FOREIGN DIRECT INVESTMENT IN THE HUNGARIAN FOOD SECTOR

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SUMMARY

Hungary has been a popular target for foreign investments since the beginning of political and economic reforms. The country has received one-fourth of total FDI inflows that arrived to the Central and Eastern European region. Food processing was one of the first sectors to be privatised in Hungary. Foreign investors have participated very actively in the process since 1990. The share of foreign ownership in the Hungarian food processing sector exceeded 60 percent by 1997.

The main objective of this study is to analyse the major determinants that resulted in an uneven distribution of FDI among the seventeen individual food processing industries in Hungary. The factors that attracted large amount of foreign investment into certain food industries are searched by a regression model and cluster analysis. The paper also includes illustrative case studies of three food processing industries.

The study reviews the fears previously associated with foreign ownership in the food sector; then it weighs them against the results achieved by 1999. Hungarian food industries have accumulated a great deal of experience concerning foreign investments over the period of nearly ten years. The assessment analysis of this experience provides the Hungarian agri-food sector, foreign investors, and Central and Eastern European countries with valuable future reference.

KEYWORDS: Food processing; Sub-sectoral analysis; Concentration.

Shortly after the political changes in the late 1980s, Central and Eastern European countries opened their economies to foreign direct investments[2] (FDI). Although the majority of FDI is traded within the developed regions (Western Europe and North America), Central and Eastern European (CEE) countries have rapidly increased their capital import since the beginning of reforms. Stocks of foreign investments in CEE exceeded USD 80 billion in 1998. There is certainly a historical reason for dynamically growing capital inflows into the former socialist countries. By opening up after decades

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[2] Foreign direct investment (FDI) is a transaction in which an investor based in one country (the home country) acquires assets in another country (the host country) with the intent to manage that particular asset. This management dimension explains the 'direct' aspect of FDI distinguishing it from portfolio investments in foreign stocks, bonds and other financial instruments. (World Trade Organisation, 1996)

of isolation, they suddenly became popular targets of foreign capital. There is a notably uneven distribution of FDI among the CEE countries. Poland, Hungary, the Czech Republic, and Russia have received the overwhelming majority of foreign investments. In terms of cumulative FDI stocks, though Poland slightly overtook Hungary in 1997, the FDI stocks per capita in Hungary is still the highest in the region.

Table 1

Stocks of FDI in the Central and Eastern European countries
(in billion USD and in USD/capita)

Country	FDI stocks	FDI/capita
Poland	26.6	689
Hungary	22.5	2184
Russia	10.3	70
Czech Republic	7.6	738
Romania	2.8	123
Slovenia	2.4	1200
Croatia	2.1	438
Latvia	1.9	779
Estonia	1.4	966
Slovakia	1.4	259
Lithuania	1.0	270
Bulgaria	1.0	119

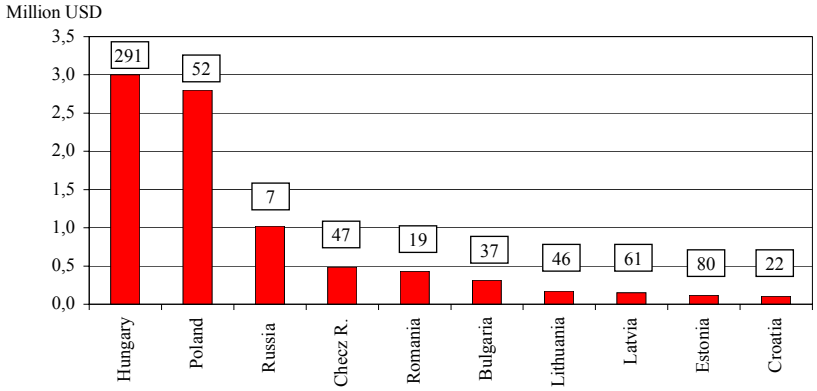
Source: Business Central Europe, December 1998, January 1999 p. 65.

Food sector has traditionally played an important role in the economies of all the CEE countries. It has ensured domestic food supply, processed agricultural raw material and in many countries contributed notably to foreign earnings. Restructuring has driven the food sectors into deep crisis in the CEE region. Capital shortage hinders modernisation and productivity improvements. Foreign direct investments are therefore of great importance in the region. Food sector has been a popular target of foreign investors; the shares of agri-food investments of total FDI stocks were between 10 and 20 percent in most of the CEE countries in 1997. Some countries, however, have attracted much more investments to their food sectors than others have. (See Figure 1) Similarly to total FDI stocks, it is relevant to calculate the agri-food FDI/capita figures for each country, since they indicate the magnitude of agri-food investments relative to the size of the population and result in a different order of countries.

Hungary absorbed the largest amount of foreign direct investments into its food sector by 1997. Food processing was one of the first sectors to be privatised. Before 1995, foreign direct investments typically arrived through purchasing state owned food processing companies. Foreigners attained almost half of the registered capital in the privatisation of the food sector that was basically completed by 1996. Investments, continued at the previous intensity also after 1996 primarily in the form of capacity expansion and to a less extent green-field investments. Food processing industries had absorbed nearly 30 percent of capital inflow of all processing industries by 1996, while food industries contributed to the output of processing industries with only 20 percent. Hungarian food sec-

tor has received a total of USD 3 billion FDI since 1991. Approximately USD 1.2 billion were spent on acquisitions and the remainder on technology and other general improvements (Eurofood, 1998). The share of foreign ownership in food industries exceeded 60 percent of registered capital in 1997. General motivations of foreign investors have been abundant and cheap raw material, tax incentives and most importantly, an entirely commercial-based privatisation approach.

Figure 1. Cumulative stocks of agri-food FDI in Central and Eastern European countries in 1997



Remark: Figures in the boxes: agri-food FDI capita in USD/capita.
Sources: OECD, (1998) and Business Central Europe, (1999).

This paper consists of three distinct sections. The first section (Chapter 1) focuses on the uneven distribution of FDI among the seventeen food processing industries in Hungary. Foreign investors have apparently preferred certain food processing industries to others. The objective of this study is centred on the question: what factors drove the priority decisions of investors? International experience shows that they favour the same food processing industries throughout Central and Eastern European countries. In order to identify the reasons for the uneven distribution of FDI among the Hungarian food processing industries, a simple econometric model was constructed including the available market power, market size, and sales opportunities and profit rate as explanatory variables.

The second section (Chapters 2 and Chapter 3) includes a cluster analysis in which food industries are grouped into three clusters by their most important characteristics. One food processing industry was selected from each cluster to support the findings of the econometric calculations and illustrate the influence of FDI on a sub-sectoral basis.

The third section (Chapter 4) is a comprehensive assessment of FDI's involvement in the Hungarian food sector. There used to be many fears concerning foreign ownership. Expectations are reviewed in light of the experience accumulated over the past eight years.

1. Priorities of FDI among food processing industries

In many Central and Eastern European countries the shares of foreign ownership in the individual food processing sub-sectors are heterogeneous. This fact is very interesting

since the basic FDI encouraging or discouraging environment and public policy directions are the same in a particular host country and its entire food sector.

A question that arises is what drives the decisions of foreign investors to prefer certain food processing sub-sectors to others. Foreign investors tend to prefer the following industries:

– traditionally popular food processing industries in international markets (e.g. confectionery, tobacco, soft drinks, beer),
– industries affected by strict production control in Europe (e.g. primarily sugar and to a less extent dairy),
– 'luxury' high value added, highly processed expensive food articles (e.g. coffee, tobacco, confectionery, soft drinks, spirits, and certain dairy products),
– industries with good or excellent domestic market prospects (usually vegetable oil, tobacco, sugar),
– industries with good export opportunities (export oriented food processing industries vary country by country in the CEE region).

Low foreign interest in individual food processing industries is similarly explained by the following obvious reasons:

– moderate market opportunities (both on the domestic and export markets),
– slow restructuring and privatisation,
– low value added, inexpensive basic foodstuffs,
– administrative obstacles in certain food industries,
– marginal significance within the food sector of the particular host country.

The world-wide phenomenon of globalisation will affect food sectors in Central and Eastern Europe. The same multinational giants have appeared on the food markets of many CEE countries. This process is well-known in sugar, soft drink and tobacco production. It is anticipated to come about also in the confectionery and vegetable oil industries. Slightly smaller but still large European firms will continue to influence the distilling, beer, dairy and meat processing industries.

In order to capture shares on the food markets of CEE countries, foreign firms have either purchased privatised companies or built new production capacity. The share between acquisitions and green-field investments was largely determined by the market prospects and privatisation concept of the particular host country.

