# Agricultural and Food Competitiveness in Transition Central and Eastern European Countries: Social Profit Rate and Domestic Resource Cost Approaches

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**Abstract**

*Agricultural and food products in Central and Eastern European countries (CEECs) in transition to a market economy experienced improvements in international competitiveness in crops (wheat and sunflower) and higher value-added processed products. Less improvement in competitiveness is for animal products. The international competitiveness is in to some extent maintained by lower factor prices, which are likely to increase by increase in shadow prices of land and labour. Product quality, technology and efficiency improvements and rationalisation of costs, particularly in animal production and food processing are areas for improvements of international competitiveness in CEECs agriculture and the food sector.*

**Keywords:** *agro-food sector, distortions, restructuring, competitiveness, integration.*

## Introduction

This paper synthesizes and evaluates the results on agricultural and food social profitability and international competitiveness in Central and Eastern European countries (CEECs). The focus is on a critical analysis of measures on the basis of social profit rate and domestic resource cost (DRC) approaches. The social profit rate approach originates from investment appraisal experiences in developing countries. Similarly, the DRC approach was largely applied for investment appraisal and evaluation of policy distortions in developing countries (e.g. Scandizzo and Bruce, 1980). While on a first glance these two approaches look similar evaluating the opportunity costs of domestic production valued in terms of shadow prices, there is a considerable methodological difference between these two approaches, which is explained in the paper.

The important contribution of our paper is to provide a critical analysis of the previous studies in terms of different approaches used and policy findings. The initial studies for CEECs addressed the crucial differences of social profitability across branches and associated distortions for understanding income redistribution and resource-misallocation caused by government policies and underdeveloped market structures. The most recent studies addressed the issue of competitiveness under world market conditions and under different policy scenarios associated with European Union

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(EU) accession. The investigation of social profitability and international competitiveness in CEECs agriculture and the food sector have undergone through different stages. First, during the old system, the research was conducted in Hungary related to measures of international competitiveness. The DRC measures were calculated by agricultural and food products (Borszeki et al., 1985).[2] Second, in the initial stage of transition when it was important to decide about restructuring in the CEEC economies, an extensive research work of social profit rates at the (three-digit) branch level using sectoral input-output tables, including for agriculture and food processing, was conducted for Bulgaria, former Czechoslovakia (CSFR), Hungary, Poland, Romania, and former Soviet Union (FSU) republics by Hughes and Hare and their collaborators (Hughes and Hare, 1994; Hare and Fomin 1993; Senik-Leygonie and Hughes 1992). Their relevance is for public policy, industrial restructuring, modernisation and new investments. Third, several DRC studies in the CEECs, by agricultural and to a lesser extent food products have been conducted as a response to the concluded Uruguay Round Agreement in agriculture (URAA) on freer international trade, and as a consequence of the EU's Copenhagen declaration regarding competitiveness. While the URAA relates to international competitiveness under world market conditions, the EU with its the Copenhagen accord in June 1993 set EU membership criteria. One of them is a functioning of market economy in a new member country and the ability of its economy and its parts to cope with the competitive pressures and market forces within the Single European Market (SEM) of the EU. To enhance competitiveness and to evaluate the degree of competitiveness, the DRC measures for agricultural products have been calculated widely by CEECs under more rigorous world market conditions and under more favourable EU conditions. Fourth, as the negotiation for EU membership has become reality, the most recent trend is to combine the DRC measures with modelling of policy and welfare implications of different policy scenarios (e.g. Stoforos et al., 2000), and efficiency implications such as potential effects of foreign direct investment (FDI) to mitigate the policy effects (Banse et al., 1999; 2000a; 2000b).

The paper critically evaluates the main results of the selected studies on social profit rates and the DRC ratios for agro-food products in CEECs. The rest of the article is structured as follows. In the next, second section, an overview of the social profit rate calculations for the agro-food branches for Bulgaria, the CSFR, Hungary, Poland, Romania, and to a lesser extent FSU is presented. In the third section the results of various DRC studies for agricultural and food products in the CEEC-6 (Bulgaria, the Czech Republic, Hungary, Poland, Romania, and Slovakia) are critically evaluated. In the fourth section, some DRC simulation results for agricultural and food processing activities are reviewed. The final section provides a synthesis of main findings and concludes with the implications of the results of the CEEC agro-food sector competitiveness from point of view of methodology and policy implications.

