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Vertical price formation in the Finnish food chain

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Abstract: In this paper we analyse, how food prices have been spread between different actors in the Finnish food chain in 2000-2007. In addition, we compare price formation in Finland to eight other countries. We argue that the main factors explaining different food price behaviour between different countries especially in Europe are; the level of processing in the consumed food products, domestic competition, availability of substitute products, domestic consumption structure and consumers' preferences. Our results show, that retailers' share of food prices has increased in Finland, while both the farmers' and processors' share has been decreasing. This development differs significantly between countries. Yet, it seems that the lack of competition gives retail sector a significant advantage in the food chain, especially when food processors are facing increased competition on from imports.

Keywords: food chain, price formation, Finland

1. Introduction

Well-functioning and efficient food supply chain is an important part of society welfare. Food chain efficiency and society welfare can be significantly shrunk down by oligopolistic and strategic behaviour of some stage of the food supply chain. Food chain efficiency has a horizontal aspect that requires competitive markets at each stage of the chain. It has also a vertical aspect requiring effective transmission of incentives between stages of the chain.

Conflict of interest between the participants of the food supply chain has increased as market has opened and regulatory reduced. Agricultural producers, input suppliers, output processing firms and retailers often have unequal power to influence the flows and attributes of products. Moreover, they have unequal power to capture and retain a sufficient share of the value that they add to products. In addition, information asymmetry between consumers, sellers and producers accentuates inefficiency in food market and exposes considerable price uncertainty.

Rapid changes in the world food markets have, again and even more strongly, made the debate over price transmission in the food chain more relevant. Recent price developments, both in the world market prices and, thus national consumer prices, raises questions what are the main factors affecting food prices, and who has the market power to transmit cost increases further on to consumer prices.

The widening margin between the retail and producer prices of food has been documented in numerous empirical studies both in Europe and in the USA for many different food products (Digby 1989, Kinsey and Senauer 1996, Løyland et al. 2001, Reed et al. 2002, Kjuus 2004, Pyykkönen 2007). There are good reasons to suspect that strategic behaviour exists also in the Finnish food market. Since the most common reason for the prevalence of vertical restraints in the food sector is the increasing market power of food retailers (McCorriston 2002), market concentration can be expected to have important implications particularly in the food market. The emerging literature already provides signals that the heavily concentrated purchasing groups of largest food retailers, for example, have the power to behave strategically in the Finnish food market (Jalonoja and Pietola 2004). It is important that the possible explanations for this development are investigated in order to improve the understanding of supply chain dynamics and of the need and nature of policy interventions.

Our aim is to enhance food price transparency by investigating vertical price formation in the Finnish food market. Our study addresses internal food chain problems concerning incentives and relations between and within stages of the Finnish food supply chain. We utilize public statistics to examine how total food expenditures in Finland have split among the sectors in the food supply chain: farmer, processing, import, retail and restaurant, and government taxes. We take into account that there might be considerable differences in proportions by product group level.

Besides the Finnish case, we also analyse how total food expenditures have split among the sectors of food supply chains in other countries. Our comparison countries are Finland, France, Denmark, Germany, Italy, Spain, Sweden, United Kingdom and USA. There are both similarities and differences between the food supply chains of these countries. For example, interestingly, the concentration of the food retail trade is relatively low in Italy and very high in Finland and Denmark. After this comparison, we can infer more accurate whether the domestic food market in Finland exhibit strategic behaviour in the extent that it decreases society welfare.

Our paper is structured as follows. In the next section, we review the factors effecting on price formation in general and particularly in the Finnish food supply chain and discuss on the recent price development. In sections three and four, theoretical framework and data used are presented. Main results are introduced in the fifth section and major findings are concluded in section six.

2. Price formation and development in the Finnish food supply chain

2.1. Price development

Changes in the world agricultural markets have direct effects also on the Finnish food supply chain. Large volatility in agricultural product prices in the world markets, especially in the short term, is often caused by a significant shock in the supply side. For example, unfavourable weather conditions may cause a major decline in supply, and thus lead to rapid price increases. Accordingly, increasing supply due to favourable weather conditions will lead to decreasing prices. On the other hand, rapid demand shocks are

less common. However, demand shocks caused by e.g. animal diseases, such as BSE, may have quite long-lasting effects on demand and they may even lead to a permanent change in consumption habits.

In the long term, factors affecting price development are obviously much broader and come both on the demand and supply side. In the supply side, productivity growth due to technological progress with all its dimensions is the most important factor. On the demand side, the long term factors affecting agricultural product prices are commonly referred as the determinants of demand (see e.g. Tomek & Robinson 2003, 17). Determinants of demand include demographic factors, economic factors and consumers' preferences. Demographic factors include population size, age distribution and ethnicity. Economic factors include income, income distribution and availability of other products. Consumers' preferences are affected by the level of education, life experiences, information, advertising and so on. Most recently, factors with the greatest contribution on global food price increases has been population growth, economic growth and thus increasing income levels, and changing consumption patterns especially in China and elsewhere in Asia.

