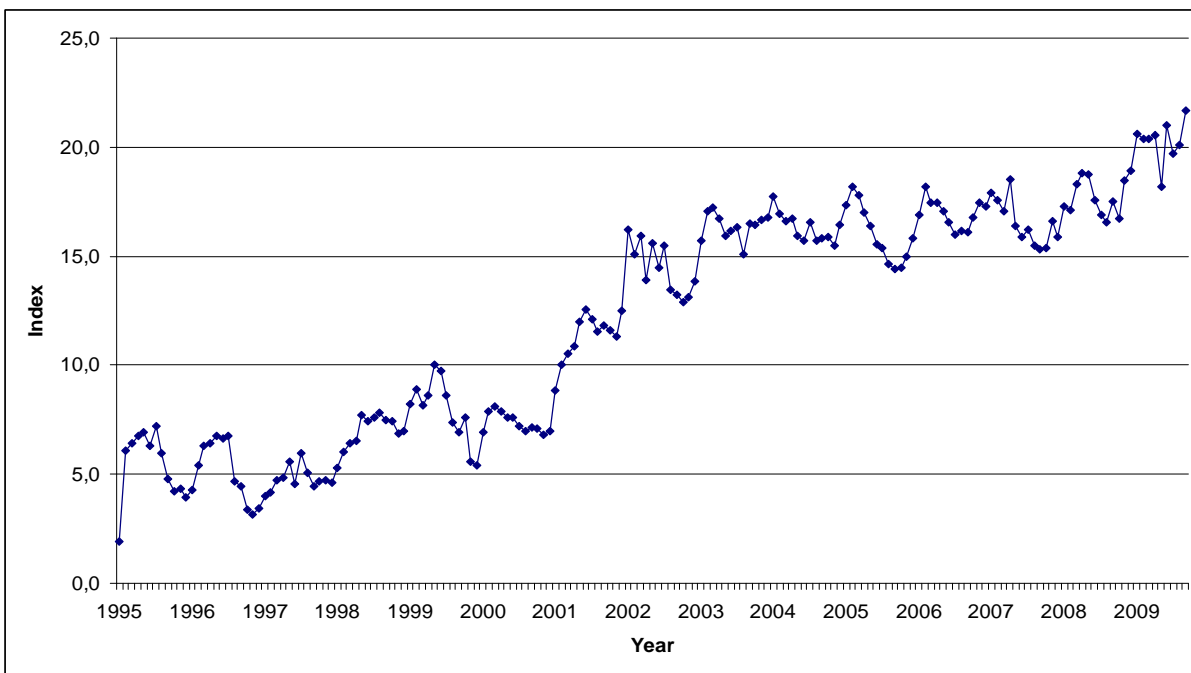Figure 1. Food price indices at retail (R) and producer (P) levels between 1995 and 2009.

Figure 2: The spread between retail index series and producer index series

Table 1 Descriptive statistics for the index series

Descr.	R	P	D	S	M
Mean	108.6	96.5	111	112.8	131
Median	108.5	95	129.6	112.4	108
S.D	8.7	4.5	20.4	7.77	13.8
Skew.	0.8	1.97	0.28	0.18	1.2
Kurt.	3	5.69	1.89	1.9	3.8
Obers.	177	177	177	177	177

Obviously, price index representing producer price has maintained very much in the same level within the sample year, given all other index series have shown a clearly increasing trend over the years, especially among which marketing cost labelled by M grew the most. This tendency for producer price index and other indices to diverge over time gives rise to a widening in the index spread particularly after year 2002 (See Figure 2). While growth in the price spread is not in itself indicative of buyer power as marketing cost such as labour cost may be the cause for the phenomenon (Lloyd et. al. 2009). Nevertheless, it is a necessary condition for the existence of buyer power. Thus, further investigation on the existence of buyer power including related factors such as marketing cost should be carefully carried out.

RESULTS

To decide whether VAR(p) or VECM is proper model for our analysis, we begin with a descriptive analysis of the charaterisitic of individual prices index series drafted in Figure 1. In other words, we have to examine the stationarity properties of the univariate time series. The series is integrated of order d (denoted I(d) if it attains stationarity after differencing d times. If the series is I(1) it is deemed to have a unit root. Stationarity of the price processes is tested using Augmented Dickey-Fuller (ADF) test (1976) and complementary KPSS test (Kwiatkowski-Phillips-Schmidt-Shin,1992).

Inspection of Figure 1 suggests that the series possess a increasing rend that characterized the random walk I(1) model. Thus we consider performing the unit root tests with two different restricted structures: with intercept and with intercept and trend.

Result of unit root test in level form is reported in Table 2. All the test indicates that all of the index series restricted on intercept are non-stationary, and further test on the first difference shows stationarity 4, which suggest that the index series are I(1) with either intercept or with intercept and trend. Given that the data are all integrated in first order, we now analyze the price transmission between retailing price and producer supply price by VECM model defined by equation (3). Thus the second step of our analysis is to test the cointegration relationship among the index series.

The result of Johanson cointegration test is presented in Table 3. The Akaike Information is used to determine the optimal order of lags (3 lags for each series). Both trace statistics and Max-eigenvalue indicate that a single cointegrating vector (r=1) is found significant, whether or not the linear trend restriction included. Further, under sequential testing, the first rejection failure occurs while using the model without trend and, thus, we accept the model without trend as appropriate. We further check the cointegrating residuals for autocorrelation and trending test, and the results appear to be satisfactory.

