# Competitiveness in the Food Industry:

# a CGE Modelling Approach to assess Foreign Direct Investment in Transition Countries

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ABSTRACT

For transition countries, the food industry sector is a key industry in terms of output and employment shares. As a competitive sector that receives substantial foreign direct investments (FDI), it plays an important role as an element in the process of integration in the European and world market. The GLOBE Computable General Equilibrium model is applied to analyse scenarios of alternative development pathways of the food industry sector, taking into account the impact of FDI in the European food industry. The scenario analyses of this study identify that with an enhanced attraction of FDI in the food processing industries in the New Member States (NMS) the integration of the agri-food sectors in the NMS into the Single European Market will become even stronger.

**Keywords:** Food industry, foreign direct investment, CGE, transition countries.

## 1 INTRODUCTION

In 2005, the European Union (EU) was the world's largest producer of all foodstuffs. In particular, the European food industry sector was the largest manufacturing sector; worth over €836 billion in terms of production and accounting for about 14% of the total manufacturing turnover. For the NMS, the food industry sector plays an important role as an element in the process of integration being a competitive sector that receives substantial foreign direct investments (FDI).

A quantitative approach is applied to analyse scenarios of alternative development pathways of the food industry sector, taking into account the impact of inward and outward (foreign direct) investments, translated into different technical change ratios.

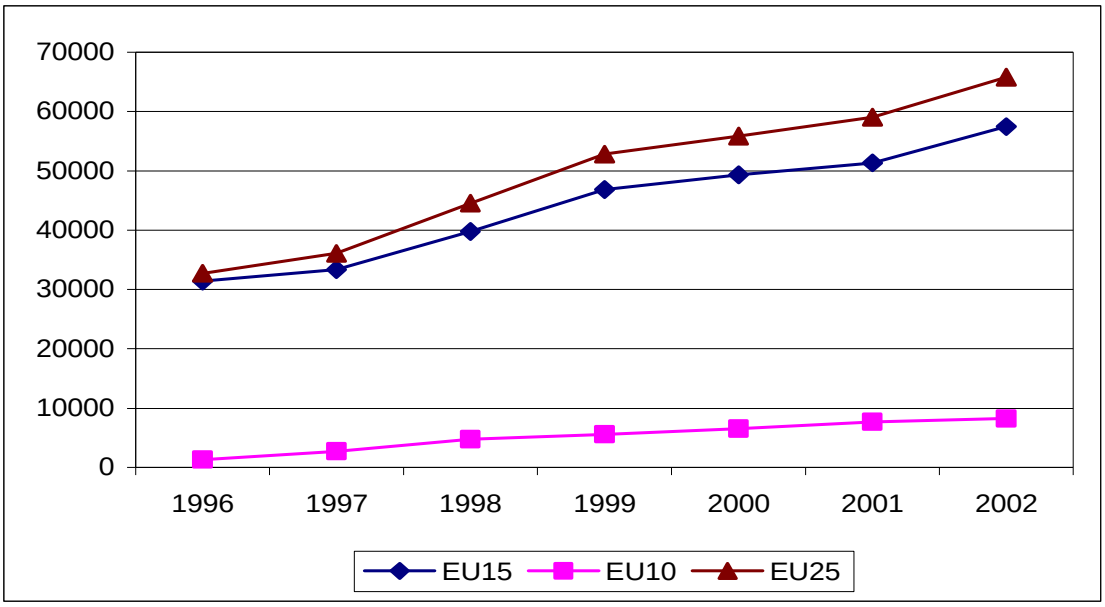
This paper is based on a project analysing the European food industry sector, which has been carried out under the leadership of Centre for European Policy Studies (CEPS) and coordinated by the Institute for Prospective Technological Studies one of the Joint Research Centres of the European Commission.

The paper describes in the first part on foreign direct investments (FDI) in the European food industry with a focus on the NMS. In the consequent sections the paper introduces the analysis, based on a computable general equilibrium model (GLOBE model), simulating relevant scenarios of potential development paths of the food industry sector, and taking into account in particular FDI as a driving factor. Based on these simulations conclusions are drawn.

## 2 FDI IN THE FOOD INDUSTRY

The food industry and certain sub-sectors in particular are attractive to FDI. The U.K., the Netherlands, France, Denmark and Italy are the main investors of the EU in the food industry sector; while France, Germany, Italy and some NMS are the main recipients of FDI. FDI has an upward trend both in EU15 and the NMS (Figure 1). In fact, inward FDI stocks in the food industry increased by 101% on average in the EU25 over the period 1996-2002. Finland, Latvia and Denmark experienced the highest increases. In France, the level of foreign investments slightly decreased during the same period. As compared to the EU15, the NMS experienced a higher increase in FDI stocks over the same period.