The change in the world agricultural product prices do not necessarily mean that changes in agricultural producer prices or consumer food prices would be similar in all individual countries. In fact, price development can be quite different even in the countries with many similar characteristics in the agricultural and food markets. The size and similarity of price effects depends significantly, among other things, on the production and consumption structure, trade and export competition and market structure. Yet, changes are also different with different agricultural products and food products even within the regions.

We argue that main factors explaining different food price behaviour between different countries especially in Europe are; the level of processing in the consumed food products, domestic competition, availability of substitute products, domestic consumption structure and consumers' preferences. In addition, markets differ in terms of all these aspects between dairy, meat and cereal product markets. In the meat markets, the major factor is the differences in consumption structure compared to production structure, and the ability to compete at the export markets. Milk consumption in Finland is directed by fresh milk. Thus, time from farm to stores and to consumers is limited to approximately one week. That gives for domestic production a natural protection towards competition. Indication to food prices is, that milk consumer price levels, and thus also producer price levels remain at the higher level compared to other countries. Recent price development supports this view (Figure 1 & 2).

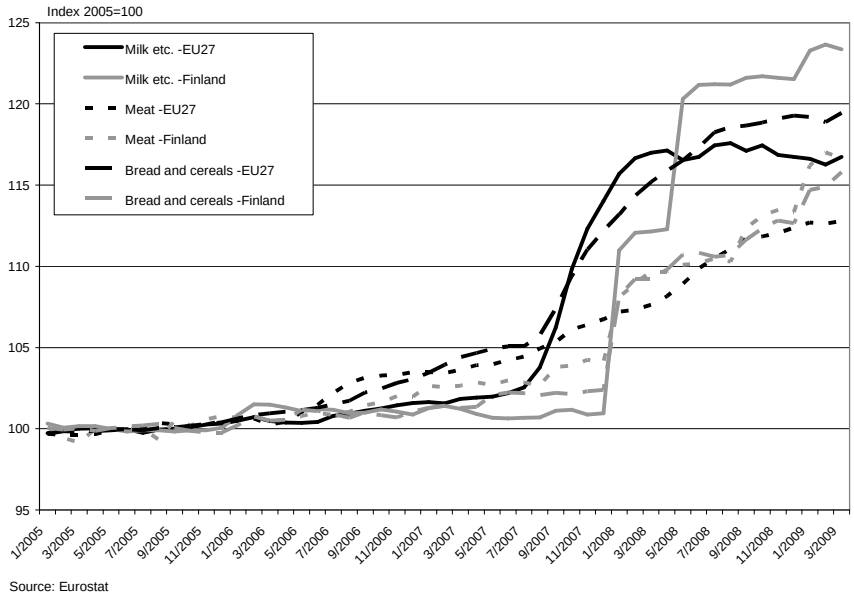


Figure 1. Consumer prices in the EU and in Finland

Volatility in agricultural product prices effects on price formation also in the Finnish food chain. The actual size of these effects, however, differs significantly between different product categories. In the milk sector, most of the consumption is liquid fresh milk. Finnish consumers prefer it over UHT-processing, giving Finnish milk processing industry a significant benefit in terms of home market protection. Liquid milk is a fresh market product also at the consumer level. Same applies to bread, but cereals on the other hand can be held in storage with relatively low costs, without any significant reduction in quality. Also the production cycles differs between milk, meat and cereals production. This restricts the ability of producers to respond to price signals, and thus makes the price elasticity of production inelastic.

In the integrated and competitive global market national producer prices can not diverge much from international development of producer prices. In Finland, this actualises in the pig meat market, which is particularly highly integrated at least in EU level (Figure 2). There might, however, be justified differences in producer price levels and lags in price developments between nations. This has been the in the Finnish dairy markets compared to the EU. In the long run, import or even threat of import competition assimilates the movements in producer price development. Remarkable large increases in milk producer price in last year in Finland ended up in reductions in this year. The most recognized reason for reductions is growing cheap import which puts pressure on domestic production. This is also a good example of the functioning of the integrated market.