## Social Profit Rates for Agriculture and Food Processing Branches in the Initial Stage of Transition

The social profit rate compares the value-added of activity at world prices to the value of gross output at world price by activity. Hughes and Hare (1991; 1992; 1994) and their collaborators empirically evaluated distortions using social profitability indicators for Bulgaria, the CSFR, Hungary, Poland, Romania, and the

FSU by branches of the economy, including agriculture and food industry. To make comparisons across branches and between countries, they defined profitability indicators as a ratio between shadow profitability relative to the world value of output. As critically pointed out by Glyn (1994, p. 222), on this way defined social profit rate "is in fact a measure of total factor productivity across industries" rather than a DRC ratio.

In the numerator of the social profit rate is the activity value-added (value of gross output minus tradable input costs) in world prices, which relates to the denominator in the DRC ratio. On the other hand, in the denominator of the social profit rate is the value of gross output at world price, which differs considerable from the numerator of the DRC ratio, which is the sum of the costs of using domestic primary resources (land, labour, and capital) valued in terms of social (shadow) prices. Hughes and Hare (1991; 1992; 1994) and their collaborators defined short-run, medium-run and long-run indicators of the shadow profit rates. The short-run shadow profit rate was calculated by setting the shadow prices for both labour and capital equal to zero. The medium-run shadow profit rate was calculated by setting the shadow price of labour as a positive number and the shadow price of capital equal to zero. The long-run shadow profit rate was calculated by setting positive numbers for the shadow prices of both labour and capital. The (official) exchange rate is used as a benchmark of comparison. For calculation, they employed a sector-level input-output tables. It is likely that home-consumption and informal grey-economy are underestimated in countries with an important share of informal activities in value of gross output. Moreover, most of the analysed countries experienced at that time rather high inflation rates, which may also biased input-output relations, price, costs, and profitability structures. They aimed to provide policy implications of initial conditions related to profitable sectors desirable to expand on one side, and unprofitable sectors, which are likely to contract, on the other. The social profitability was appraised by world market prices and shadow profit rates instead of indicators based on distorted domestic prices to reveal the real profitability of activities. They identified sectors that are likely to be competitive in international markets as well as those which may be expected to contract with liberalisation, deregulation, and restructuring. According to their calculations, agriculture seems to be short-run profitable in Bulgaria, the CSFR, Hungary and Poland under the condition of sunk costs of land, labour and capital (Table 1). When a shadow wage was included in calculations of medium-run profitability, Bulgarian and the CSFR agriculture failed to be profitable. Additionally, when the cost of capital was included in calculations of long-run profitability, agriculture, as it was structured at the beginning of transition seems, to be non-profitable in each of four countries. Food sector branches were largely found to have poor international competitiveness, except for Bulgaria and Hungary where the food processing branches were profitable only on short-run when the shadow costs of labour and capital were set at zero. Drink and tobacco performed rather well in Poland and, with exception on long-run, in Bulgaria. Hungarian drink and tobacco producers were unprofitable when the costs of primary factors were considered. Moreover, drink and tobacco branches performed poorly in the CSFR. These results clearly suggested that substantial restructuring and new technology investment were desirable to improve overall economic efficiency and international competitiveness to avoid huge contraction of several loss-making food processing activities.