**Figure 1: FDI inward stocks in the food industry, 1996-2002 (€ million)**




Source: UNCTAD (http://www.unctad.org/Templates/StartPage.asp?intItemID=2527&lang=1) and WIIW (http://www.wiiw.ac.at/e/fdi.html).

The main sectors that attract FDI are those of high-value production and often with a significant share of output being designated for exports (e.g. tobacco, soft drinks, brewing, confectionery, oil refining, and specific dairy products). Sugar beet processing has also been a popular target, while most FDI in the NMS have involved the takeover of local firms, with subsequent restructuring including new investments, transfer of new technologies and marketing expertise. In some countries, privatization has also been a route for foreign investment to enter the sector and FDI flows have trended downwards as privatization has been completed (e.g. Bulgaria). Finally, completely new production facilities have been established by FDI, such as tobacco and pet food in Lithuania.

In the NMS the food industry is still in the process of transition from inherited structures in the past to the new market environment. Nevertheless, there has been considerable success in attracting foreign investors from the EU15. In seeking new markets, the largest EU15 processors have started operations in EU10 markets, affecting local market competition.

The impact on local food companies is mixed. While local food companies face market pressure from multinational investments, they can also benefit by learning from foreign investors. For example, multinationals were in a better position to provide farms more credible contractual arrangements coupled with the use of assistance programs. However, local processors have benefited by imitating foreign affiliates and using the higher-quality inputs from their suppliers. As a result, FDI in the agri-food sector, through the establishment of foreign affiliates in NMS have significant positive backward and forward linkages (spillover effects) reflected in product quality improvements, growth of small local suppliers through assistance programs, increased competition and productivity. Yet, FDI could lead to elimination of competitors and monopolistic or oligopolistic situations with undermined small input-suppliers.

Factors mentioned as encouraging foreign investment include low labour costs and cheap raw materials, and current or expected access to the EU market. In some countries, their position as a platform to enter markets to the East might also be important. Given the pattern of FDI, one might speculate that global food multinationals have also wanted to leverage their marketing expertise in brand management in the domestic markets of the NMS.

Where countries have found difficulty in attracting FDI into the food industry, this has been due to bureaucratic barriers, as well as sudden and unpredictable changes in the legal framework and particularly taxation.

Overall, foreign direct investment has played a crucial role in the integration of the NMS into the European food system, and also more generally in the restructuring of the European food industry. There is plenty of evidence that FDI has contributed to productivity growth of food systems, not just at the processing and retail level, but also at the producer level. Restrictions on foreign investment either directly through regulatory constraints or indirectly through poor macro-economic policies or weak property rights regimes have hurt economies in general and the competitiveness of food systems more specifically.

## 3 GLOBE-MODEL

The current situation in agri-food trade relations of NMS with the EU15 Member States is analysed with the GLOBE model (MCDONALD et al. 2006). The GLOBE model is a member of the class of multi-country, computable general equilibrium (CGE) models that are descendants of the approach to CGE modelling described by DERVIS et al., (1982). The GLOBE model is Social Accounting Matrix (SAM) based that has been calibrated using data derived from the Global Trade Analysis Project's (GTAP) database (DIMARANAN 2006), wherein the SAM serves to identify the agents in the economy and provides the database with which the model is calibrated. The SAM also serves an important organisational role since the groups of agents identified in the SAM structure are also used to define sub-matrices of the SAM for which behavioural relationships need to be defined[1]. The implementation of this model, using the GAMS (General Algebraic Modelling System) software, is a direct descendant and extension of the single-country and multi-country CGE models developed in the late 1980s and early 1990s.

The here applied aggregation of the GLOBE model consists of 23 commodities and activities, 5 factors and 18 regions (Table 1). This aggregation of the database produces a model with around 80,000 equations/variables, which is at the upper limit of model size for the results to be tractable.

[1] As such the modelling approach has been influenced by Pyatt's "SAM Approach to Modeling" (PYATT, 1987).

**Table 1: Applied GLOBE model accounts**

| Label | Description | Label | Description |
|---|---|---|---|
| **Commodities and Activities** | | **Factors** | |
| gran | Grains | land | Land |
| scb | Sugar cane and beet | UnSkLab | Unskilled labour |
| ocrp | Other crops | SkLab | Skilled labour |
| pbf | Plant based fibres | cap | Capital |
| lstk | Livestock | natres | Natural resources |
| mlk | Raw milk | **Regions** | |
| aprd | Other animal products | deu | Germany |
| mins | Minerals | ita | Italy |
| meat | Meat | aut | Austria |
| mprd | Meat products | gbr | United Kingdom |
| vof | Vegetable oils and fats | fra | France |
| dair | Dairy products | bnl | Benelux |
| suga | Sugar | espt | Spain and Portugal |
| ofd | Other food products | reu | Rest of EU-15 |
| btob | Beverages and tobacco | pol | Poland |
| bind | Base industries | hun | Hungary |
| manu | Manufactures | cze | Czech Republic |
| mach | Machinery | reur | Rest of EU-10 |
| util | Utilities | robu | Romania and Bulgaria |
| cns | Construction | tur | Turkey |
| trd | Trade and communication | roecd | Rest of the OECD |
| tran | Transport | cis | Former communist block |
| serv | Services | merc | MERCUSOR |
| | | row | Rest of the World |