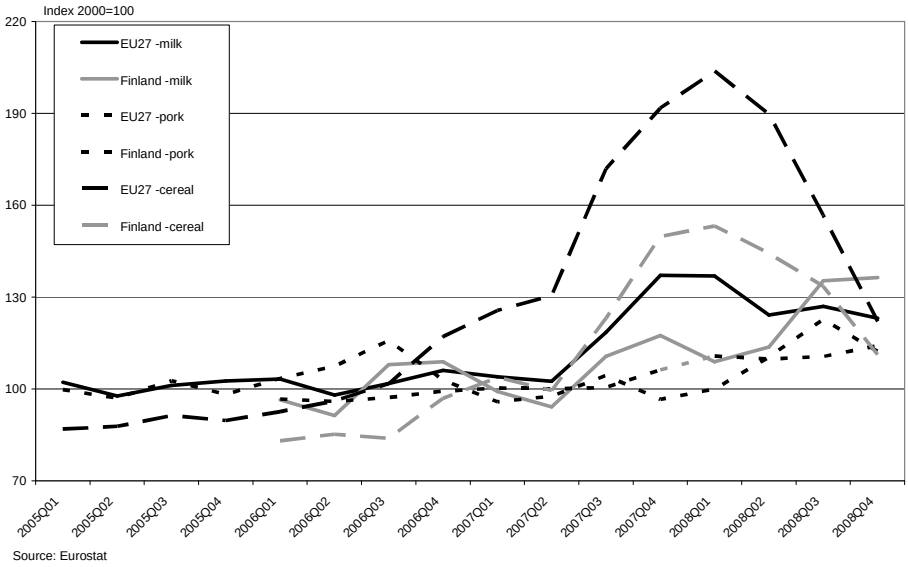


Figure 2. Producer prices in the EU and in Finland

2.2 Finnish food sector

The Finnish food sector changed radically in 1995 when Finland joined the EU. It was no longer possible to regulate the market price level of agricultural products through national border protection and export subsidies. The retail price of food fell, on average, by 11 % in 1995 despite of the fact that the value added tax was raised from 12 to 17 %. 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. Since 1995 food imports into Finland have increased considerably and the Finnish suppliers have experienced increased competition from abroad. This, of course, has favoured Finnish consumers.

The position of Finnish food companies on the domestic market has been challenged by competitors from abroad. In order to stay in business, Finnish firms have been forced to rationalize and reorganize their production. However, several Finnish food companies do well on the international markets. Most part of this success has been achieved through locating the manufacturing of products where costs are low. In this way Finnish food industry has been able to compensate for the high cost level in Finland.

In the Finnish food supply chain, grocery trade is highly concentrated[1]. It is characterised by the formation of chain retailers, as well as by the centralisation of the procurements and logistics. The Finnish food industry is highly heterogeneous with large international companies and small local firms. Food industry has undergone large rationalization operations in recent years but its productivity has not increased as much as productivity for example in the retail sector (Huovari and Jalava 2007). However, food processing in Finland is innovative: new products are launched to market frequently. At the same time, the processing rate of food products has risen.

The economic importance of the food processing and distribution within the food supply chain has increased over time. The most un-concentrated part of the Finnish food supply chain is the agricultural

[1] Five largest retailers took over 90 per cent of the total food market.

producers. They have been facing big challenges by EU legislation and increased globalisation. Growing international trade and integrated prices of raw materials affect on the whole chain. The most negative effects hit to farmers, while retail sector can use import even as a pressure mechanism in the negotiations with the food processing industry. Success of agricultural producers in achieving their goals is very tightly influenced by the other sectors of the food supply chain.

The Finnish retail trade sector has gone through even more radical structural changes than the food industry. Structural changes in the retail trade are directly influencing the market opportunities of food producers through concentration and chaining. The retail sector is able to take advantage of the competition between the domestic and foreign food companies. For the food manufacturers the bargaining power of food retailers and the threat from substitute products, e.g. retailers' own labels, are among the most competitive forces.

The two leading Finnish retail chains of food and daily goods have increased their market share from 55 % in 1990 to 76 % in 2008. Today, concentration at the retail level in Finland belongs to the top end compared to other European countries. The increased concentration of retail power means that large retail outlets now exert significantly more control over others in the marketing chain. The largest food trade companies have rapidly become organized into chains i.e. concentrated their purchasing. Today the purchases of about 80 % of foodstuffs are concentrated to certain major suppliers and distributed through national logistic channels. The appearance of discount chains has changed the market structure, and the position of private labels of food store chains is strengthening.

3. Framework for the analysis

Analysis of market structures are often based on the assumptions on the perfect competition, full availability of information and free market entry and exit conditions. Given these conditions exists, markets will clear in a competitive equilibrium with equal price faced by consumers and producers. However, as it is very well recognised that in the real world market failures such as information asymmetries, imperfect competition and restrictions for free entry exists, it is important to take those into account in the analysis.

Gardner (1975)[2], provides a framework on how the changes in supply shift will effect on consumer prices. According to Gardner, the price spread may be measured by the difference between the retail and farm price P_x-P_a, by the ratio of the prices P_x/P_a, by the farmer's share of the food Euro aP_a/xP_x, or by the percentage of marketing margin $(P_x-P_a)/P_a$.