**Table 1.** Short-run, medium-run, and long-run social profitability measures by agriculture and food industry and country

| | 110 Agriculture | | | 300 Food processing | | | 310 Drink and tobacco | | |
|---|---|---|---|---|---|---|---|---|---|
| | Short run | Medium run | Long run | Short run | Medium run | Long run | short run | Medium run | Long run |
| Bulgaria | 0.398 | -0.025 | -0.372 | 0.068 | -0.013 | -0.180 | 0.173 | 0.091 | -0.216 |
| Czechoslovakia (CSFR) | 0.194 | -0.104 | -0.593 | -0.199 | -0.266 | -0.429 | -0.165 | -0.276 | -0.488 |
| Hungary | 0.443 | 0.193 | -0.314 | 0.012 | -0.089 | -0.265 | 0.112 | -0.009 | -0.243 |
| Poland | 0.338 | 0.266 | -0.046 | -0.003 | -0.147 | -0.364 | 0.764 | 0.734 | 0.551 |

*Note:* The ratio of value-added of activity at world prices to the value of gross output at world price by activity.

*Source:* Compiled by the author on the basis of Hughes and Hare (1994) and Hare and Fomin (1993).

Hare and Fomin (1993) conducted additional calculations of social profitability measures by branches for Romania (Table 2). Agriculture (crops) was found among the most profitable sectors, while the food-processing sector, especially branches of milling and bakery products, canning (vegetables and fruits), meat and meat products, and milk and dairy products performed the worst. Production of edible and other vegetable oils was found among internationally profitable branches. It is worth mentioning that Senik-Leygonie and Hughes (1992), in a similar study for the FSU republics, found a mismatch between existing patterns of specialisation and social

**Table 2.** Short-run, medium-run, and long-run social profitability measures by agriculture and food industry in Romania, 1989

| | Short run | Medium run | Long run |
|---|---|---|---|
| **110 Agriculture** | 0.585 | 0.386 | 0.082 |
| **301 Meat and meat products, fish and fish products, milk and dairy products** | -0.757 | -0.789 | -0.930 |
| **302 Canning (vegetables and fruit)** | -0.592 | -0.841 | -1.004 |
| **303 Edible and other vegetable oils** | 0.236 | 0.217 | 0.080 |
| **304 Milling and bakery products** | -0.925 | -1.146 | -1.298 |
| **305 Sugar and confectionery** | 0.039 | -0.027 | -0.167 |
| **306 Other foodstuffs** | 0.150 | 0.113 | -0.027 |
| **313 Alcoholic drinks** | -0.291 | -0.331 | -0.470 |

*Source:* Compiled by the author on the basis of Hare and Fomin (1993).

profitability of sectors. The performance in agriculture was found to be less critical than in food processing, which was among the worst performing sectors in each of the FSU republics.

Michael et al. (1993) provide estimates of the DRC ratio for the Hungarian economy by sectors at the beginning of transition (in 1990), and agriculture was found to be internationally competitive, while most food processing branches (except confectionery, wine, and to a lesser extent soft drinks and tobacco) were found to be internationally non-competitive (Table 3). The international competitiveness of food processing branches improves when improvements in quality adjustments, expected reductions in EU import tariffs and quantitative restrictions on Hungarian exports were considered.

**Table 3.** DRC Results for Hungary by Agricultural and Food Products, 1990

| | Unrestricted trade | Trade restrictions | Small quality adjustment | Medium quality adjustment | Large quality adjustment | EU Association Agreement |
|---|---|---|---|---|---|---|
| **1. Unprocessed products** | | | | | | |
| **Agriculture** | 0.94 | 0.94 | 0.94 | 0.93 | 0.92 | 0.84 |
| **Slaughter/meat products** | 2.90 | 2.89 | 1.23 | 1.22 | 1.20 | 1.06 |
| **Poultry and eggs** | 1.49 | 1.49 | 1.07 | 1.06 | 1.05 | 0.98 |
| **Milk/milk products** | -11.75 | -14.85 | 1.75 | 1.72 | 1.69 | 1.37 |
| **2. Basic products** | | | | | | |
| **Canning** | 1.59 | 1.59 | 1.27 | 1.27 | 1.27 | 1.14 |
| **Flour-milling** | 1.65 | 1.65 | 1.31 | 1.35 | 1.42 | 1.15 |
| **Baking** | 1.07 | 1.07 | 1.09 | 1.11 | 1.15 | 0.97 |
| **Sugar** | 1.73 | 1.73 | 1.44 | 1.48 | 1.54 | 0.92 |
| **Confectionery** | 0.68 | 0.68 | 0.77 | 0.81 | 0.87 | 0.59 |
| **Vegetable oil** | 2.28 | 2.28 | 1.23 | 1.26 | 1.29 | 1.19 |
| **3. Sophisticated products** | | | | | | |
| **Alcoholic drinks** | 2.53 | 2.48 | 2.02 | 2.17 | 2.43 | 1.69 |
| **Wine** | 0.81 | 0.89 | 0.94 | 0.97 | 1.00 | 0.86 |
| **Brewing** | 1.13 | 1.13 | 1.20 | 1.28 | 1.41 | 0.96 |
| **Soft drinks** | 0.85 | 0.85 | 0.93 | 0.99 | 1.09 | 0.96 |
| **Tobacco** | 0.84 | 0.84 | 0.95 | 1.01 | 1.11 | 0.92 |