1.1. Distribution of FDI in the Hungarian food sector

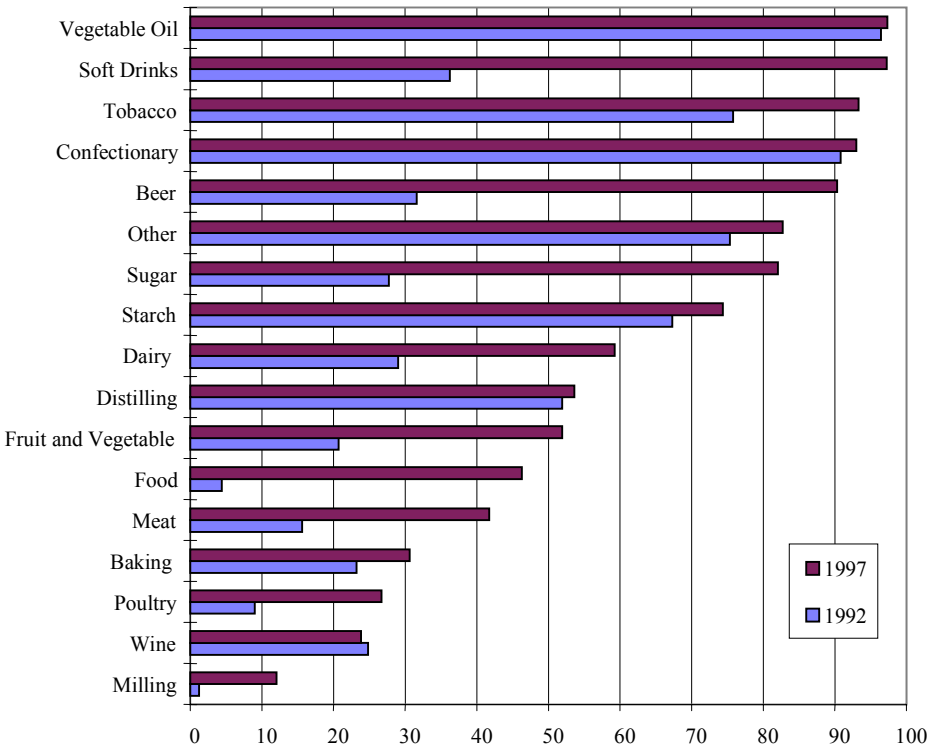
Priority considerations of foreign investors related to certain food processing industries have been prominently expressed in the uneven distribution of FDI in the Hungarian food sector. (See Figure 2.) It has apparently followed the general trends that prevail in the CEE countries.

Two phenomena characterise specially the Hungarian food sector. One is the speed of foreign acquisitions. Owing to a rapid start of privatisation, distilling, starch, confection-

ery and vegetable oil industries were acquired by foreign capital as early as 1992. (See Figure 2.) As a result, foreign investors owned one-third of the entire food sector's registered capital in 1992. The other speciality is the relatively high foreign ownership in even 'less popular' sub-sectors such as meat, fruit and vegetable processing, and feed industry.

The ultimate question is: upon what considerations did foreign firms prefer some food processing industries to others in the Hungarian food sector?

Figure 2. Share of foreign ownership in the registered company capital in Hungarian food processing industries.



Sources: Research Institute for Information and Agricultural Economics, National Association of Food Processors in Hungary.

1.2. Regression analysis

The problem of uneven distribution of FDI among the individual processing industries of the food sector has been pointed out by many studies but has not received much formal analysis. In order to identify the driving forces that resulted in the different levels of foreign ownership, I constructed a regression model.[3] The basic assumptions propound that available market power, market size, sales opportunities and profit rate of each food

[3] The functions in the regression analysis were estimated and tested by E-Views 3.0 software.

industry have affected the amount of foreign investments. The specification of the regression equation is therefore the following:

$$\mathrm{LOG}(FDI) = a_0 + a_1 \cdot \mathrm{LOG}(P) + a_2 \cdot \mathrm{LOG}(NCOS) + a_3 \cdot \mathrm{LOG}(CONC) + \\ + a_4 \cdot \mathrm{LOG}(EXP) + a_5 \cdot \mathrm{LOG}(MS) + \varepsilon$$

where $a_0 \ldots a_5$ are the coefficients of the equation and ε is the error term. Data for 17 individual processing industries were processed in the model. The dependent variable LOG(*FDI*) is the logarithm of foreign ownership share of registered capital in the i^{th} food industry. The applicable explanatory variables were unfortunately restricted by limited data sources. The incorporated variables were the following:

P – profit rate of the i^{th} food industry,
NCOS – number of companies in the i^{th} food industry,
CONC – level of concentration in the i^{th} food industry,
EXP – share of export sales in the total sales of the i^{th} food industry,
MS – share of the i^{th} food industry in the output of the Hungarian food sector.

The impact of market power and market positions was to be captured by the concentration variable. A series of industry-concentration indicators[4] were computed including concentration ratios from CR_1 to CR_{10} and Herfindahl-Hirschman indices. The various indicators were tested in the model and following to the test results CR_4 was selected to be in the final version. Market size was represented by the share of the i^{th} food industry in the Hungarian food sector. Market structure was characterised by the number of companies in the particular food industry. Initially the model was run with 1993 data for explanatory variables and 1997 figures for foreign ownership rates. The reason for such a time-lag was to examine how the 1993 structure and characteristics of food sector affected FDI and contributed to the industry-wise foreign ownership share in the successive four-year period.

Following the 'general to simple' modelling philosophy, insignificant variables were eliminated step by step. Three out of the five assumed explanatory variables turned out to be insignificant. These are quite surprisingly profit rates, number of companies and export shares. The number of companies variable did not carry substantially new information compared with concentration. The initial version of the model resulted in negative coefficient for profit rate, which was due to the erratic profitability performance of the companies under the period of restructuring and privatisation.

The most significant explanatory variable emerged to be industry-concentration followed by market size, which is the share of the i^{th} food industry in the food sector. As a basic conclusion of the model, market power was of highest importance to foreign investors in choosing specific food industrial branches. These results of the model verify such previous assumptions which showed that foreign firms preferred those food industries where concentration level was high and market positions were strong (*Alvincz*, 1994; *Vissi*, 1994).

[4] Appendix I. contains the definitions of CR_k and *HHI* as well as their computed values in the Hungarian food processing industries for 1993 and 1997.

The reduced regression equation was run by using three different functions. All data used in the regression calculation are taken from the data-sets of the Research Institute for Information and Agricultural Exonomics (Agrárgazdasági Kutató- és Informatikai Intézet, AKII). In the case of variables *FDI*, *P*, and *EXP*: AKII 1998a, and in the case of variables *CONC*, *NCOS* and *MS*: AKII 1993 and AKII 1998b. A comparison of the applied functions is presented in Appendix II. After assessing and comparing the results of the various functions, the power function with additive error terms was eventually selected. The results of the model are shown in Table 2. The specification of the equation is:

$$FDI = a_0 \cdot CONC^{a_1} * MS^{a_2} + \varepsilon,$$

where parameters a_0, a_1 and a_2 were estimated by using the non-linear least squares.

Table 2

The results of non-linear least square regression estimation

Variable	Coefficient	Std. Error	*t*-statistic	Probability
C	2.988635	1.73253	1.725012	0.1065
CONC (level of concentration)	1.103067	0.245675	4.489954	0.0005
MS (market size)	0.308789	0.157674	1.958398	0.0704

Basic statistics of the regression:

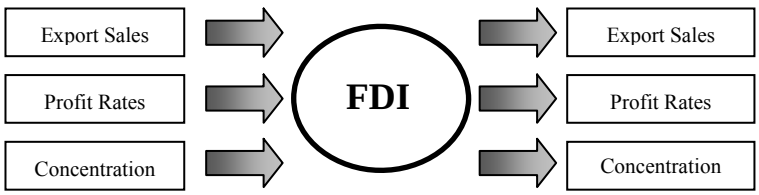
R-squared	0.676825
Adjusted *R*-squared	0.630657
Standard error of regression	0.174801
F-statistic	14.66006
Probability (*F*-statistic)	0.000368

In the case of cross sectional data series, the value of R^2 close to 0.7 is considered very good. The regression model has considerable explanatory power despite the small size of the sample. The *F* test of R^2 is significant at the 1 percent level.

1.3. The effects of FDI in the Hungarian food processing industries

The analysis can not stop at the point of identifying the motives that drive FDI allocation among the food industries.

