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# Vertical price transmission in the Finnish food sector

Heini Toikkanen<sup>1</sup>, Jyrki Niemi<sup>1</sup>

<sup>1</sup> MTT Agrifood Research Finland, Latokartanonkaari 9, FI-00790 Helsinki, Finland, heini.toikkanen@mtt.fi



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## **Abstract**

In this study we estimated vertical price transmission in the Finnish food sector by using the Engle-Granger two-staged co-integration method. The results indicate that the producer price of beef and the consumer price of beef roast are co-integrated and that price transmission is quite effective. Liquid milk does not significantly differ from raw milk. However, the consumer price of liquid milk and the producer price of milk do not follow each other. The producer price and consumer prices of eggs are not co-integrated, either. A highly competitive market situation has existed on both egg and dairy markets during the 21st century.

Keywords: Finnish food market; co-integration; price transmission.

## **1. Introduction**

The rise in food prices has provoked a great deal of a public discussion, including debate over the distribution of the price paid by the consumer within the supply chain. In well-functioning food markets, producer and retail prices do not vary independently but changing market information affects the whole market area, and the prices shift in the same proportion.

Food prices fell after Finland became a member of the European Union in 1995, when the prices of agricultural products decreased to the same level as in other member states (Niemi & Ahlsted 2009). Nevertheless, the food price level in Finland is the second highest in the EU. The added value tax rate on food is one of the factors explaining the difference in prices. However, research results (Niemi & Ahlstedt 2011) indicate that the retail sector has accounted for an increasing share of food prices, while the shares of primary producers and the processing sectors have decreased. The position of retailers in the food chain has strengthened, as they invite tendering among the other actors in the food chain under stricter conditions. Unlike the food industry, the retail trade is not dependent on domestic primary production, and thus it is able to take advantage of competition between the food companies, which creates a good basis for efficient tendering. Retailing has become more and more concentrated and concatenated. In 2011, the two largest retail chains, S-group and K-group, achieved an 80% market share (Niemi & Ahlsted 2013), which is a further indicator that grocery competition is essentially between the two largest retailers. Each retail chain has its own discount stores and private labels.

The aim of this study is to examine vertical price transmission in the Finnish food supply chain by means of four commodities: beef, eggs, liquid milk and potatoes. The study will assess how rapidly and to what degree changes in producer prices are transferred to consumer prices. The results characterize the Finnish food markets and the differences between the analysed sectors.

## **2. Method and data**

Vertical price transmission has been widely studied in different fields. Initially, vertical price transmission was investigated using a simple dynamic econometric model. Subsequently, co-integration methods have become established in vertical price transmission research (Goodwin 2006). In this study, vertical price transmission is studied by the Engle and

Granger two-staged co-integration method (Engle & Granger 1987). This method allows the direction and speed of price transmission to be examined. The short-run disequilibrium is estimated by an error correction model (ECM), in which the short-run relationship is explained by the residuals obtained from the long-run model. The stationarity of the time series was analysed using two different approaches. The null hypothesis of the augmented Dickey-Fuller (ADF) test is that a time series is non-stationary. On the other hand, the null hypothesis of the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test is that a time series is stationary.

Research data consists of price series for beef, eggs, potatoes and liquid milk. The data were collected monthly and cover the years 1995–2012. The consumer price series of the commodities were collected from the statistics provided by Statistics Finland, while producers' price series were taken from the statistics provided by the Information Centre of the Ministry of Agriculture and Forestry (TIKE). To avoid distortion of the results due to changes in taxation, value added tax is not included in these prices. Beef consumer prices have followed an increasing trend throughout this century. However, beef producer price development has halted, and a smaller share of the price paid by the consumer ends up with the producer. Egg prices reveal a parallel phenomenon to beef, but variation in price of potatoes is significantly larger than that of the other analysed commodities. Seasonal variation is considerable, but has evened out during the current century. The producer and consumer price series for milk are relatively smooth.

### **3. Results**

The results of the unit root tests indicate that the producer price of beef, the consumer price of beef roast, egg prices and the consumer price of milk have at least a unit root. Non-stationary price series were tested at the first difference so as to define the number of unit roots. The tests indicate that price series tested have one unit root and are integrated at level 1. Co-integration analysis shows the price of beef roast and the beef producer price are co-integrated, but the consumer and producer prices of eggs are not closely interrelated. The prices of potatoes, the producer price of milk and the price of beef mince are found to be stationary.

Liquid milk does not significantly differ from raw milk. However, the results show that the consumer price of liquid milk and the producer price of milk do not follow each other. A highly competitive market situation has existed within the dairy industry sector during the 21<sup>st</sup> century. Liquid milk is not a value product, but more like a product that is sold at cheap rates to attract customers. Since various added value products play a more and more important role in the dairy industry, liquid milk probably does not accurately represent the Finnish dairy product market as a whole. The producer and consumer prices of eggs are not co-integrated, either. The supply chain for eggs is quite simple, and little is done to the product between the farm and the retail outlet. Even packaging is often done on the farms. The egg market has been highly competitive, and the supply elasticity of eggs is very low, so the price is not a compulsory competition tool for retailers. In addition, in the 21st century the egg range has hugely increased. The price series of potatoes are stationary, so they are co-integrated. Nevertheless, the producer price of potatoes still explains only small part of the shift in the consumer price.

The producer price of beef and the consumer price of beef roast are co-integrated, so that an error correction approach can be used. However, the price series of mincemeat was

stationary, so the consumer price of mincemeat and the producer price of beef are not co-integrated. In other words, the price series do not correlate. Finnish beef production is dependent on domestic dairy production and a major proportion of domestic beef is consumed as mincemeat. Given this situation, the consumer price of mincemeat is expected to closely follow changes in the beef producer price. The consumer price of beef roast and the producer price of beef are co-integrated, so it was possible to study vertical price transmission. The results demonstrate that changes in the producer price are transmitted to the consumer price in both the long run and the short run. In the short run, 70 % of the change is transmitted and a final equilibrium is reached within five months. In other words, price transmission is quite effective. However, the producer price of beef explains only a small part of the consumer price of beef. This small part corresponds quite closely to the producer's contribution to consumer price. The rest of the price can be explained by other factors such as production costs.

#### **4. Conclusion**

Widening margins between the retail and producer price have been documented in every sector examined in this research. Abuse of a dominant position in the market is frequently mentioned as an explanation for the decreasing producer price margins. This is clearly a plausible explanation. Drawing on data on price indices at retail and producer levels, Niemi and Liu (2011) demonstrated that the hypothesis of perfect competition can be rejected, implying that the Finnish food market is characterized by oligopsony power. However, other conceivable explanations should also be considered. These explanations include increased hygiene standards, agricultural policy, differences in productivity and the abuse of market power. It is important that all these possible explanations are investigated together in order to improve the understanding of supply chain dynamics and of the need for and nature of policy interventions. Therefore, further work is needed to collect more conclusive evidence. Important areas of further research include an estimation of the symmetry of the vertical price transmission, market power, and how added value is divided among actors in the supply chain.

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