The effects of two policy scenarios are examined. Scenario 1 (HARM scenario) considers the impact of the expansion of the EU and the harmonisation of policies associated with EU memberships, while scenario 2 (HARMTECHCHG scenario) is concerned with the impact of technical changes consequent upon EU membership and foreign direct investment (FDI). Where a policy shock is constituted of changes in a number of different policy instruments, e.g., tax rates, separate simulations are run for each set of changes in policy instruments so as to provide an appreciation of the impact of each component of the shock; this is in addition to simulations that include all the changes in policy instruments. Consequently, as a general rule and as is only presented here, the final experiment in a scenario represents the core experiment. For instance, while an assessment of EU accession and policy harmonisation may be viewed as a single exercise the modelling of such an event will typically involve the running of a number of different simulations so as to provide an understanding of the roles of bilateral trade tax reductions and domestic policy harmonisation. Modelling FDI in a global comparative static CGE model raises a number of methodological issues. For this study it was decided, that the FDI simulation should be limited to changes in the technologies used by the food processing activities in the recipient regions, and the changes would be determined by the differences in technological characteristics of the corresponding activities in the source regions. This simplification captures the effects that are of primary interest in this study; namely the impacts of changes in the cost structures within food processing activities upon the patterns of inter regional trade.

# 4 SCENARIO RESULTS

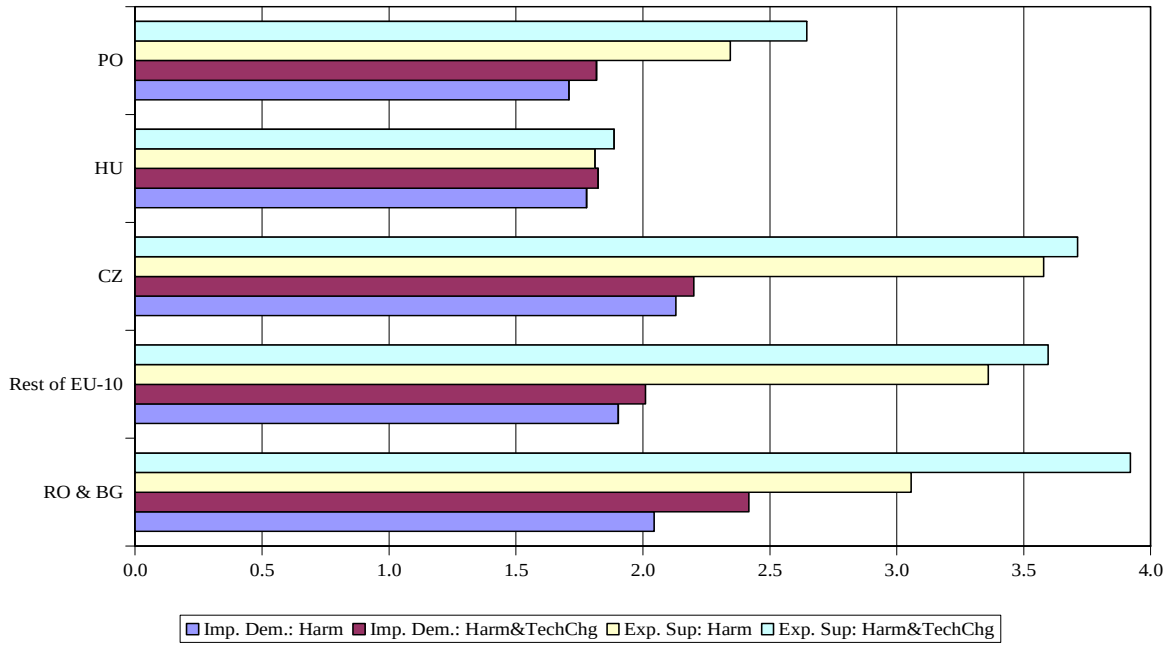
The HARM, HARMTECHCHG scenarios will be compared with the initial situation (BASE). The expectation is that the effects of both experiments will be complementary; it is therefore important to note the extent to which the complementary effects mean that the combine effects are greater or smaller than the sum of the individual effects. The discussion of the results will first focus on changes in macroeconomic variables and trade. Changes in output prices and quantities will be discussed followed by changes in factor demand and prices.