Figure 3. Analysed impact relations of FDI in the Hungarian food industries.

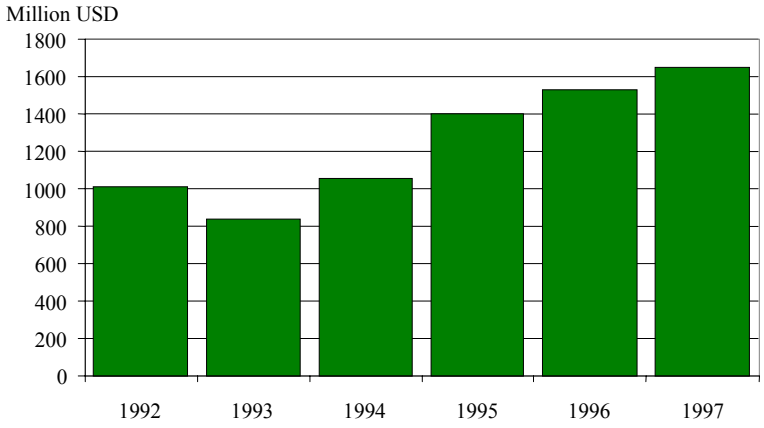


FDI itself has had an impact on the same factors that assumed or proved to determine the share of foreign ownership. FDI is therefore in the middle of an impact flowchart as illustrated in Figure 3. In order to measure the impact of foreign capital, 1993 and 1997 figures of export, profit, and concentration were compared in the food industries.

Exports

Export sales declined considerably in the early 1990s due to severe droughts and the restructuring in agriculture and food industries. Because of rapid and successful privatisation in the food sector, export sales have nearly doubled since 1993. (see Figure 4.) Foreign owned companies greatly contributed to the impressive growth. More than 70 percent of the increase in export sales were generated in food industries that have strong or dominant foreign ownership.

Figure 4. Export sales of the Hungarian food processing sector from 1992 to 1997



Source: Research Institute for Information and Agricultural Economics.

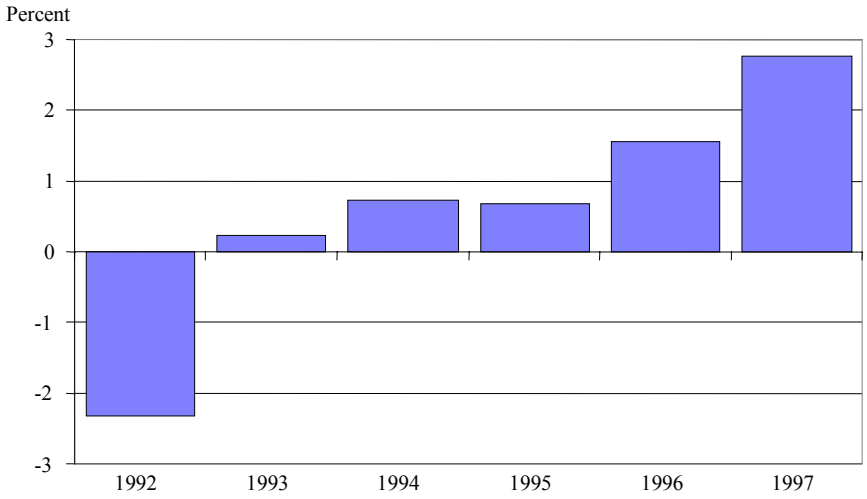
The product structure of exports has not much changed over the past few years. The major exporting industries continue to be poultry, meat, fruit and vegetable processing, and vegetable oil industry. These four industries together accounted for 72 percent of total food exports in 1997. However, the relative importance of exports is also growing rapidly in many foreign capital dominated sub-sectors such as confectionery, beer, soft drinks and tobacco. Export opportunities have grown in relative importance also in the entire food sector, the share of food exports in the total export sales of Hungary increased from 13 percent in 1993 to 21 percent in 1997.

The geographical focus of Hungarian food exports has undergone a distinct shift from East to West over the 1990s. The share of the EU increased to 40-45 percent and the share of CEFTA countries grew sharply from 5 percent in 1993 to over 20 percent in 1998. Exports to the Newly Independent States (NIS) declined to 10 percent by 1998.

Profitability

Profitability in the Hungarian food sector has improved considerably over the past years. High losses of the early 1990s turned to profits in 1993 and have constantly grown since then. (See Figure 5.) The losses at the beginning of the decade and the stable growth of profitability afterwards are attributable to the events of restructuring and privatisation. The reduction of corporate tax rate in 1995 from 36 percent to 18 percent definitely gave an additional impetus to profit growth. Private foreign and domestic ownership propelled the profitability increase. The trend, however, conceals the huge discrepancies of profit rates among individual sub-sectors.

Figure 5. Profit rate of the Hungarian food sector from 1992 to 1997*



* Profit rate = profit before taxes/total sales.
Source: Research Institute for Information and Agricultural Economics.

The majority of industries generated profits in 1997. The impressive 15-20 percent profit rates of vegetable oil and starch industries are obviously due to their monopolistic industry structure. The dominant firms of both the starch and vegetable oil industries are in the hands of foreign investors. Tobacco, coffee and distilling have also healthy profit rates from five to 12 percent. These industries are characterised by strong or dominant foreign involvement. Losses turned to profits of two to five percent in a number of important sub-sectors such as meat, fruit and vegetable processing, feed and confectionery, where foreign participation is also high.

On the other hand, even high foreign ownership has had apparently no positive effects on the profitability of dairy, sugar, beer and soft drink industries. What resulted in an inconsistently varying profitability among the food industries?

1. First, the profit rate of an industry is the sum of profit figures of several companies. The performance of individual companies deviated significantly from average even within the same industry (see Table 4 in the case study of dairy processing).

2. Foreign investors tend to spend a great deal of money on the modernisation of the companies bought through privatisation. Technical, logistic and other developments required a huge amount of additional investments between 1993 and 1997. Many foreign companies expand production capacity and acquire other companies on the market. Investments and company acquisitions might temporarily deteriorate profit performance.

3. Some foreign companies apply 'hidden profit repatriation', although they do not admit the fact in public. These companies increase their costs to such a high level that profit earnings fall to zero or even below. In these cases, the beneficiaries of suspiciously high licence and consulting fees for instance often happen to be the foreign parent company of Hungarian subsidiaries.

Present profitability figures are still quite volatile across the industries of the Hungarian food sector. It will supposedly become more transparent as agriculture continues to recover and the investments in the food sector start to affect. A corporate level analysis would certainly enlighten the influence of foreign ownership on profit rates, but company based ownership and profit figures are confidential by nature and they are hard to access to.

Concentration

The change of CR_4 concentration figures between 1993 and 1997 did not follow a uniform pattern among the food industries. Concentration increased in the biggest subsectors such as meat, poultry, fruit and vegetable processing, dairy and most prominently in the sugar and beer industries. It did not change in the starch, feed and confectionery industries, and dropped in the rest of other sub-sectors. The primary reasons for declining concentration in particular industries were the following:

– new small companies have been established and so far succeeded to survive in the shade of the giants in the vegetable oil, pasta and soft drinks industries,
– the performance of several big companies within the same industry has been levelled up in the distilling and tobacco industries,
– big companies have lost their importance on the scattered markets of milling, wine and bakery products.

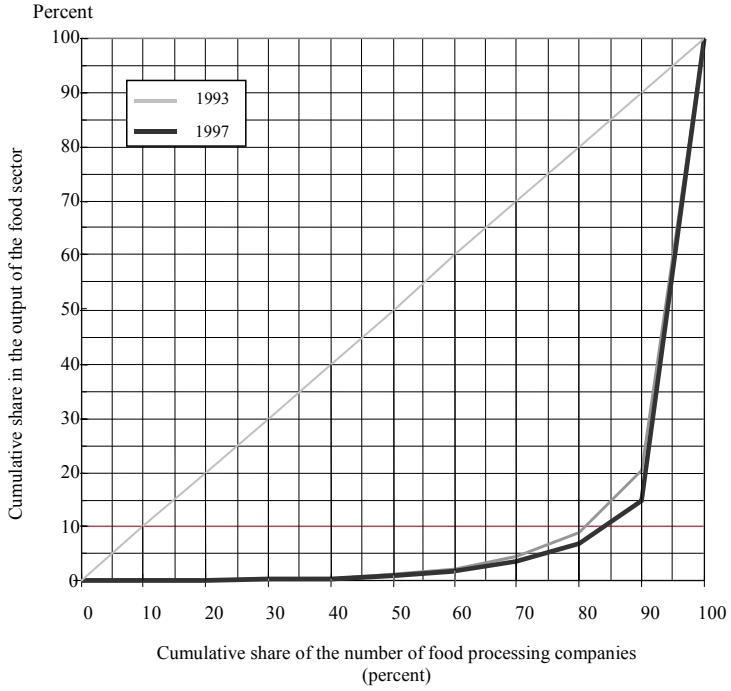
The largest sub-sectors, meat, poultry, fruit and vegetable processing and dairy are subjects to the fiercest competition. These industries are characterised by 10 to 15 medium to big sized firms and many small ones. Big firms are usually in foreign ownership. They manage to aggressively increase market shares at the expense of small or medium size domestically owned firms. Concentration is anticipated to accelerate primarily in the above mentioned large food industries as well as milling and baking industries (*Szabó*, 1997; *Fórián*, 1998).