*Note:* Quality adjustment on the basis of world to domestic price ratio changes. Negative values correspond to the most non-competitive branch; positive values, but less than one corresponds to competitive branches; and values greater than one corresponds to non-competitive branches.

*Source:* Compiled by the author on the basis of Michael et al. (1993).

These initial studies of social profitability and international competitiveness for CEECs showed some common features of very unprofitable branches (e.g. the most energy intensive sectors and food processing) and slightly different stories about the

most profitable sectors from country to country. These studies clearly suggested the poor performance with often negative social profitability and internationally non-competitive position of most food processing branches rather than of primary agriculture, but with scope for substantial efficiency gains in food processing. Improvement would require substantial restructuring, modernisation (e.g. new investments), and reorganisation towards operation in a competitive international environment along with developing the trade in the direction of comparative advantage.

**DRC Studies of Agricultural and Food Competitiveness**

The DRC ratio compares the opportunity costs of using domestic primary resources (land, labour and capital) and of non-traded inputs to the value-added in social (world) prices (e.g. Scandizzo and Bruce, 1980; Tsakok, 1990):

$$DRC_i = \frac{\sum_{j=k+1}^{n} aij V j}{P_i^b - \sum_{j=1}^{k} aij P_j^b},$$

where $a_{ij}$ (j = k+1 to n) in the numerator of the DRC is the technical coefficient for primary domestic resources and non-traded intermediary inputs (j = k+1 to n), and $V_j$ is the shadow price of primary domestic resources and non-traded inputs. The denominator of the DRC represents the value-added of output i at social prices where $a_{ij}$ (j = 1 to k) is the technical coefficient (units of input j per unit of output i) for traded inputs, $P_i^b$ is the social price of output i, and $P_j^b$ is the social price of input j. The exchange rate used in the DRC calculations is the opportunity cost benchmark. When the DRC is less than 1, but greater than 0, production is efficient and internationally competitive. The production is internationally non-competitive, when the DRC is greater than 1. The DRC ratio less than 0 indicates internationally non-competitive loss-making activities.[3] The DRC is rather simple measure for calculation, which provides detail information on structure of costs and value added. The DRC ratio is sensitive on the choice of social price, exchange rate, technological input-output ratios, distinction between inputs, which are and which are not a subject of international trade, opportunity costs of primary domestic factors (changes in shadow prices of land, labour and capital), and substitutability among inputs due to technical innovations, restructuring, and changes in relative prices (e.g., Tsakok, 1990).

This paper synthesis and critically evaluates the DRC calculations for agricultural and food products in CEEC-6 (Table 4). The results are related to different products, time periods or individual years, and farm characteristics such as farm ownership (e.g. commercial, co-operative, and individual farms in Hungary), farm size (e.g. small versus large farms in Poland), and regional location of farms (e.g. in Slovakia). The studies also differ regarding assumptions and data used. Banse et al. (2000a and 2000b), Ratinger (2000), Bojnec (1999), and Gorton and Deaconescu (1998) provide also sensitivity analysis assessing the impact of different policy variables (input and output prices, shadow factor prices, and exchange rate) on the magnitude of the DRC ratios.