**Table 2: Real GDP from Expenditures under Different Scenarios, in 100 Mill. USD**

| | BASE | HARM | HARMTECHCHG |
|---|---|---|---|
| **Germany** | 18521.66 | 18522.34 | 18522.40 |
| **Italy** | 10876.87 | 10877.18 | 10877.21 |
| **Austria** | 1895.92 | 1896.15 | 1896.15 |
| **United Kingdom** | 14253.94 | 14253.94 | 14253.95 |
| **France** | 13200.38 | 13200.56 | 13200.57 |
| **Benelux** | 6280.34 | 6280.35 | 6280.38 |
| **Spain and Portugal** | 6920.21 | 6920.31 | 6920.31 |
| **Rest of EU-15** | 7176.84 | 7177.00 | 7177.02 |
| **Poland** | 1745.12 | 1742.72 | 1758.81 |
| **Hungary** | 510.52 | 509.72 | 511.35 |
| **Czech Republic** | 553.03 | 552.75 | 555.73 |
| **Rest of EU-10** | 754.42 | 754.38 | 760.47 |
| **Romania and Bulgaria** | 507.81 | 503.49 | 514.94 |
| **Turkey** | 1465.68 | 1465.63 | 1465.64 |
| **Rest of the OECD** | 166059.59 | 166059.66 | 166059.68 |
| **FSU** | 6253.87 | 6254.21 | 6254.24 |
| **MERCUSOR** | 11297.42 | 11297.37 | 11297.36 |
| **Rest of the World** | 42074.83 | 42074.92 | 42074.93 |
| **Total** | 310348.43 | 310342.69 | 310381.13 |

A national level the impact of harmonization and an enhanced productivity growth in food processing has only little impact (Table 2). The scenario HARM has a slight negative effect at national level due to the introduction of direct payments and an increase in market price support. The combined scenario HARMTECHCHG, however, compensates for the negative effects of the HARM scenario. Real GDP is increasing in all NMS compared to the base situation.

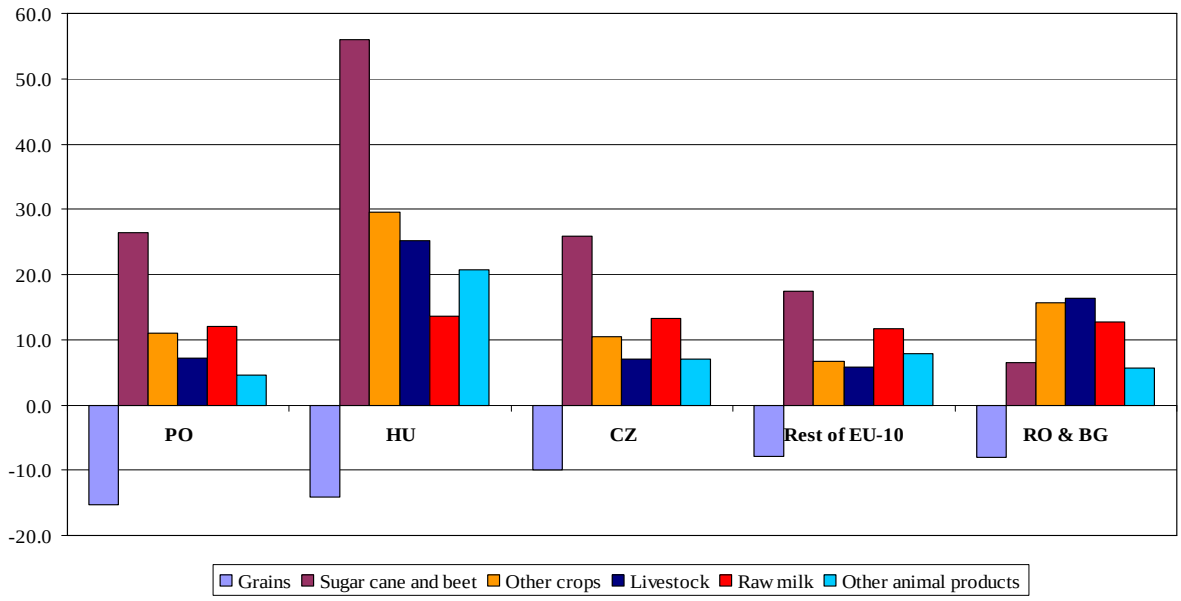
**Figure 2** **Changes in Total Import Demand and Export Supply in the NMS under Different Combined Scenarios, relative to BASE, in percent**




In the NMS import growth is driven by the impact of the single market (scenario HARM). Total import demand grows between 1.5% in Poland and 2% in the Czech Republic. Under the HARMTECHCHG scenario market integration of Romania and Bulgaria increases more strongly and total imports in Romania and Bulgaria increase by 2.4% (Figure 2). Exports in the NMS increase due to both the harmonization and increasing productivity growth. Here both effects add-up and result in higher growth rates in total exports than growth rates in total imports in all NMS.