The change of comprehensive concentration indicator of the Hungarian food sector is illustrated by Lorenz curves and the Gini index.[5] The Lorenz curves in Figure 6 show

[5] The classical application of Lorenz curve and Gini coefficient is an illustration of inequality in income distribution within a certain population. They have been also commonly used to measure market concentration levels. The Gini coefficient (G) is a summary measure of the deviation in the Lorenz curve. It is proportional to the area between the curve and the diagonal line. The value of G ranges between 0 and 1. In the case that all companies have equal market shares, the Lorenz curve is a diagonal line and G=0; in the hypothetical case when one firm controls 100 percent of the market, G=1.

strong inequality among Hungarian food processing companies. As early as 1993, the first decile had a share of 80 percent of total Hungarian food processing, while 90 percent of the companies accounted for only 20 percent of food production. Overall concentration in the food sector increased from 1993 to 1997 thus making the Lorenz curve steeper. The change of the curve indicates a growing market power of the large firms on the expense of the small ones. The Gini coefficient (G) verifies and summarises the same trend in one single indicator. The value of G has increased from 0.71 in 1993 to 0.75 in 1997 despite the fact that the number of companies grew by 36 percent over the same period. The acquisitions and aggressive growth of foreign owned companies has been a major driving force of increasing concentration of the Hungarian food sector.

Figure 6. The Lorenz curve of the Hungarian food sector in 1993 and 1997



2. Cluster analysis of the food processing industries

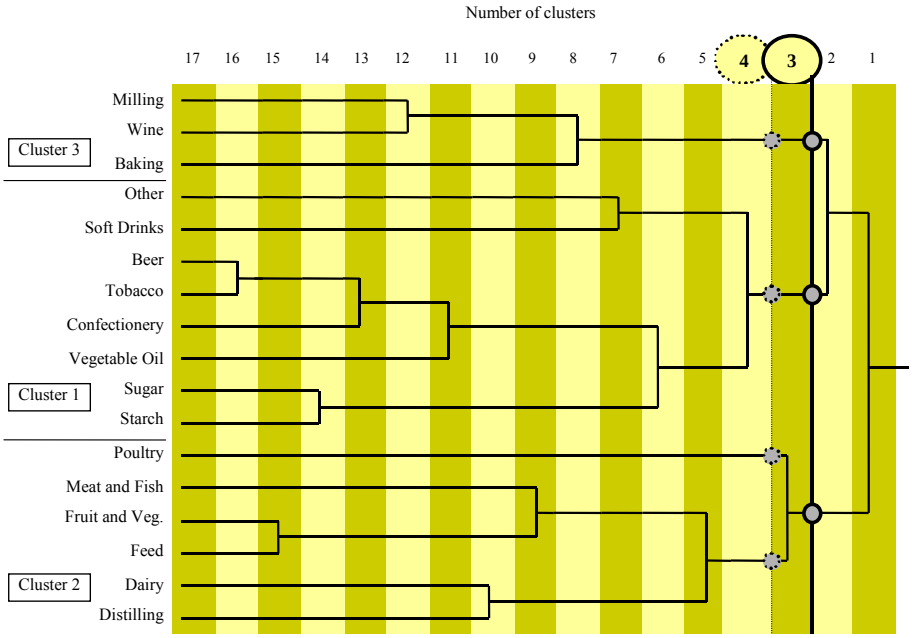
The previously presented regression analysis confirms the assumption that market power has been one of the most important driving forces of foreign investments in the Hungarian food processing sector. We also learned that the share of foreign capital and CR_4 concentration levels of 1997 are strongly correlated with each other. In order to search for further motivations and interests of foreign capital a cluster analysis[6] was carried out based on the 1997 figures of foreign capital share and CR_4 concentration ratios.

[6] The cluster analysis was carried out by using SPSS 7.5 software. The clustering algorithm included hierarchical cluster procedure with average linkage method using Euclidean distances.

Since the number of industries in the analysis is low, the hierarchical cluster procedure was applied.

The tree graph (dendrogram) in Figure 7 was constructed by using the agglomerative method, where each object starts out as its own cluster and the two closest clusters are combined into a new aggregate cluster in subsequent steps. The milling, wine and baking industries connected each other early in the process constituting a tight cluster. Beer, tobacco, confectionery, vegetable oil also formed a tight group in the early phase and incorporated the pairs of sugar and starch, and other processing and soft drinks a few levels later in the cluster combine process. The third cluster consists of meat and fish, fruit and vegetable, feed, distilling and dairy industries with poultry industry joining the group only on the three-cluster level. Poultry processing as an outlier has formed a totally separate cluster long up to the four-cluster level.

Figure 7. Dendrogram of the cluster analysis of Hungarian food processing industries



The following verbal interpretation of clusters demonstrate that three- and four-cluster levels are relevant to the classification of the Hungarian food sector.

Cluster 1. – High foreign ownership and high concentration cluster

Cluster *1* includes highly concentrated industries that attracted over 70 percent of foreign ownership. All of these industries have small shares (one to five percent) in the total food sector. (See Figure 9.) They have either monopolistic (starch, vegetable oil) or oligopolistic (coffee, tobacco, sugar) market structures, or they are characterised by the co-

existence of a few large companies and dozens of small-scale enterprises (beer, confectionery, soft drinks, paprika). The majority of Cluster *1* industries produces 'luxury', highly processed and relatively expensive food articles. This advantage coupled with excellent 'inside-industry' market positions resulted in the fact that the industries in Cluster *1* were privatised first and bought by foreign investors rapidly, almost 'in a hurry' before 1993.

Cluster 2. – Average foreign participation and average concentration cluster

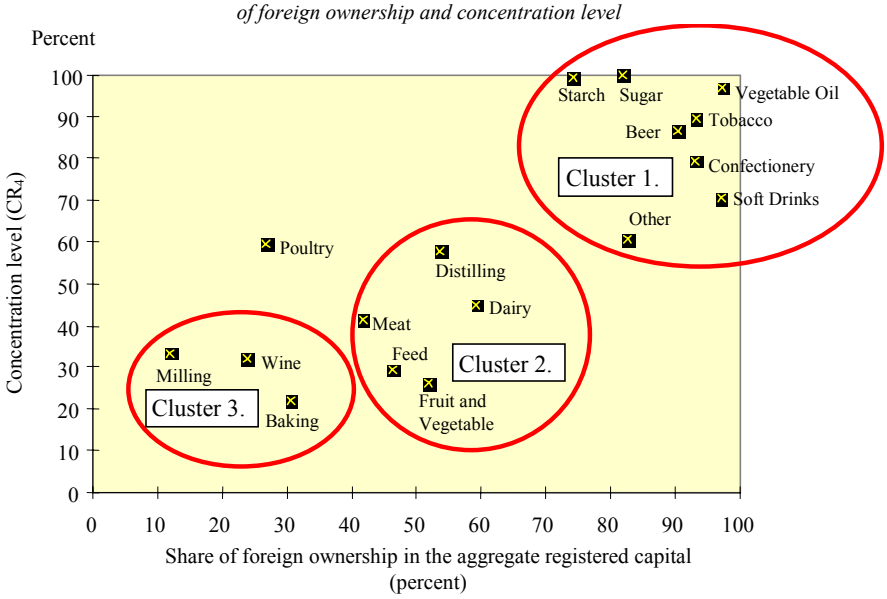
Cluster *2* includes the largest industries that together account for half of the total food production of Hungary. With the exception of distilling, each contributes to the output of the food sector with 8 to 17 percent. These industries consist of several huge processing companies. The output of the industries in Cluster *2* is a range of basic foodstuffs. Since these sub-sectors are involved in first stage processing and rely heavily on agricultural raw materials, they were badly hit by the market crisis of agricultural products in the early 1990s. The companies struggled with over-capacity and outdated equipment. That slowed restructuring and privatisation. Export had always been an important strength of these industries but they needed to be redirected to new markets after losing the traditional eastern ones. Foreign companies therefore cautiously started to invest into these industries. They bought the biggest and healthiest companies gradually between 1993 and 1996. The main factors of FDI motivations in Cluster *2* were large domestic markets and good exporting opportunities. This cluster consists of industries with good growth prospects, therefore foreign capital share is expected to increase which, in turn, will result in strengthening concentration among the companies of these industries.