According to Gardner (1975, 402) the changes in farm product supply effect retail and food processing prices in two distinctive ways. In normal cases, the percentage difference between consumer price P_x and producer price P_a will fall when P_a rises as a results of reduced supply of agricultural output. Conversely,

[2] The model was developed by Hicks, and first applied to agricultural policy analysis by Floyd 1965.

increased supply, e.g. due to the productivity growth in agriculture, reduces P_a, and thus will widen the percentage difference between consumer and producer prices. If productivity growth is higher in retail or food processing compared to agriculture, agriculture will face a declining share of price spread within the food chain. Under a perfect competition, changes in producer prices will transmit fully to food processors, which will transmit the cost increases directly to consumers. The model suggests that farm-retail price spread depends on shifts in both retail-level demand and farm-level supply, but retail-level shifts may have stronger impact.

When the assumption on perfect competition is made less restrictive, an obvious conclusion is that price changes are no longer transmitted perfectly within the supply chain. In example, if retailer exerts some market power e.g. markets work under oligopoly, it makes the pricing decision in order to collect some oligopoly rent. The formation of oligopoly rent is presented in Figure 3.

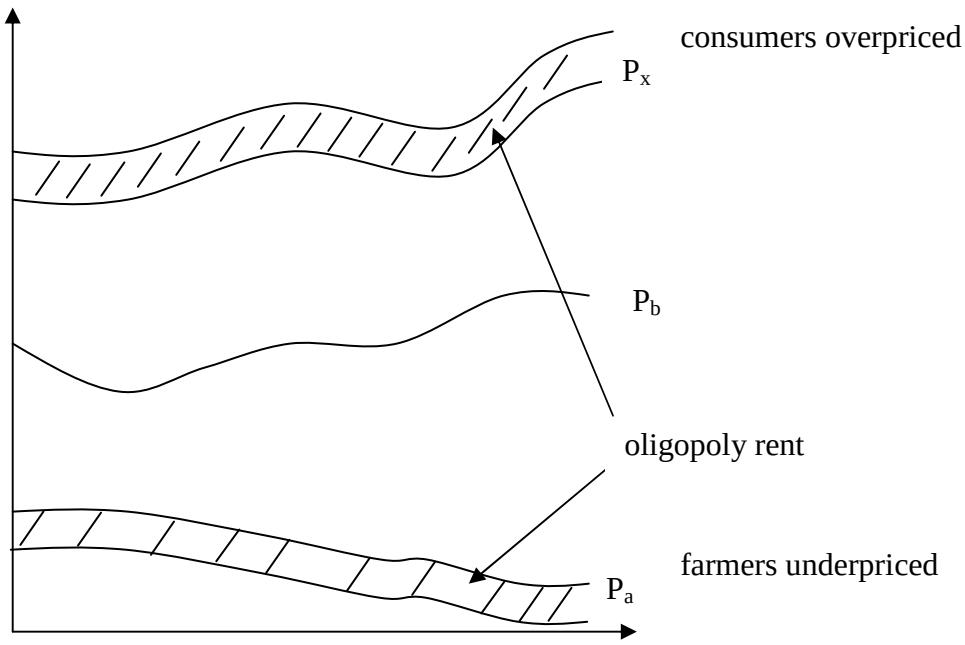


Figure 3. Formation of retailers' oligopoly rent in food chain

Assume that food processing industry price P_b is based on derived demand from the retailer, and producer price P_x is based on the derived demand by food processors. Under the retailer oligopoly consumers end up overpriced and farmers underpriced as seen in the shaded area in Figure 3. The loss in welfare due to oligopoly rent is divided between food processors and farmers. If the food processors exert some market power against the farmers, they can pass the welfare loss to farmers in total.

In the analysis of price spread and price transmission, it is important to recognise also the other main factors besides market structure that can effect on violating the assumptions behind the competitive markets. James & Alston (2002) point out that a conventional assumption on product homogeneity when the commodity of interest is actually heterogonous will lead to errors in the analysis. When heterogeneity

is present, the elasticity of demand for particular products may be rather elastic because of branding, observed quality or individual preferences.

We based our analysis on fact, that asymmetries exists in the Finnish food industry and that, the market power is not equally distributed within the food chain. We will provide preliminary indicators on the competitiveness in the Finnish food chain for further analysis. Our results can be applied to empirically estimate using the methods of new empirical industrial organisation (NEIO) relative market power of each actor in the Finnish food chain.

4. Data and methods

Data for the analysis has been obtained from publicly available sources. The data for EU countries is collected from Eurostat but some numbers have been checked from national statistics sources. USA data is from USDA.

First, we examine by product groups (dairy, meat, cereal) on how food expenditures in Finland have split among farmer, processing, import, retail trade and restaurant, and government taxes in 2007. Our aim is to emphasize that there might be significant differences in price formation between products. In this examination, the data has been obtained from many different Finnish sources, mainly from Statistics Finland.