In most of the NMS output prices show a strong increase for agricultural products, which are almost non-traded, e.g. sugar beets and raw milk (Figure 3). The strong increase in prices for dairy and refined sugar in Hungary leads also to an increase in sugar beet and raw milk prices. Here higher input prices also influence the market prices of processed output. In the other acceding countries this relationship is not evident due to high productivity growth in food processing industries and smaller increases in prices for intermediate inputs. Due to reduced price support after harmonisation, and a strong increase in production, cereal prices decline in all NMS. Lower border protection for beverages and tobacco also cause declines in prices for these commodities in all NMS.

**Figure 3: Changes in Output Prices of Primary Agricultural Products under Scenario HARM&TECHCHG in NMS, relative to BASE, in percent**




In general grain production increases in all NMS while production of other crops decline in most of the NMS decline after introduction of the CAP; these changes are broadly consistent with the price changes. In Hungary, apart from grains the supplies of all primary agricultural products decline, and also decline in most food processing activities. In Poland, livestock supply increases by more than 5% in the HARM scenario. For livestock production the increase in prices also follows in an increase in output in Poland and the Czech Republic. In the rest of EU-10 an increase in raw milk and sugar beet prices has a positive impact on output level. The decline in other animal products (mainly pork and poultry meat) is caused by an increase in feed costs. The impact of enlargement for primary agricultural production in the EU15 is rather limited. The results indicate a shift of cereal production from the EU15 to the NMS of Central and Eastern Europe. In Figure 4 and Figure 5 the changes in output quantities for processed food under both scenarios are presented.

**Figure 4: Changes in Output Quantities for Processed Food under Scenario HARM in NMS, relative to BASE, in percent**

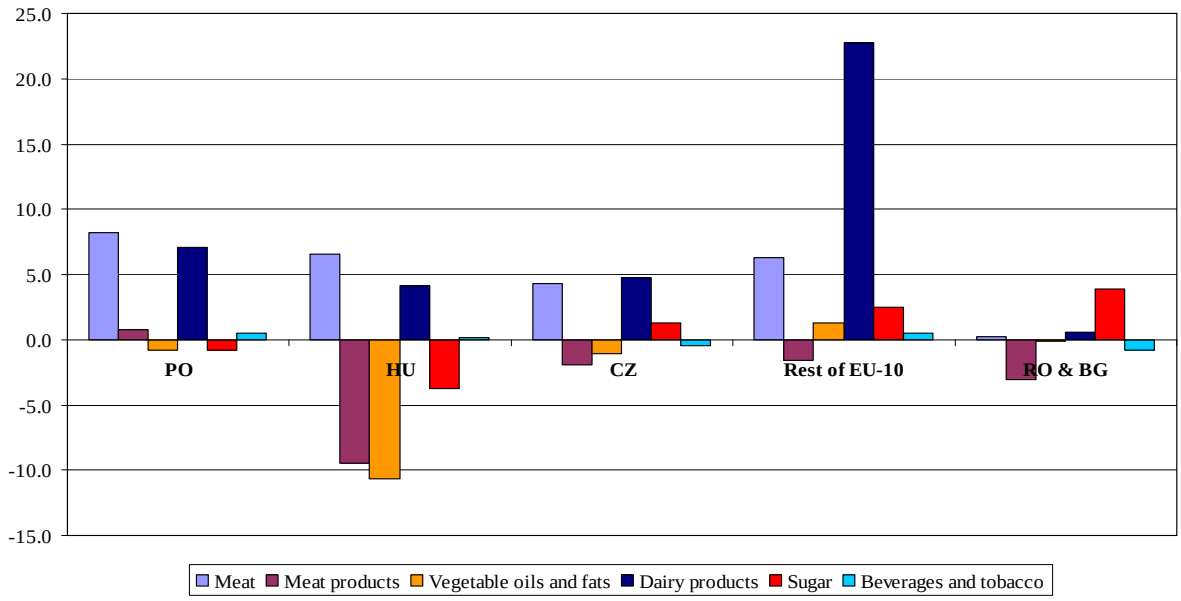
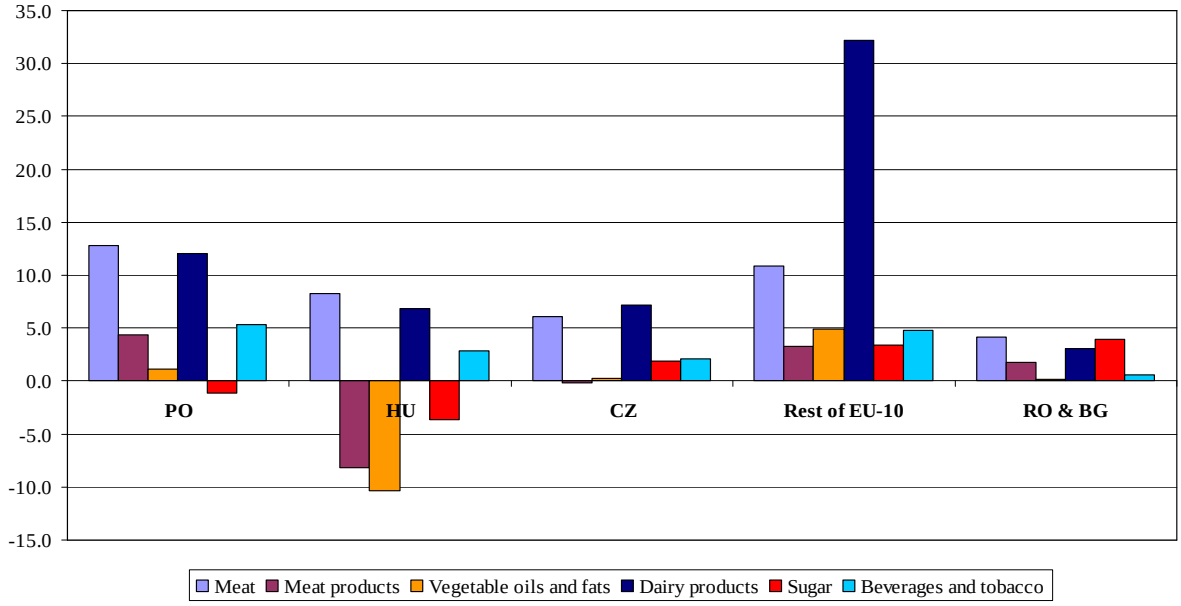