Cluster 3. Low foreign participation and low concentration cluster

Cluster *3* includes also rather small processing industries, which contribute to the output of the food sector by two to seven percent. The structures of these industries are rather scattered having many processing units of similar sizes. Since baking and wine producing companies are not very big, it was hard for foreign investors to acquire significant market positions in these industries. Baking activities in Hungary usually cover a very small local market with the exception of a few large companies operating on concentrated markets such as Budapest. Winemaking is closely tied to basic agricultural activity. The fact that foreigners are still not allowed to own land in Hungary has hindered their involvement in winemaking. Milling was excluded from foreign investments for strategic and political considerations. The low participation of FDI in Cluster *3* can therefore be explained by the scattered structure of these industries and administrative discouraging reasons.

The clusters are based on the proximity of observation points to one another. (*Hair* et. *al*., 1995) Therefore, the relation and position of cluster members can be illustrated graphically as well. The score of each observation on the two variables are plotted on a chart in order to verify the clusters that were derived from the formal application of cluster analysis. The scatter-plot diagram confirms the relevance of relying on the results of three and four cluster levels. Poultry processing is rather far away from all three clusters and therefore, may constitute its own fourth cluster. On the three cluster levels it connects to Cluster *2*.

Figure 8. Scatter plot of food processing industries by the intensity of foreign ownership and concentration level



Remark: data from 1997.

Table 3

*Summary of characteristic profiles of clusters**

Variables	Cluster 1.	Cluster 2.	Cluster 3.
*n***	8	6	3
Share of FDI in registered company capital (percent)	over 80	40–60	10–30
CR_4 ratio (percent)	over 60	25–60	under 35
Domestic market size (in USD million)	40–260	350–1 000	80–420
Export capability (in USD million)	10–150	50–400	25–72
Labour productivity (in thousand USD/employee)	60–300	40–100	20–70
Number of firms (cluster average in brackets)	7–187 (73)	84–282 (116)	122–594 (303)
Type of products	'luxury' items and beverages, high value added	basic food items and intermediary products	basic food items and intermediary products

* Data from 1997.
** *n* is the number of sub-sectors in the cluster.

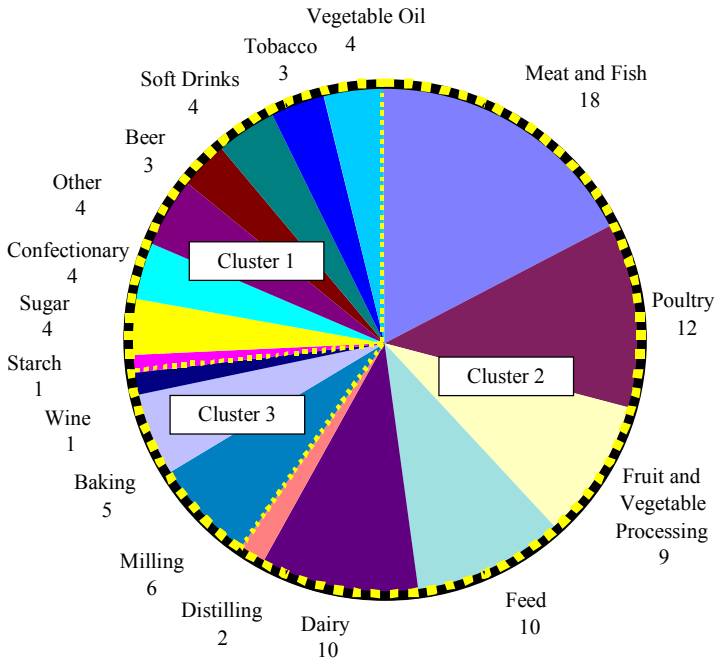
As indicated in the previous verbal interpretation, cluster members show resemblance in many more aspects than the share of foreign capital and concentration level. Table 3 summarises the characteristics of food processing industries on the three cluster levels. Poultry processing industry has most of the characteristic features of Cluster *2*, however, in terms of foreign capital it is closer to Cluster *3*. Distilling industry from Cluster *2* con-

verges towards Cluster *1* in the aspects of market size and types of products. Figure 9 illustrates a combined indicator of domestic market size and export capability showing the shares of cluster members in the output of the Hungarian food sector.

The analysis of the content of the cluster summary table reveals additional interesting phenomena about the behaviour (motivations and performance) of foreign investors. Foreign capital feels most comfortable in relatively small sub-sectors with high level of market concentration and low number of participants. The product groups in Cluster *1* have promised the best prospects for demand growth, once income levels start to grow significantly in Hungary and in other CEE countries. Productivity is far the highest in industries of Cluster *1*, which is a distinct result of rapid modernisation and capital infusion.

Foreign investors are becoming increasingly active also in the industries of Cluster *2*. They take advantage primarily of domestic and export market sizes. Modernisation of these industries has been a slower process partly because privatisation started later and partly because financially strong foreign owned companies account for approximately 50 percent of the production in the cluster.

Figure 9. The share of food processing industries in the output of Hungarian food sector
(percent)



Source: Research Institute for Information and Agricultural Economics.

The example of sub-sectors in Cluster *3* indicates that foreign investors are not particularly interested in capturing companies with modest market shares on small markets. Productivity figures in these industries are among the lowest in the entire food sector.

3. Case studies on selected food industries

The following case studies elaborate the situation of one food industry from each cluster described above. Vegetable oil industry was selected to illustrate Cluster *1*; dairy industry exemplifies Cluster *2*, while milling industry demonstrates Cluster *3*.

3.1. Vegetable oil

Vegetable oil industry probably induced the most serious debates about privatisation procedures. One single monopoly used to dominate the vegetable fats industry. The Hungarian decentralisation policy that split most of the former food processing giants left the vegetable oil processing monopoly intact. Although domestic buyers were very interested to purchase the company, they did not have sufficient resources for the transaction. The monopoly was eventually bought for USD 120 million by Cereol Corp[7] affiliated with the Italian Feruzzi Group. The State Property Agency (SPA) compelled Cereol to use certain amount of domestic raw material and improve the processing lines in technical and environmental terms. The company is presently owned by Eridania-Beghin-Say (EBS).

In 1992, a few sunflower seed producers submitted a complaint to Economic Competition Office (ECO) accusing Cereol of paying unfairly low price for raw material. Although ECO finally disapproved the complaint, Cereol raised its procurement prices to the satisfaction of raw material producers. Cereol is still far the largest firm in the industry accounting for 93.5 percent of total production in 1997. The rest of the companies have all been established within the past ten years. They are small crushing units often specialising in market niches (special oils, bio-products etc.).

Many considered the survival of the vegetable oil processing monopoly and its transfer to foreign ownership as bad strategic mistakes and a dangerous precedent in the privatisation of the food sector. The ECO was not authorised to veto the acquisition, but decided to thoroughly monitor the activities of Cereol based on the Price Act.[8] The dominant firm position was expected to imperil the interests of raw material producers and consumers. Experience did not verify these fears, in fact there are many positive features in the industry. Cereol learned a lesson from the 1992 procurement price incident. The dissatisfaction of raw material producers is not a good business policy, in fact it may endanger its own production. Therefore, Cereol have raised procurement prices that are now close to world market level.

Cereol fully met its development obligations assigned by SPA. It modernised and expanded processing capacities. Bottling capacity grew by over 300 percent after the takeover. The high debts of the former state monopoly were paid and losses were turned to at least 8 to 10 percent profit by as early as 1995. The company accounts for the huge majority of the 400 percent growth of Hungarian vegetable oil exports between 1992 and 1997. Productivity of the Hungarian vegetable oil processing industry jumped sevenfold from 1992 to 1997. On the other side of the coin there is the interest of consumers. They have had to pay higher prices for better quality products and better packaging.