Second, we make a country comparison and calculate how total food expenditures have split among the sectors of food supply chains in Finland, Sweden, Denmark, Germany, France, Spain, Italy, Great Britain and USA. Now, our aim is to compare the price formation in the Finnish food supply chain to the food price formation in other countries. By doing this, we get a baseline to our results concerning the Finnish food supply chain and can therefore make stronger conclusions.

In this examination, we split the food, beverage and alcohol consumption expenditures among farmer, domestic processing, import, retail trade and restaurant. The share of government taxes is now included to the share of retail and restaurants. Some countries have different VAT on different food products plus different kind of commodity taxes which makes the separation of tax share impossible in practise.

The calculations based on following simple formula:

Agricultural goods output, value at producer price

- *forage plants, value at producer price*
- *agricultural export*
- *from domestic agriculture to the manufacture of export food product, value at producer price*

= *DOMESTIC AGRICULTURE*

Gross value of food processing industry (beverages and alcohol)

- *export of food stuff*
- *DOMESTIC AGRICULTURE*

= *DOMESTIC FOOD PROCESSING INDUSTRY*

IMPORT

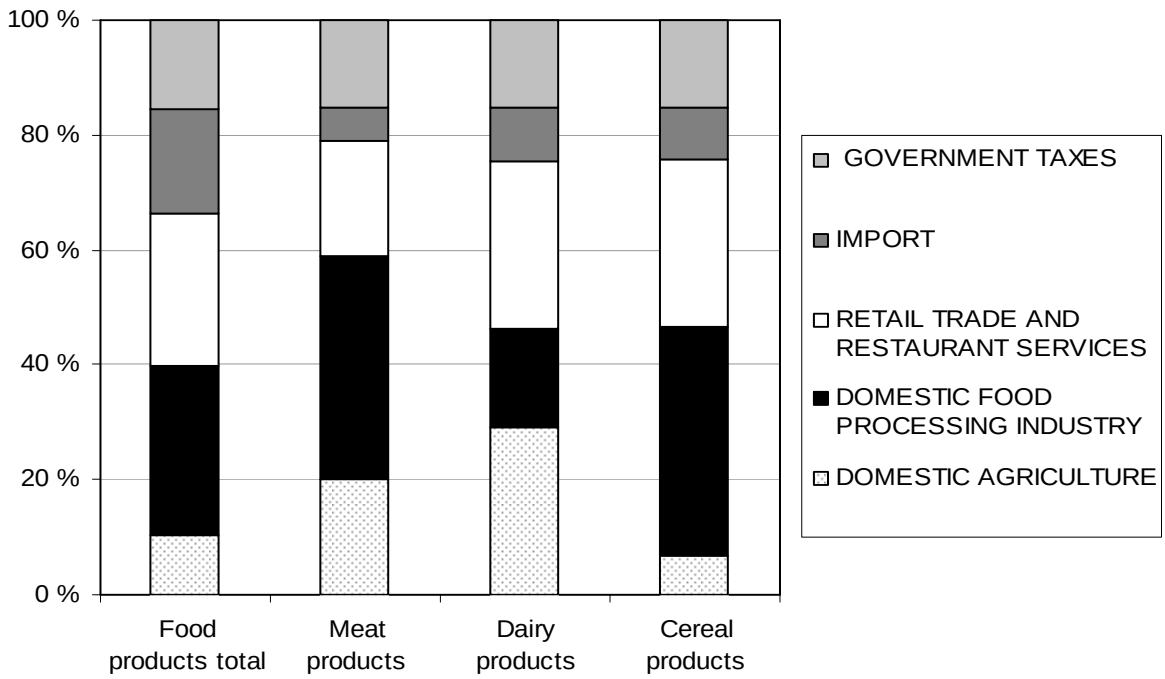
Consumption expenditure of food, beverages, alcohol, and restaurant services

- *DOMESTIC AGRICULTURE*
- *IMPORT*
- *DOMESTIC FOOD PROCESSING INDUSTRY*

= *RETAIL TRADE AND RESTAURANT SERVICES PLUS GOVERNMENT TAXES*

5. Results

We take a vertical price formation aspect and examine by product groups (dairy, meat, cereal) how food expenditures in Finland have split among farmer, processing, import, retail trade and restaurant, and government taxes in 2007. We want to highlight that there might be considerable differences in shares in product group level. Although, an exact calculation of these shares is rather difficult, we are able to provide some reasonably reliable proxies based on the data from publicly available sources.



Source: Statistics Finland

Figure 4. Food price formation by product groups in Finland in 2007

First notion is that the farm share of food consumption expenditures varies across product groups. Dairy farmers have received on average 30 % of dairy products consumption expenditures, meat farmers on average 20 % of meat products consumption expenditures and crop farmers on average 7 % of cereal products consumption expenditures in 2007. Moreover, even great movements in producer prices do not seem to affect much on food consumer prices.