**Figure 5: Changes in Output Quantities for Processed Food under Scenario HARMTECHCHG in EU-12, relative to BASE, in percent**

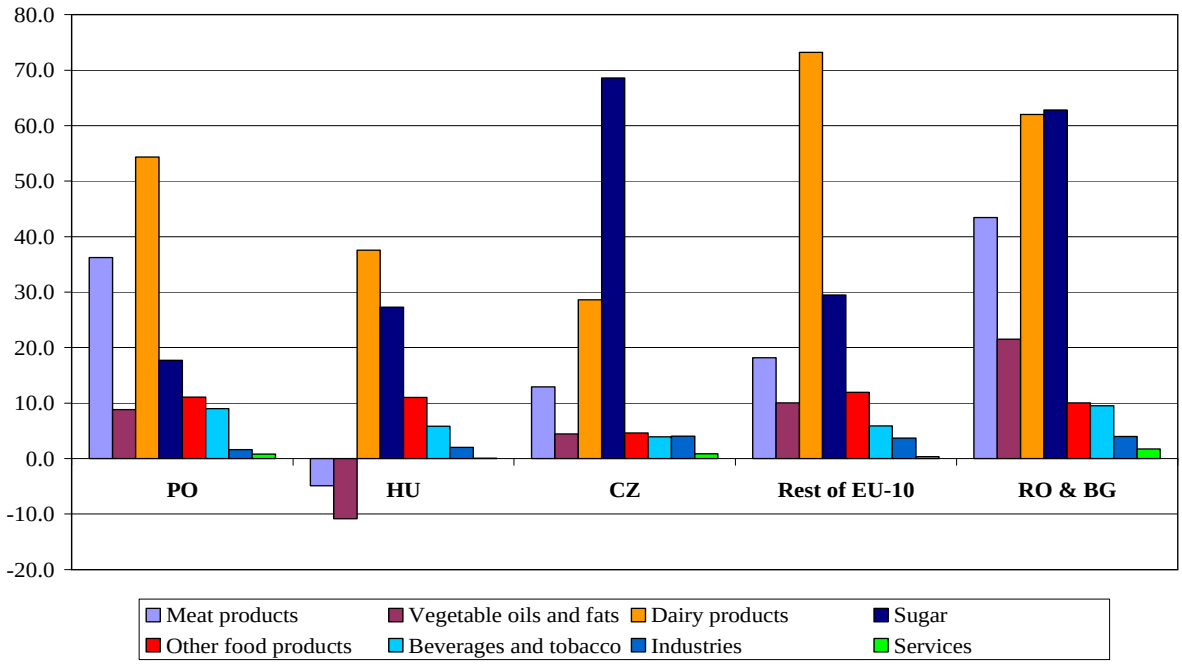



The figures highlight that due to improved technical change in the HARMTECHCHG scenario the production quantities for processed food improves compared to the HARM scenario. Overall the production of most processed foods in the NMS improves considerably compared to the BASE situation.