[7] The whole name of the Hungarian subsidiary is Cereol Hungary Co., the case study refers to it by the short version.
[8] The Price Act authorised the ECO to intervene and block the price increases of monopolies between 1991 and 1994.

Cereol apparently intends to maintain good corporate and business relations. In order to ensure raw material supply, it co-ordinates the production of oil-seed producers. Vegetable oil industry and indirectly Cereol offers the second highest wages among the food industries. The rate is twice as much as the average wage level in the Hungarian food sector. Some of the fears about letting foreign investors have a food processing dominant firm did not prove to be real. However, Cereol firmly takes advantage of its dominant position.

3.2. Dairy

Dairy industry provides one of the most colourful and illustrative cases of foreign ownership in the Hungarian food sector. The structure of the dairy industry was rather plain in the 1980s. There were only some co-operative processors besides the Dairy Trust Company, which controlled 85-90 percent of the market. Through the restructuring process, the state monopoly was decentralised into 16 units out of which some were split even further. SPA decided to involve domestic milk producers and other domestic investors into the privatisation. They offered compensation coupons and tried to use favourable credit lines to buy dairy processing companies. Foreigners, however, were more successful in the bidding process and managed to grasp the biggest and most prosperous processing units.

Dairy companies have traditionally focused on the domestic market in Hungary. Processing facilities are geographically scattered and cover the entire area of the country. Foreign firms aimed to buy dairy factories close to Budapest. They have invested huge amounts into quality improvements, packaging, marketing distribution and logistics. At present, there are five big foreign firms in the Hungarian dairy industry: Parmalat, Danone, Bongrain, Nutricia and Gala Italia. One big group, Baranyatej–Mizo was in domestic ownership until 1999. Besides the biggest firms, dairy industry consists of over 60 companies of various sizes. In the severe competition for market share, the companies have no other choice than growth. Many of the dozens of domestically owned companies are financially weak and operate with outdated equipment. They often have poorly organised raw material supply and old fashioned product-mix. The small factories are easy prey for the expanding strong ones that usually buy them for their market share.

The performance of the big firms is not homogeneous. They all have their own strategic leading product group (UHT milk, fresh milk, fruit yoghurts, desserts, cheese, milk powder and baby foods). Although total assortment of the companies is wide, there is a relatively small overlap among the strategic products (*Szabó*, 1996). Another big difference can be found in their marketing strategies. Some put emphasis on promotion, others on distribution or pricing. The altering strategies, price margins, marketing orientation and investment schedules have resulted in an enormous discrepancy among the profitability of the companies. Table 4 shows data for 1996. The performance of individual companies might vary from year to year, yet the table illustrates the phenomenon of having substantially different profit rates even within the same industry.

Concentration in the dairy industry started in 1995 and has speeded up since 1998. The CR_4 measure of concentration (the market share of the four biggest companies) has increased significantly. CR_4 was as low as 29 percent in 1995; it grew to 36 percent in

1996. In these years the most active buyers were the French Bongrain S. A. and Hungarian-owned Baranyatej.[9] CR_4 jumped to 45 percent in 1998 and approached 52 percent by the end of 1999. Recently Gala Italia and Dutch-owned Nutricia have stimulated concentration growth. Nutricia acquired a number of smaller companies in its surrounding area, while Gala Italia purchased Avonmore in 1999. CR_4 is expected to reach 65 percent by 2002. Concentration will primarily grow through acquisitions, but some of the big ones might expand by reinforcing their present corporate premises. The six biggest firms are anticipated to further generate the growth of concentration.

Table 4

The performance of major dairy processing companies in Hungary in 1996

Company	Majority ownership	Total sales (in USD million)	Profit/loss (in USD million)	Share of profit/loss to sales (percent)
Danone	French	57.8	5.54	9.6
Tolnatej	Hungarian	34.7	2.16	6.2
Répcelak-Bongrain S.A.	French	24.6	1.10	4.5
Avonmore	Irish-Dutch	24.0	0.49	2.0
Szabolcstej	Hungarian	43.2	0.77	1.8
Zalkatej	Hungarian	11.8	0.17	1.4
Ceglédtej	Hungarian	16.0	0.12	0.8
Veszprémtej-Bongrain S.A.	French	33.9	0.18	0.5
Északtej	Hungarian	22.4	0.01	0.03
Fejértej-Parmalat	Italian	65.3	0.01	0.02
Hajdútej-Nutricia	Dutch	74.2	-0.03	-0.04
Baranyatej	Hungarian	53.1	-1.00	-1.9
Győrtej	Hungarian-Austrian	47.1	-1.01	-2.1
Class Tej	Hungarian	12.9	-0.61	-4.7
Szegedtej-Gala Italia	Italian	34.1	-1.99	-5.8
Zalatej-Bongrain S.A.	French	21.1	-2.67	-12.6

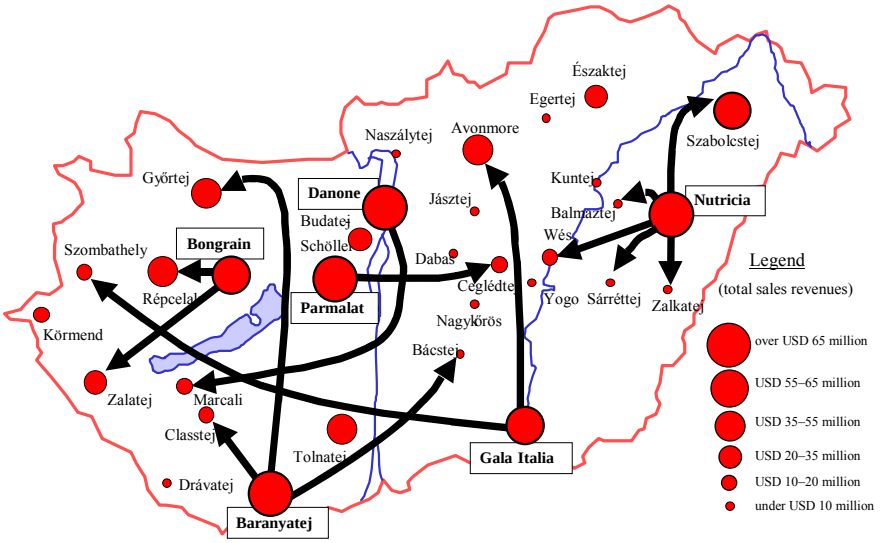
Source: Heti Világgazdaság, August 16, 1997. p. 116.

The Hungarian dairy industry still suffers from redundant capacity. At present, about one-third of the dairy processing capacity is not utilised. Big companies, therefore, will supposedly close down some of the purchased companies to secure their own market growth. Besides big multinationals currently present on the market, one or two more foreign companies might possibly enter the market by purchasing well-managed Hungarian middle scale companies such as Tolnatej. There are dozens of small dairy companies, the annual revenues of which stay under USD 10 million and their share is predicted to total a bare 15 percent of the Hungarian dairy market by 2002 (*Szabó*, 1998). Many of these small dairy companies will eventually fall in the intensifying competition. Yet some of them might survive, provided they concentrate on market niches and speciality products, make co-operation agreements with large supermarket chains or are located in

[9] The Dutch-based concern Friesland Coberco Dairy Foods received one-third of the shares in Baranyatej in the summer of 1999 by validating its formerly acquired collateral rights. The Dutch company, however, is reluctant to get the controlling package of the indebted company. Friesland Coberco is expected to entirely withdraw from Baranyatej-Mizo and most probably let the company fall.

geographically unimportant segments of the market (e.g. by the country border). Figure 10 illustrates the process of concentration growth in the Hungarian dairy industry. The six biggest companies are highlighted on the map. The sizes of the companies refer to total sales revenues in 1996 and 1997.

Figure 10. Company acquisitions in the Hungarian dairy industry 1995-1999
(the arrows indicate the directions of purchases)



3.3. Milling

The milling industry is an illustrative example of Group 3, where both the level of industrial concentration and foreign ownership are very low. Before privatisation, the milling industry included 20 grain trading companies (one in each county of Hungary) that encompassed large mills with extensive storage capacities. There were also about a hundred small and middle-scale mills in the industry.

Due to the strategic importance of grain production in the Hungarian agri-food sector, SPA followed a line of privatisation strategy different from that of other food industries. Large processing units were decentralised and mills were offered to domestic agricultural producers and private investors mostly for compensation coupons. It was quite an exceptional phenomenon in the food sector that privatisation strategy directly favoured domestic investors, although foreign capital also showed interest. Privatisation resulted in an atomised production structure and low foreign participation.