An adjusted border prices (export/import parity prices) to the farm and food-processing factory are often taken as the social prices for outputs and tradable inputs. The most recently, in an pre-accession environment and in the wake of negotiations

for accession for EU membership, the respective EU output and tradable input prices, and EU shadow factor prices for the CEEC are used (e.g. Ratinger, 2000; Banse et al, 2000b). The social price of land as an opportunity cost of land is often measured as its rental value in most profitable alternative agricultural use. The social price of labour as an opportunity cost of labour is often taken as marginal productivity of labour in a next best employment opportunity for qualify labour and unqualified labour considering unemployment on cost of labour (e.g., Bojnec, 1999). The social price of capital as an opportunity cost of capital in terms of its marginal productivity in a next best opportunity is often considered as real interest rate for loans and as evaluated depreciation costs.

The focus in our synthesis of the DRC results of various studies is on world market conditions by agricultural (crop versus livestock products) and food products. The DRC results indicate that crop produce, particularly wheat and sunflower, tends to be more internationally competitive than animal products. This suggests that the transition process proved to be more difficult in livestock than in crop production where crop farms adjusted faster and more efficiently to international comparative advantages than it was the case in more capital intensive livestock production, which experienced greater negative implications of disorganisation and disruptions during decollectivisation and privatisation.

During the old system, the *Bulgarian* production of cereals (wheat, maize and barley), sunflower and milk was internationally non-competitive, while pork and to lesser extent poultry were internationally competitive (Ivanova et al., 2000). During transition to a market economy, most improvements in international competitiveness were arising from fixed capital cost reductions and labour gains reducing costs. Large-scale cereals and sunflower production were recorded to be internationally competitive, while the results for livestock production were mixed (Ivanova et al., 2000 and Gorton et al., 2000). In spite of some potential increases in opportunity costs of labour and fixed capital owing from upward wage adjustments and renewal of equipment and machinery, most crop products are expected to remain internationally competitive. Pork production was recorded as internationally competitive, while poultry as internationally non-competitive. International competitiveness in beef and milk production first deteriorated, but improved later particularly in beef production. According to Gorton et al. (2000), milk and beef production in Bulgaria were constrained by a small and fragmented nature of farms, their low technical efficiency, and effective taxation of domestic producers owing from low output prices.

The studies of *Czech* agriculture suggested that large-scale farms engaged in cereals production (wheat and barley) seem to be internationally competitive, but internationally non-competitive in animal production (milk, beef and pork) (Ratinger, 2000 and Gorton et al., 2000). [4] Cereals and milk are likely to be competitive under the higher EU agro-food output price structures. Among potential factors that may deteriorate international competitiveness are increases in shadow costs for land and labour, and appreciation of the national currency. The technology of production and allocation of resources may change due to factor price changes leading to substitution of labour by capital, particularly with greater capital (and FDI) inflows.

The DRC calculations for *Hungarian* agricultural and food products have been available since 1968 (Borszeki et al., 1985; Banse et al., 2000). During the old system, large-scale wheat, maize and to a lesser extend sunflower production were

recorded as internationally competitive, while animal products (except for sheep) and food processing products, as internationally non-competitive. One of the most striking findings was that competitiveness of food processing deteriorated with the increase in the degree of processing. During the 1990s, wheat and sunflower production are internationally competitive, while for maize, barley and rapeseed there were variations by individual years in association with adverse weather conditions and transitional factors (Banse et al., 2000). On the contrary, animal products (milk, beef and pork) were recorded as internationally non-competitive with an additional deterioration in the level of international competitiveness over time.

For *Poland*, the initial DRC calculations failed to find any agricultural product competitive under international market conditions (Safin and Rajtar, 1997). The most recent study by Czyzewski et al. (2000) argued that the farm size does matter when explaining international competitiveness for agricultural produce. Larger farms were recorded as more competitive than smaller farms suggesting that greater intensity in use of intermediary inputs, capital intensity and economy of size improve competitiveness, while land and particularly labour intensity reduces competitiveness. Wheat, rapeseed, and sugar beet production on large farms were found internationally competitive. The DRC results for potatoes on small farms varied considerably over time suggesting that potato production might be internationally competitive, as it is already a case with apple production on small farms. Unlike for other CEECs, milk and to a lesser extent beef production were recorded as internationally competitive particularly on larger farms. The international competitiveness deteriorated for rather protected pork production.