The results of the HARM scenario show an intensified agri-food trade between the Member States of the EU-15 and the New Member States which is due to the Single European Market. However, most of this increase in trade between EU Member States reflects a redirection of

trade flows rather than trade creation. Here, trade relations with the countries of the Former Soviet Union (FSU) are mostly affected. The differences in changes in export supply across the NMS are also due to the initial protection of the EU15 and the NMS, as well the degree of integration into international markets before enlargement. Under the combined scenario exports of grains and livestock increase for all NMS; these increases are triggered by lower border protection in the EU15 countries. Other crops' exports however decline in most NMS, which can be explained by lower excess supply in the NMS. Compared to primary agriculture, processed food exports grow even more strongly after EU membership. The meat, dairy and sugar industries show the highest increase in exports under the HARMTECHCHG scenario (Figure 6). The results of the HARMTECHCHG scenario show that the combination of EU membership and an inflow of FDI to the food processing industries, which is modelled in terms of higher rates of technical progress in the agri-food sector, will result in an increase in agri-food export in New Member States by 10 %.

**Figure 6: Changes in Industries' Exports under Scenario HARM&TECHCHG in EU-12, relative to BASE, in percent**




Factor prices do not change significantly in the EU15; enhanced productivity growth in the NMS food processing industries have only minor impacts on factor prices and demand in the EU15 countries. On the other hand enhanced productivity growth in food processing will even fuel the increase in land prices in the NMS (Table 3). Here land scarcity increases in the NMS under HARMTECHCHG scenario and land prices continue to increase. The strong increase in land price can be also explained by the fact the land is a fixed factor in agriculture which after accession receives big subsidies paid to land.

**Table 3: Changes in Land Prices, relative to BASE, in percent**

| | Harm | HarmTechChg |
|---|---|---|
| Germany | 0.09 | -0.03 |
| Italy | 0.11 | 0.07 |
| Austria | -3.10 | -3.10 |
| United Kingdom | -0.23 | -0.26 |
| France | -0.92 | -1.00 |
| Benelux | 0.89 | 0.69 |
| Spain and Portugal | -0.59 | -0.60 |
| Rest of EU-15 | -0.36 | -0.43 |
| Poland | 103.70 | 119.94 |
| Hungary | 238.66 | 252.31 |
| Czech Republic | 60.81 | 71.03 |
| Rest of EU-10 | 105.90 | 123.78 |
| Romania and Bulgaria | 222.34 | 241.82 |
| Turkey | 1.00 | 1.03 |
| Rest of the OECD | -0.04 | -0.05 |
| FSU | 0.02 | 0.02 |
| MERCUSOR | -0.08 | -0.09 |
| Rest of the World | -0.01 | -0.01 |

The change in land price is mainly due to the strong increase in subsidies paid to this factor but also due to changes in cropping pattern. The HARM scenario, with introduction of direct payments, has a strong impact on land demand for grains in all NMS. Land demand for sugar beet and for livestock declines, due to decoupled payments in livestock production. This tendency is even stronger in the combined HARM&TECHCHG scenario. The combined scenario HARM&TECHCHG has little impact in most other European countries with the exception of Austria where land for grain declines and for livestock uses expands.

**Table 4: Changes in Unskilled Labour Demand in Agri-food industries under Scenario HARMTECHCHG, relative to BASE, in percent**

| | Poland | Hungary | Czech Republic | Rest EU-10 | Bulgaria & Romania |
|---|---|---|---|---|---|
| Grains | -5.18 | 10.66 | -4.72 | 2.89 | -5.16 |
| Sugar cane and beet | 3.12 | 0.93 | 5.90 | 5.90 | 5.14 |
| Other crops | -2.73 | -11.69 | -1.76 | -1.87 | 1.70 |
| Plant based fibres | -0.46 | 9.56 | -0.08 | 1.23 | 7.01 |
| Livestock | 7.57 | 5.11 | 3.76 | 0.30 | 3.36 |
| Raw milk | 1.57 | 7.51 | 1.17 | 3.44 | 3.32 |
| Other animal prod. | 3.85 | -0.77 | 1.71 | 0.99 | 4.85 |
| Meat | 8.36 | 10.56 | 5.12 | 7.19 | 5.61 |
| Meat products | 2.40 | -2.08 | 0.68 | 0.02 | 1.31 |
| Vegetable oils | -2.64 | -9.64 | -4.53 | -2.25 | -2.91 |
| Dairy products | 8.02 | 6.46 | 5.53 | 20.42 | 1.12 |
| Sugar | 3.27 | 5.40 | 3.39 | 6.85 | 3.13 |
| Other food prod. | 0.72 | 0.27 | -0.11 | 0.17 | 3.26 |
| Bever. & tobacco | -0.41 | -0.15 | -1.44 | 1.05 | 2.11 |