At the beginning of the 1990s, the milling industry lost its eastern markets. The oversized processing capacity and outdated equipment in the industry has brought up fundamental problems in the recent three years. Due to overproduction, the depressed flour prices did not cover processing expenditures. The small mills cannot push down expenditures any longer. Dozens of them will be driven into bankruptcy in the very near future.

During the beginning of the privatisation process, in 1993 and 1994, agricultural producers (mainly farmers' co-operatives) acquired the majority of the milling industry. Ownership structure has changed rapidly since then. Agricultural producers suffer from the lack of working capital; therefore they prefer short-term financial remedies. Agricultural producers could not handle the conflict of raw material suppliers and owners of mills at the same time. In the tight financial situation many have preferred high grain prices and disregarded owner-minded long-term considerations. In order to ease financial problems and improve liquidity, agricultural producers quickly sold their shares to other domestic private investors. Despite a thoroughly designed privatisation strategy, vertical co-ordination lead by agricultural producers did not last long in the milling industry. Hungarian investors that have bought mills recently are not strong enough to be the main initiators in the grain sector, either. Foreign capital is almost imperceptibly penetrating the grain chain from another end that has not been controlled by privatisation policies. Foreigners have purchased many grain trading companies, which have traditionally handled the huge amount of Hungarian grain exports. These companies have already started to make acquisitions in the milling industry and the next target is going to be the baking industry. They are financially strong to become the main actors of the grain chain in the next years. The increase of foreign capital will be accompanied by a rising concentration level in the milling and baking industries.

4. Assessment of FDI in the Hungarian food sector

Taking into account the analyses and the case studies of the former sections a general evaluation of the Hungarian food sector can be given.

4.1. Fears and concerns

Privatisation and foreign ownership constituted a controversial issue in Hungary in the early 1990s. It generated a lot of fears and resistance. Foreign capital implied a great deal of uncertainty for both agricultural producers and consumers. Most of the fears assumed foreign capital to act unfairly.

An extreme political direction accused SPA and the Hungarian State of selling and wasting domestic property by letting it out of domestic hands. Some analysts apprehended about short-term objectives and possible profit repatriation of the foreign companies.

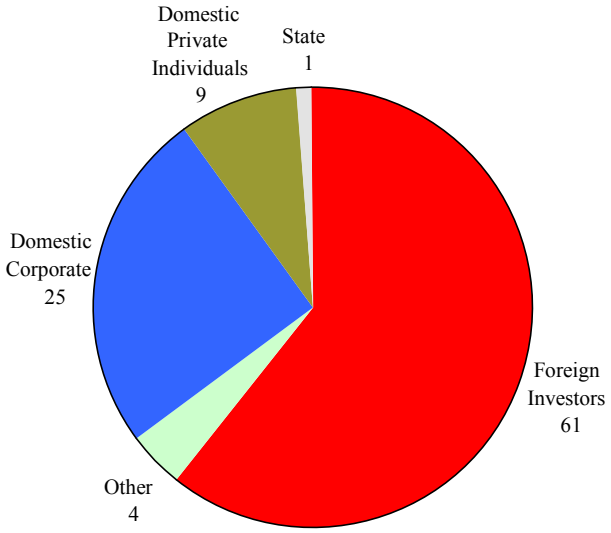
Privatisation and foreign acquisitions in the Hungarian food industry started as early as nine years ago. By the end of 1996, privatisation of the food sector was completed leaving an insignificant portion of registered capital in state ownership. (See Figure 11.)

During the relatively long presence of foreign capital in Hungary, considerable experience has been accumulated, so it is time to make an assessment on the behaviour of foreign investors. Has the anxiety regarding foreign capital investments proved true in the Hungarian food sector?

Hungarian commercial type privatisation indirectly promoted foreign investments. Agricultural producers and other domestic corporate and private investors could obviously not compete with large financially strong companies in the bidding process. SPA has often been blamed for sacrificing long-term domestic interests for short-term state

budget revenues. Generally, domestic investors have received little administrative and financial support in the Hungarian privatisation. Nor have they been granted a strongly demanded 'positive discrimination'. Agricultural producers and domestic investors managed to acquire some shares in the milling, dairy, poultry, canning and frozen food industries, but they were entirely excluded from the privatisation of several important food industries. Foreign firms purchased big chunks of the food processing capacity and started to concentrate market power by fusions and more acquisitions. The ownership structure of registered capital in the food sector will shift towards the growth of foreign ownership on the expense of domestic owners in the future.

Figure 11. Ownership structure in the Hungarian food sector at the end of 1997
(percent)



Source: National Association of Food Processors in Hungary.

Foreign direct investments implied risks for agricultural producers, domestically owned food processing companies and consumers.

1. FDI involves benefits and risks for *agricultural producers* at the same time. On one hand, foreign-owned food processing companies constitute purchasing power for agricultural produce. On the other hand, agricultural producers have no influence and control over vertical relations. Being subordinates to the processing and trading companies makes agricultural raw material producers rather vulnerable in the chain. Benefits, however, surpass risks considerably. Sure markets and financially strong buyers have contributed to the survival of many agricultural producers. One of the biggest risks for raw material producers is hidden in the EU membership of Hungary. Whether foreign-owned food processing firms will continue to procure Hungarian raw material or will look for foreign substitutes on the homogenous European market is yet uncertain. International experience suggests that multinational food processing firms rarely make their decisions on national or

emotional basis. They always purchase raw material from the most competitive sources. Hungarian producers will certainly have comparative advantages in many cases. Hungarian producers themselves can reduce and/or eliminate this risk by improving the efficiency of agricultural production by the time of Hungary's accession to the EU.

2. Another risk concerns the subsistence of *domestically owned food processing companies*. There is a considerable technological gap between foreign and domestically owned companies. The survival of the small and medium-scale processing firms will be subject to their development in technological terms, management attitude and the availability of alternative capital sources. Many of them will go bankrupt that will contribute to the growing concentration of a number of food industries. Competition will, however strengthen the vital ones and prepare them for the EU markets.

3. The fears related to more expensive and new food consumption patterns have partially proved real. *Consumers* had to pay the expenses of modernisation in the case of numerous food articles. Traditional low-price domestic substitutes were squeezed out of the market (e.g. carbonated soft drinks), but many foreign companies have continued to take advantage of the popularity of well-known domestic brands (e.g. tobacco, confectionery).

Foreign companies definitely have long-term objectives on the Hungarian market. After privatisation, they invested an additional USD 1.2 billion into the Hungarian food processing sector. Many companies have invested large amounts using a lot of external capital. At the same time, some profit has already been taken out of the country. The amount is not significant and the phenomenon of profit repatriation is a normal business activity in international capital trade.

The industry-based case studies illustrate the major dilemma of the privatisation of the Hungarian food sector. *Márton Szabó* best expressed the dilemma: 'privatisation strategy had to make its choice of two options, either to have weak but Hungarian food companies or strong but foreign ones' (*Szabó*, 1997).

Vegetable oil monopoly, for instance, would have certainly been a food industrial gold mine for the Hungarian State, but it would not have had sufficient resources to modernise the industry for several years. The examples of dairy and milling sectors prove the weakness of domestic agricultural producers as potential investors. It would be preferable to let agricultural producers build vertical relations and own up- and downstream companies like in Western Europe; but at least presently, Hungarian agricultural producers fight for their very survival and struggle with financial difficulties.

Recession and restructure of the Hungarian agriculture in the 1990s had decimated producers. Many food processing companies were financially very weak before privatisation. The entire agri-food chain was badly hit by capital shortage. In such a crisis, the only feasible solution was the involvement of external resources. Foreign direct investments have conveyed the desired capital injection into the Hungarian agri-food chain, their overall influence on the Hungarian food sector is definitely positive.

4.2. Results

Foreign investors are the primary contributors to the stabilisation of the Hungarian agri-food chain. Having captured the processing and trading segments, they have a growing impact on other elements of the food chain such as trading.

Food processing industries have highly benefited from FDI. Financial vitality and technology level of the companies has improved significantly. The overall labour productivity of the Hungarian food sector increased by 65 percent from 1992 to 1997. Domestic food supply and exports became stabilised. Modernisation resulted in improved competitiveness on international markets.

Secondary benefits are of no less significance. Large food processors provide predictable and continuous market for agricultural raw material producers. Strong foreign companies force small and medium size processors to keep up with competition. New management, marketing, information, logistic and financial methods have been introduced by foreign companies. These management concepts have spread out and have been adapted by other domestic food processing companies. Average wages in foreign capital dominated food industries have also grown rapidly. They are two to four times bigger than the average Hungarian wage level.