Also the share of domestic food processing industry of consumer food expenditures varies across product groups. Industry receives the highest share in cereal products (40 %). Industry's share of consumption expenditures is also high in meat products (37 %). However, one must notice that meat product group also includes long-processed prepared food stuff. This is problematic for the reason that highly processed foods are more complex and, generally speaking, involve more than one agricultural commodity, but we can't take this into account on our calculations. This also means that in the meat products, industry's share is overestimated. Share that goes to dairy industry is the lowest (17 %) among the product groups we examine. One reason is that in Finland fresh milk takes a great proportion of dairy consumption expenditures but it is a fairly low processed product. Generally, the share of domestic food processing industry of consumer food expenditures is the larger, the longer the food product is processed.

Imports have become more important also in the Finnish food chain. Imported products have been taking a growing share of Finnish food consumption expenditures since the mid-1990s.

Comparing food product groups, we can also notice that the retail trade and restaurant share of consumption expenditure is the steadiest among the sectors in food supply chain (20-25%). Regardless of

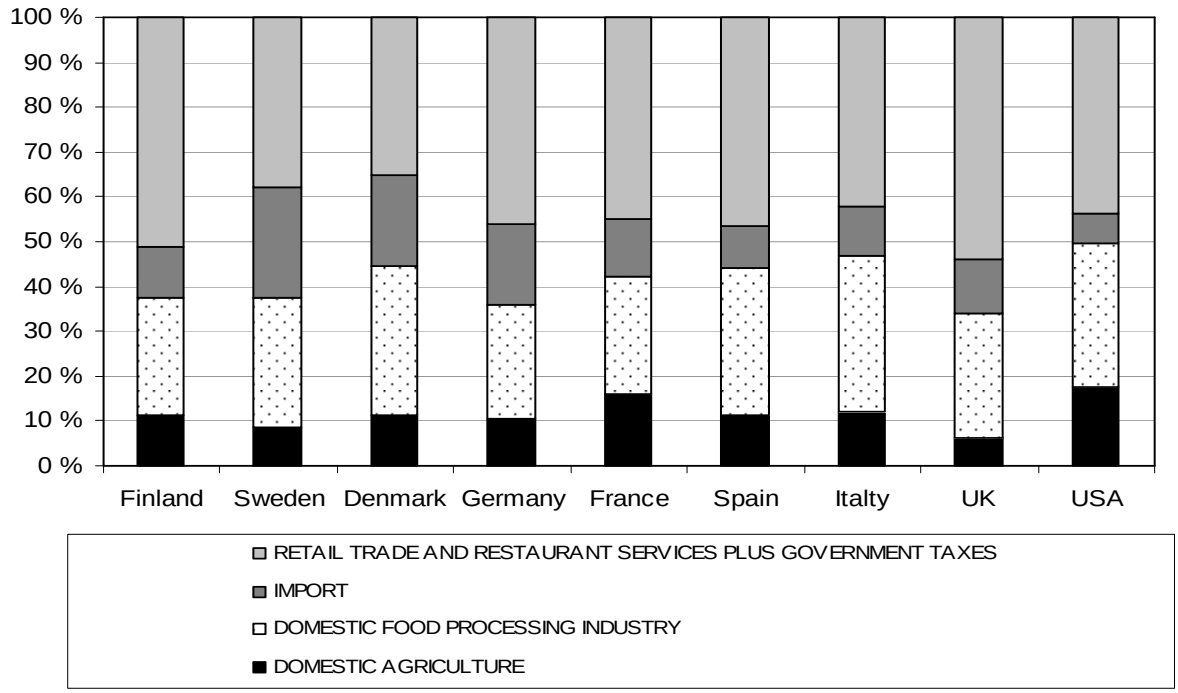
product group, it seems that retail trade has a quite strong position in the food supply chain. The retail trade does not face as much competition as food industry. However, the retail sector is able to take advantage of the competition between the domestic food companies and foreign ones.

Next, we will make a country comparison and calculate how total food expenditures have split among the sectors of food supply chains in Finland, Sweden, Denmark, Germany, France, Spain, Italy, Great Britain and USA.

Traditionally food markets have been national owing to among other things transportation costs, tariffs, consumer preferences for national products, different national regulations related to health and food safety issues etc. Some of these barriers to entry have been reduced or even eliminated. The market integration and modern logistics have facilitated import from EU countries. It has become easier for the retail sector to find a competitive supplier abroad. The large-scale economies in production can make transport of large volumes over long distances profitable. Long distances are for example no serious trade barrier in regard to cheese while it may be a serious disadvantage with regard to fresh milk. This area, too, has recently seen some increase in trade across borders. Retailers in Finland have, for example, started to import milk from Sweden.