The impact of the HARM&TECHCHG on labour demand in agricultural sectors is less pronounced compared to the changes in land demand. Compared to HARM scenario, the employment effects are greater under the combined HARM&TECHCHG scenario. Here the

additional production incentive in primary agriculture by enhanced technological change leads to an increase in employment in agri-food industries.

The introduction of the CAP has some effect on agri-food production and consequently also on demand for labour. However, the changes in labour demand are relatively small compared to land demand. These different effects are due to the fact that land is a sector-specific factor in agriculture. On the other hand labour is assumed to be flexible and to be able to move into and outside agriculture. Production technology allows substituting between different production factors. Lower land user prices leads to an increase in land use and a decline in labour use in some cropping sectors, e.g. grains. Here changes in relative factor prices lead to increases in labour intensity in grain production in Poland, the Czech Republic and in Bulgaria and Romania. In the food processing industries growing output in dairy and meat processing leads also to an increase in employment.

# 5 CONCLUSIONS

This paper identifies the importance of attracting FDI in transition countries which contributes to an accelerated economic growth, an improved trade balance and higher employment in the agri-food sectors. FDI serve to generate employment and income to the extent that they do not eject local firms out of business. FDI remove capital constraints and result in transfer of technology or spurring innovation. However, FDI could also result in concentration of global market power and repatriation of profits.

The qualitative and quantitative analysis shows the impact and importance of EU membership for the agri-food sectors in the NMS. In general, EU membership has a positive impact on production and income in the agri-food sectors in the NMS. The internal trade liberalisation amongst the members of the Single European Market will help to improve the market integration of the agri-food sectors into the European economy. With the full membership agri-food trade balances improve which indicates an increase in the competitiveness of the NMS agri-food industries. Of special importance in this discussion is productivity in food processing. The scenario analyses clearly illustrate the importance of further steps to improve factor productivity in the agri-food sectors. If the NMS attract FDI investments and investments from national sources the positive developments shown in these analyses would become even clearer.

For primary agriculture the most significant result is the increase in land prices after accession. Due to higher land prices agricultural income increases by more than 50% after accession which is explained by the introduction of direct payments in the New Member States. Primary agriculture is also affected by an inflow of FDI to the food processing industries, and by an increase in intermediate demand of the food sector which is partly supplied by domestic agriculture.

As it has been already argued, the degree of competitiveness of industries is determined especially by the development of sectoral productivity. Therefore, the scenario analyses of this study focus on the impact of *enhanced productivity growth* in the agri-food sector. The competitiveness of the EU agri-food industry improves only a little under the conditions of the enlarged market of 27 Member States. In the case of the Single European market with 27 Member States the impact of enlargement on the position of the food industry in the old EU15 Member States is rather limited. However, for the agri-food industry in the NMS the Single

European market provides an opportunity and a threat. On one hand, the single market means an extended free trade area for the producers in the NMS with an increase in market potentials. On the other hand, farmers and food processors now face the competition of their neighbours from the EU15 countries.

To exploit these opportunities the food industry has to improve the attraction of FDI into their food processing sectors. The scenario analyses of this study identify the importance of FDI on production, trade and income in the NMS. However, the functioning of factor markets is also a pre-condition for this kind of successful development. Market imperfection such a high labour immobility or market imperfections reduce the benefits of EU membership significantly. The results show that the overall impact of EU membership can be negative considering high labour immobility, if structural change is not taking place.

Competitiveness improves either by a reduction of the price of raw material or by higher productivity growth in the specific industry. Under these circumstances total value added will increase. Higher productivity might be the result of higher value added induced by innovation, production differentiation or economies of scale. However, the functioning of agricultural and food markets after enlargement is crucial in terms of production and trade in agri-food products.

As shown in the analysis the introduction of the CAP in the NMS leads in many markets to an increase in agricultural producer prices. In those markets the CAP provides an incentive to expand agricultural output and to gain market shares in the Single European Market. With an enhanced attraction of FDI in the food processing industries in the NMS the integration of the agri-food sectors in the NMS into the Single European Market will become even stronger.

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