For *Romania*, the DRC results indicated internationally competitive large-scale cereals (wheat and maize) and sunflower production, and internationally non-competitive sugar beet and to a lesser extent animal production (milk, beef, pork and poultry) (Gorton and Deaconescu, 1998; Gorton and Davidova, 2000). There was a divergent pattern in the DRC development with deterioration in internationally competitiveness for cereals and sunflower production and improvements for sugar beet and animal products (e.g. for pork) closer to be internationally competitive. Crop and animal production are likely to be internationally competitive, but it is less likely for sugar beet without substantial improvements in efficiency.

The DRC results by Michalek (1995) for the *Slovak* large-scale co-operative-owned farms in the early stage of transition indicated that there were differences in international competitiveness in different regional parts of the country. Only barley, pork and sheep were internationally competitive, while milk and beef were internationally non-competitive in each of the three analysed regions of Slovakia. The international competitiveness for wheat, maize, sunflower, rapeseed, potatoes, and most of other crops varied by regions as a consequence of different regional diversity in soil quality, geo-climatic conditions, marketing conditions and distance to the market outlets.

The most recent study for *Slovakia* by Bozik et al. (2000) indicated internationally competitive crop production (wheat, rapeseed, sunflower, sugar beet, to a lesser extent maize, and except in 1996, potato production). On the contrary, except in 1996, animal products were recorded as internationally non-competitive. Price and subsidy incentive system was in favour of intensive livestock production where opportunity costs of production were high. The opportunity costs for the use of land

**Table 4.** DRC Calculations for Agriculture and Food by Products and Country

| | **Bulgaria** | | | | | **Czech Republic** | | | **Hungary** | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Ivanova et al. (2000)** | | **Gorton et al. (2000)** | | | **Ratinger (2000) & Gorton et al. (2000)** | | | **Borszeki et al. (1985)[a]** | **Banse et al. (2000a)** | | | | |
| | 1989 | 1997 | 1994 | 1995 | 1996 | 1994 | 1992 | 1996 | 1978-83 | 1990-92 | 1993 | 1994 | 1995 | 1996 |
| Wheat | 1.50 | 0.28 | 0.5 | 0.3 | 0.3 | 0.82 | 0.49 | 0.47 | 0.80 | 0.69 | 0.81 | 0.64 | 0.71 | 0.89 |
| Rye | | | | | | | | | | | | | | |
| Maize | 1.66 | 0.27 | | | | | | | 0.84 | 1.00 | 1.88 | 1.28 | 0.90 | 0.82 |
| Maize – feed | | | | | | | | | | | | | | |
| Barley | 1.81 | 0.41 | 0.8 | 0.7 | 0.4 | 1.49 | 0.76 | 0.54 | | 0.84 | 1.71 | 1.21 | 0.77 | 1.27 |
| Oats | | | | | | | | | | | | | | |
| Rapeseed | | | | | | | | | | 1.12 | 1.03 | 0.75 | 0.85 | 1.24 |
| Sunflower | 1.29 | 0.63 | | | | | | | 0.88 | 0.95 | 0.80 | 0.76 | 0.72 | 0.80 |
| Sugar beet | | | | | | | | | | | | | | |
| Potatoes | | | | | | | | | | | | | | |
| Early potatoes | | | | | | | | | | | | | | |
| Pasture | | | | | | | | | | | | | | |
| Milk | 1.22 | 0.32 | 1.4 | 1.7 | 1.2 | 2.54 | 1.89 | 1.96 | 1.41 | 1.47 | 2.58 | 6.90 | 6.13 | 13.98 |
| Live cattle | | | | | | | | | 1.46 | | | | | |
| Beef | | | 1.6 | 1.4 | 0.4 | 2.16 | 1.76 | 1.93 | 2.22 | 2.01 | 2.07 | 1.31 | 2.53 | 2.53 |
| Live pig | | | | | | | | | 1.51 | | | | | |
| Pork | 0.30 | 0.30 | 0.9 | 0.7 | 0.6 | 3.10 | 1.74 | 1.40 | 2.11 | 1.21 | 1.67 | 5.41 | -3.84 | 2.88 |
| Live sheep | | | | | | | | | 0.94 | | | | | |
| Mutton | | | | | | | | | 1.27 | | | | | |
| Chicken | 0.98 | 1.35 | | | | | | | 1.99 | | | | | |
| Eggs | | | | | | | | | | | | | | |
| Apples | | | | | | | | | 2.10 | | | | | |