Next, Table 4 reports the parameters of the cointegrating vectors normalised on retail price index obtained from model 3. The result shows that $\beta_1 > 0$, and $\beta_2 > 0$, which is in accordance with the theoretical model 1. However, it is noteworthy that the parameter of coefficient of M representing marketing cost shows statistically insignificance. This implies that labour cost alone may not serve the best proxy as a general marketing cost variable. In addition, the signs for the existence of buyer power β_3 and β_4 turn positive and negative respectively, which is correctly signed according to the predictions in the theoretical model. However, the estimated coefficient of supply shifter index S.

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1. [4] The unit root test results on the first difference are not reported but are available upon request.

Table 2. Unit Root Tests for selected oil prices in EU market

Test	R	P	M	D	S	Critical values
ADF (intercept and trend excluded)	-2.33	-2.28	-1.82	-2.00	-2.06	-3.15* -3.44** -4.01***
ADF (intercept included)	0.59	0.47	2.04	0.49	-0.70	-2.58* -2.88** -3.47***
KPSS (intercept and trend included)	0.20 **	0.28 ***	0.36 ***	0.36 ***	0.29 ***	0.12* 0.15** 0.22***
KPSS(intercept included)	1.52 ***	0.93 ***	1.70 ***	1.65 ***	1.40 ***	0.35* 0.46** 0.74***

Notes: ADF is Augmented Dickey-Fuller test, test statistics is according to MacKinnon (1996) critical values for rejection of hypothesis of a unit root. KPSS is the η-test of Kwiatkowski et al. (1992). Asterisk (*), (**) and (***) denote significance level at 10 %, 5% and 1% respectively. [5]

Table 3: Test for Cointegration among R, P, M, D and S index series.

(i) Constant included

Hypothesized No. of CEs	Max-Eigenvalue	5% max	Trace statistic	5% trace
r=0	44.50**	33.88	83.32**	69.82
r=1	23.56	27.58	38.82	47.86
r=2	9.07	21.13	15.26	29.80
r=3	4.98	14.26	6.19	15.49
r=4	1.21	3.84	1.21	3.84

(ii) Constant and linear trend included

Hypothesized No. of CEs	Max-Eigenvalue	5% max	Trace statistic	5% trace
r=0	44.69**	38.33	94.34**	88.80
r=1	28.06	32.12	49.64	63.88
r=2	11.22	25.82	21.57	42.92
r=3	6.44	19.39	10.36	25.87
r=5	3.92	12.52	3.92	12.52

Note: Critical values based on MacKinnon-Haug-Michelis (1999) **denotes rejection of hypothesis at 5% level

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2. [5] Unit root testing and cointegration analysis are conducted using EVIEWS 6.

appears to be insignificant. In order to obtain more precise statistical significance of coefficients S and D, we further perform a set of likelihood ratio tests. The results is displayed in Table 5, and clearly the null hypothesis of the perfect competition ($\beta_3 = \beta_4 = 0$) is rejected between producer and retailing prices. Meanwhile, we merely note that though $\beta_4 = 0$ cannot be rejected, but it is correctly signed according to the theoretical model. Therefore, overall the results suggest that the spread between producer and retailer prices is not consistent with perfectly competitive behaviour and thus might be caused by, at least as a candidate amongst other factors, the existence of oligopsony power in Finnish food retailing.

Table 4. Estimated cointegrating vectors (normalised on retail price index)

Index proxies	Parameters	Values
Producer price index (P)	β_1	0.65***(0.16)
Marketing cost (M)	β_2	0.09 (0.07)
Demand shifter index (D)	β_3	0.68*** (0.16)
Supply shifter index (S)	β_4	-0.03 (0.08)

Table 5. Test results for competition

Hypotheses	Values
H_0: $\beta_3 = 0$	10.02*** [0.002]
H_0: $\beta_4 = 0$	0.13[0.71]
H_0: $\beta_3 = \beta_4 = 0$	11.12***[0.00]

V. CONCLUSIONS

In this paper, we have applied the test method by Lloyd et al. (2009) to test the presence of buyer power in vertically-related Finnish food markets. As explained by Lloyd et al. (2009) the approach is simple and transparent yet delivers a statistical test derived from a theoretically-consistent basis. Furthermore, the test demands relatively little in terms of data and is implemented using standard techniques of modern time-series analysis.

Drawing on data on price indices at retail (R) and producer (P) levels, we showed that the hypothesis of perfect competition can be rejected, implying that the Finnish market is characterised by buyer power by the Lloyd's et al. (2009) measure. Of course, the result cannot be interpreted as being conclusive of the use of buyer power in Finnish food retailing. Clearly, econometric tests of the sort have limitations. Data is subject to measurement problems, particularly regarding the quality of proxies that are available to account for changes in sector-specific marketing costs (demand and supply shocks) are not to be taken lightly. It should also be stressed that the test does not allow the degree or economic significance of market power to be measured, merely whether it exists.

However, the method proposed by Lloyd et al. (2009) is both familiar to applied economists and readily implemented, and delivers a 'first pass' test that when used in combination with other evidential indicators, can be useful in contributing to uncovering the existence of buyer power in the vertical food chain.

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