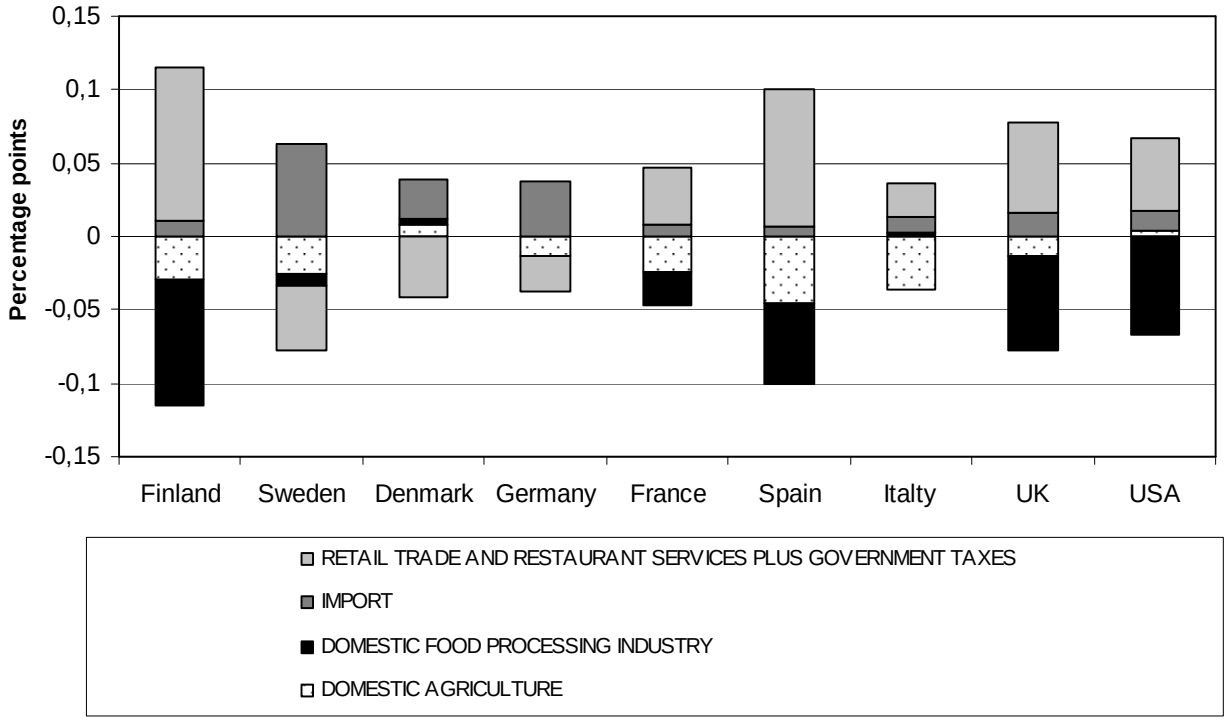
However, although markets have become more integrated and cross-border barriers have been reduced, generally the food markets remain national with respect to the way in which they operate. Consumers usually prefer food from their own country. Therefore, most of the food found in supermarkets today is still of national origin. For example, less than 5 per cent of the branded packages of food are found on the shelves of supermarkets in all the Nordic countries. Retail marketing, too, is organized nationally. Marketing both creates and reflects consumer preferences which are clearly national. Moreover, there are differences due to national regulations of, for example, opening hours, advertising, sale of alcoholic products, location of shops, etc. The national character of marketing is illustrated by the fact that all chains, even international chains such as Aldi, Lidl, and Netto plan their food marketing on a national scale.

Taking this kind of reasoning into account we represent in Figure 5 on how food expenditures have split among farmer, domestic processing, import, retail trade and restaurant in 2007 in our comparison countries. We also calculate how the shares of these sectors have changed from year 2000 to year 2007 (Figure 6).



Source: Eurostat, USDA

Figure 5. Food price formation in 2007



Source: Eurostat, USDA

Figure 6. Changes in food price formation during the years 2000-2007

In 2007, the highest farm shares are in the USA and France. According to Figure 5 the lowest farm share is in the UK. Similarly, the highest industry shares of food consumption expenditures are in Italy and

Spain and the lowest are in Germany and France. However, among the sectors in the food chain, differences in industry's share are the smallest between countries in comparison. Import food has been consumed most in Denmark and Sweden in 2007 measured as a share of total food consumption expenditures. Respectively in USA, the import share is the lowest. The highest retail, restaurant and tax shares are in UK and Finland, and the lowest ones are in Sweden and Denmark. However, this is problematic due to the high share of import foodstuff in these countries. Most of the import food goes directly to the shelves of grocery stores. High import share explains partly for the low retail, restaurant and tax share. One reason for differences in retail, restaurant and tax shares is different Value Added Tax (VAT) and commodity tax policies. The high share of retail trade, restaurant and taxes in the UK is interesting, because most of food in UK is taxed at rate zero. VAT and excise duties on food products (for example beverages) are higher in the Nordic countries, especially in Denmark and Finland, than in the other countries in the EU.