| | Poland | | | | Romania | | Slovakia | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Safin & Rajtar (1997) | Czyzewski et al. (2000)[b] | | | Gorton & Deaconescu (1998) | | Michalek (1995)[c] | Bozik et al. (2000)[d] | | |
| | 1992 | 1993 | 1994 | 1995 | 1996 | 1998 | 1992-93 | 1994 | 1995 | 1996 |
| Wheat | 1.46 | 0.67; 0.48 | 0.76; 0.54 | 0.69; 0.49 | 0.23 | 0.78 | 0.87; 1.60; 097 | 0.76 | 0.47 | 0.33 |
| Rye | | | | | | | | 1.37 | 2.11 | 0.43 |
| Maize | | | | | 0.32 | 0.90 | 0.69; 2.89; 0.52 | 1.05 | 0.70 | 0.35 |
| Maize – feed | | | | | | | 1.71; 1.0; 1.0 | | | |
| Barley | | | | | | | 0.44; 0.54; 0.52 | 2.27 | 0.75 | 0.22 |
| Oats | | | | | | | | 1.43 | 1.54 | 0.84 |
| Rapeseed | | n.a.; 0.78 | n.a.; 0.76 | n.a.; 0.69 | | | 2.57; 1.45; 0.78 | 0.44 | 0.80 | 1.04 |
| Sunflower | | | | | 0.52 | 0.80 | 1.58; -4.5; n.a. | 0.77 | 0.59 | 0.56 |
| Sugar beet | 1.43 | 0.85; 0.56 | 1.59; 0.99 | 0.97; 0.63 | 3.48 | 2.41 | 9.04[c]; -6.13; 2.88 | 0.63 | 0.69 | 0.99 |
| Potatoes | | 1.61; n.a. | 2.35; n.a. | 0.86; n.a. | | | -3.25; 3.88; 21.1 | 0.79 | 0.44 | -2.8 |
| Early potatoes | | | | | | | 0.45; 2.19; 10.8 | | | |
| Pasture | | | | | | | 1.33; 1.0; 1.0 | | | |
| Milk | 2.29 | 0.75; 0.58 | 0.70; 0.56 | 0.72; 0.57 | 5.14 | 1.15 | -1.84; 9.14; -4.06 | 5.48 | 2.85 | 2.84 |
| Live cattle | | 1.04; 0.92 | 0.99; 0.89 | 1.03; 0.92 | | | | | | |
| Beef | | | | | -1.33 | 1.15 | -0.32; -2.38; -1.76 | -4.00 | -19 | 11.9 |
| Live pig | | 1.00; 0.98 | 0.96; 0.93 | 1.93; 2.36 | | | | | | |
| Pork | -0.33 | | | | 3.37 | 0.97 | 0.22; 0.30; 0.32 | -0.70 | 3.79 | 0.67 |
| Live sheep | | | | | | | 0.19; 0.32; 0.38 | | | |
| Mutton | | | | | | | | | | |
| Chicken | 1.12 | | | | 2.66 | 1.20 | | -0.50 | -0.40 | -1.50 |
| Eggs | 2.01 | | | | | | | 1.30 | -1.70 | 0.49 |
| Apples | | 0.42; n.a. | 0.27; n.a. | 0.31; n.a. | | | | | | |

[a] Year-to-year oscillations are not considered. Borszeki et al. (1985) calculated the DRC measures for the years 1968, 1970, 1972, and 1976, respectively, and for the individual years in the period 1978-1983. The DRC calculations for the years in the period 1978-1983 are presented as a mean value of the individual years. The other DRC results are: in the case of sunflower oil 1.69, granular sugar 5.38, spice paprika powder 1.98, barrel wine 1.38, and white cream cheese 1.04.