5. Conclusions

The anticipations concerning Hungary's accession to the EU represent a mutual section of interests and benefits. On one hand, foreign investors already envisage a homogeneous and unified market where market shares acquired in Hungary will be added to the total share of EU market. This expectation definitely applies to food products. Severe competition prevails on the saturated food markets of the EU and output is strictly controlled by quotas or other measures. On the other hand, Hungary considers FDI as an essential contributor to the improvement of the food industries. A developed food sector is a fundamental requirement on the way to the EU membership and only a competitive food sector will be able to succeed on the EU market.

Considerations that motivated foreign investments in the transitional economies differ to some extent from the regular corporate and country specific advantages that usually drive FDI among the developed countries. *The major motivations of FDI to Hungary enlighten some of the country's comparative advantages* compared to the food sectors of other CEE countries. These primary driving forces were the following: *1*) rapid corporate restructuring, *2*) privatisation of companies on a commercial basis, *3*) rapid legal reforms, *4*) availability of inexpensive and abundant production inputs: agricultural raw material, labour and food processing capacity, *5*) tax breaks and tax exemptions.

The high share of FDI in the Hungarian food sector has been mutually beneficial both to foreign investors and to the Hungarian food sector. Multinational companies have often struggled with a problem of growth on the mature developed markets. Spreading to new emerging markets coupled with the cost efficient production opportunities was a strategic necessity for many companies in their 'growth-squeeze'. Investments have recently started to pay off; sales and profit are in a growing phase in the Hungarian food sector. As for the Hungarian food sector, FDI was both a necessity and an opportunity. The deep crisis at the beginning of the 1990s could not be resolved without the involvement of outside resources.

The dilemma of having weak but domestically owned or strong but foreign owned food processing companies is an issue to be resolved in all Central and Eastern European countries. The Hungarian example proves that the latter one is a rapid remedy for

the structural agricultural crisis with no significant adverse symptoms. CEE countries that aspire for EU membership on the short or middle run are forced to upgrade their food industries and increase competitiveness of the entire agri-food sector. Within the given time span, there seem to be no other relevant options to overcome capital shortage and modernise food industries than attracting foreign investments.

The empirical section of this study confirms that concentration level is the most significant determinant in explaining the uneven distribution of FDI among the various food industries in Hungary. Market prospects, primarily domestic and secondarily export opportunities and the absolute size of the particular sub-sectors explain the attracting power of individual food industries. In other words, the price of food industrial modernisation was letting foreign investors have control over domestic food markets. The results of the regression model uncover the fact that profit rates prior to the acquisitions in the various industries did not affect the preference of investments. Foreign investments, however, have contributed to the growth of profit and export sales of the food sector over the recent years.

Studies that examine the experience of high foreign involvement in the Hungarian food sector will be worthwhile for both investors and CEE countries. Investors can use the findings to decide about continuing their capital expansion to other Central and Eastern European countries. By using the positive and negative lessons learnt from the Hungarian case, CEE countries on their behalf may modify or reinforce their attitudes to FDI that specifically targets the food sector.

The empirical research can be expanded to a direction of profit rate and export analysis based on individual company data. The construction of such an econometric model is highly dependent on the availability of corporate information. It would certainly enlighten the real role of profit and export in motivating FDI tendencies. Such studies would provide additional information to other CEE countries as well.

APPENDIX I

Concentration indicators

a) CR_k ratios

The formal specification of the CR_k concentration ratios is the following:

$$CR_k = \frac{\sum_{i=1}^{k} X_i}{\sum_{i=1}^{n} X_i}$$

where:

X_i is the total revenue of company i, /the revenues of individual companies (X_1, X_2, ... X_n) are arranged in descending order/,

k is the coverage of concentration ratio,

n is the total number of firms in the particular industry.

CR_k ratios are the most widely used indicators for measuring the strength of market concentration in the international economic literature. Commonly calculated ratios are CR_3 , CR_4 , CR_8 , and CR_{10} , out of which CR_4 has been applied in several research studies (*Shepherd*, 1990, pp. 109-111). CR_4 may also be used to conclude whether a market has oligopolistic structure. CR_4 is widely used also to measure food industrial concentration levels (*Hyvönen* and *Kola*, 1998; *O-Nagy* and *Szabó*, 1996).

b) Herfindahl–Hirschman index (HHI)

HHI index is determined by summing the squares of the market share percentage (*MS*) of each participant company on the particular market:

$$HHI = \sum_{i=1}^{n} MS_i^2$$

The value of *HHI* can vary from 1/*n* to 10 000 points. The higer value of *HHI* indicate a higher degree of (relative) concentration, however, this indicator is sensitive to the number of units. If the number of agents (firms) is large enough, the values of *HHI* can be assessed as follows. Competition prevails on the market when *HHI* is under 800. If *HHI* rises above 1 000 points, the market is imperilled by over-concentration (*Kopányi*, 1993). The particular market is considered highly concentrated when *HHI* exceeds 1 800 points.

Concentration indicators in the Hungarian food industries in 1993 and 1997*

Food processing industries	1993				1997			
	CR_3	CR_4	CR_{10}	*HHI*	CR_3	CR_4	CR_{10}	*HHI*
Meat and Fish	25.8	31.0	53.9	428	29.1	35.3	60.6	507
Poultry	40.1	46.9	81.5	841	48.5	60.1	84.2	1 074
Fruit and Vegetable	19.4	24.5	48.4	317	20.9	26.3	51.0	342
Vegetable oil	98.8	99.1	99.8	9 360	97.3	97.7	99.1	8 865
Dairy	26.7	33.0	59.9	470	32.2	39.7	70.9	627
Milling	35.0	43.2	74.0	684	26.6	34.5	63.6	501
Starch	99.6	99.9	100.0	9 044	99.3	99.6	100.0	9 459
Feed	23.7	29.3	52.4	371	23.0	29.6	54.8	385
Baking	20.8	25.3	41.3	277	19.0	21.9	32.5	197
Sugar	43.1	54.4	95.9	1 074	100.0	100.0	100.0	3 855
Confectionery	74.1	79.5	91.2	2 448	75.0	78.3	89.6	2 375
Other	70.7	77.1	92.0	2 077	54.4	60.8	83.4	1 312
Distilling	61.4	70.3	91.3	2 003	50.0	57.7	79.7	1 059
Wine	37.2	42.5	63.8	799	26.3	32.2	52.2	398
Beer	60.1	69.6	95.8	1 593	78.6	86.6	98.4	2 352
Soft Drinks	78.7	81.9	92.7	3 420	70.4	76.7	91.1	2 055
Tobacco	93.7	97.3	100.0	2 993	82.8	89.7	100.0	2 641

* CR_k ratios are given in percentage form.

APPENDIX II.

The specification and results of the applied functions in the regression analysis

The initial form of the regression function is:

$$FDI = a_0 + a_1 P + a_2 NCOS + a_3 CONC + a_4 EXP + a_5 MS + \varepsilon$$

After variables *P*, *NCOS* and *EXP* have been removed, the specifications of the applied functions/methods have taken the following forms:

– linear:

$$FDI = a_0 + a_1 CONC + a_2 MS + \varepsilon$$

– double logarithmic:

$$\ln(FDI) = a_0 + a_1 \ln(CONC) + a_2 \ln(MS) + \varepsilon$$

– power function (with additive error term):

$$FDI = a_0 * CONC^{a_1} * MS^{a_2} + \varepsilon$$

The table includes the main results of the regression analysis:

Function/Method	Linear			Double logarithmic			Power		
Variables/Statistics	*C*	*CONC*	*MS*	*C*	*CONC*	*MS*	*C*	*CONC*	*MS*
Coefficient	-0.133	1.052	2.322	1.420	1.176	0.420	2.989	1.103	0.309
Standard Error	0.218	0.238	1.559	0.895	0.340	0.235	1.733	0.246	0.158
t-statistic	-0.613	4.416	1.489	1.588	3.461	1.789	1.725	4.490	1.958
Probability	0.550	0.001	0.159	0.135	0.004	0.095	0.107	0.001	0.070
R-squared		0.6287			0.4808			0.6768	
Adjusted *R*-squared		0.5757			0.4066			0.6307	
St. Error of Regression		0.1874			0.4662			0.1748	
F-statistic		11.8533			6.4824			14.6601	
Probability of *F*-statistic		0.0010			0.0102			0.0004	

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