In Figure 6 is presented how the shares of each sector in food supply chain have changed from year 2000 to year 2007. As can be seen, there are both similarities and differences between countries. Clearly, farmers have been receiving a decreasing share of what consumers pay for food at retail stores in almost every country. We must also recognize that year 2007 was very good to farmers and that explains at least partly the increases in farm shares in Denmark and the USA. The industry share has decreased or stayed unchanged in the countries we examine. The most significant decrease in the industry share has occurred in Finland, Spain, UK and USA. Food import has been taking an increasing share of food consumption expenditures in every country. In Sweden, Germany and Denmark import has increased most, whereas food import has increased least in Spain and France. The development of the share of retail trade, restaurant and taxes is the most mixed one. The largest increases have taken places in Finland, Spain, the UK and the USA. However, the combined retail, restaurant and tax share have decreased in Sweden, Denmark and Germany. As explained already earlier, strong increase in the import share has a direct connection to the deduction in the retail share.

As we consider the information provided by Figure 6, countries in our comparison can be divided into two groups. In Sweden, Denmark and Germany, the growth of import explains largely the reductions in other sector's shares. This is exactly what can be predicted to happen as market get more integrated and competition from abroad increases. However, in other countries the increase in import has had a minor effect on the overall changes. In these countries the retail, restaurant and tax share has increased considerably. Finland belongs to this group.

It is interesting to notice that development in Finland is much more similar to the development in Spain than to the development for example in Finland's neighbor country, Sweden. Our baseline, however, was that the market structure and the competition situation in the food chain are very much identical in every Nordic country.

The share of domestic raw material production of food consumption expenditures has declined substantially after the year 2000 almost every country in the comparison. There can be found many causes

behind this development. In Finland, it closely relates to changes in agricultural policy of the EU and the support paid to agriculture. The increased consumption of long processed food means equally that the larger share of food price consists of other elements than raw materials produced by agriculture. The growth of import and restaurant services affect in the same manner. In Finland, it has been shown that productivity has increased more in agriculture than in food industry or retail trade. This is also one explanation for the decreasing share of domestic agriculture of the food consumer expenditures.

According to Figure 6, in Finland industry share of food consumption expenditures has declined 7 percentage points during the period of 2000-2007. It is more than in any other country in our comparison. It seems that food industry too has had to manage only with productivity growth; food processing industry has not been able to compensate for increasing costs by having more revenues from domestic market. Retailers seem to put pressure on suppliers for lower purchasing prices. The position of Finnish food companies on the home market has been also challenged strongly by competitors from abroad.

Retail, restaurant and tax share of consumption expenditure has increased 9 percentage points during the period of 2000-2007 in Finland. The increase is more than in any other country in our comparison. We argue that specifically the lack of competition, the increased concentration of retail power and therefore the growing bargaining power of the large retail groups have increased the retail, restaurant and tax share in Finland.

6. Conclusions

Efficiency and fairness of food market is essential for gaining the benefits from trade liberalization particularly in the remote and sparsely populated Finnish society. The main contribution of the research is to provide new information about efficiency of the Finnish food markets as part of the EU and the global market. Knowledge on how consumer price is divided vertically within the food supply chain is essential for designing optimal antitrust measures in order to maximize social welfare and to improve competitiveness of our food sector.

The results relating to the signs of imperfect competition in the markets have important implications for practical decision-making in the food sector. Information about relevant market structure is also important when specifying the models for forecasting the price and quantity fluctuations in a rapidly globalising market.

In Finland, retailers exert significant market power. Farmers have been the biggest sufferers. There is a lack of competition in retail, while food processors are facing increased import competition. However, farmers have not benefited in other countries either.

It seems that the EU membership reinforced the position of retail trade sector in the food supply chain relative to the domestic raw material production and food industry. Finnish retailers have increased their

share more compared to other countries, while in Finnish food processing industry the share has reduced more than in other countries in our comparison.

Our conclusion is that there are similar patterns in the development of price formation in the food chains between countries. Due to the tightening of market integration and competition every country has faced some changes in their food supply chain. Some parts of the food chain have gained from these changes, some parts have mostly suffered. Increased food import and reduced farm share are the most visible changes. Moreover, the increased concentration on both the supply and the retail side has occurred in some level in every country. Our results show that in many countries, including Finland, retail trade sector has strengthened and can exploit power in food chain.

More research will be needed to improve the precision of the analysis in this respect, for example by means of econometric models. Another avenue for further research would be to collect data on prices etc. at different stages as a basis for improved calculation of price formation in the Finnish food supply chain.

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