[b] The first number denotes the results for "small farms" with about 10 ha of farmland and the second number denotes "large farms" with around 20 ha of farmland.

[c] The first number denotes West-Slovakia, the second number denotes Central-Slovakia and the third number denotes East-Slovakia. In the case of sugar beet in West-Slovakia, the recorded result is for average factory, while for good factory it is 0.88 and for bad factory 1.70.

[d] The results by years 1991, 1993, and 1993, respectively, are the following: wheat 0.99, 0.47, and 0.95; rye -2.8, 0.87, and 0.55; maize 0.50, 0.72, and 1.28; barley 0.75, 0.71, and 2.34; oats 0.92, 0.84, and 0.84; rapeseed 1.64, 0.85, and 0.61; sunflower 0.83, 0.58, and 0.51; sugar beet 0.50, 1.06, and 0.95; potatoes 0.45, 1.15, and -4.5; milk 10.1, -52, and 12.3; beef -0.7, -0.7, and -1.7; pigs -0.4, -0.8, and -0.8; poultry -0.1, -0.3, and -0.4; and eggs -0.5, -0.8, and 0.48.

*Source:* Compiled by the author on the basis of Ivanova et al. (2000); Gorton et al. (2000); Ratinger (2000); Gorton et al. (2000); Borszeki et al. (1985); Banse et al. (2000a); Safin and Rajtar (1997); Czyzewski et al. (2000); Gorton and Deaconescu (1998); Michalek (1995); and Bozik et al. (2000).

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and labours are likely to increase as some area payments are introduced and real wages are up-ward adjusting. These developments may hinder international competitiveness of both crop and livestock products. Major efficiency gains are expected from removing policy distortions in output, input and factor markets, technology improvements, restructuring and reallocation of resources towards higher value-added activities, and efficiency gains from food processing activities.

**DRC Simulations in Terms of EU Accession and the Role of FDI in the Food Sector**

One of the subjects of a particular modelling and policy concern is a simulation of DRC since the time for the accession of the CEECs in the EU is approaching. A critical appraisal is added to investigate simulations of DRC in terms of different policy scenarios, particularly EU accession and a potential role of FDIs in this process. A body of literature has been developed most recently where several policy implications are simulated. Alternative specifications of DRC are introduced evaluating different policy scenarios associated with trade and price liberalisation, technology and quality adjustment. For example, Stoforos at al. (2000) agricultural policy analysis model for Slovenian agriculture allows simulation of competitiveness and welfare implications, which are associated with different policy scenarios and policy changes. Of particular modelling and policy interest are simulations, which also include potential offsets of policy changes through efficiency improvements by factors encouraging efficiency gains in quality increasing value-added processing where inflows of FDIs may play an important role. Banse et al. (1999; 2000a; 2000b) simulated the policy effects and the effects of the expected FDI inflows upon joining the EU on the CEEC agriculture and the food sector. The DRC indicator is integrated in a CGE model overcoming restrictive assumptions about equilibrium

prices and exchange rates within dynamic relations and simulations. The positive association between the FDI inflows in a certain food processing industry and the increases in international competitiveness (social profitability) is recorded. The efficiency gains at the firm level arise from the existing production capacity and from technical progress embodied in the new capital stock from FDI bringing new managerial culture, improving access to technology, new knowledge, and marketing techniques. There are also efficiency gains arising from FDI spillover effects and the effects arising from increased competitive market pressures on domestic producers to restructure, modernise production and to increase quality. The efficiency gains arising from interdependency between agriculture and food industry are caused by stable and/or cheaper agricultural inputs for food processing and increased demand for agricultural produce by food processors owing from improved quality of processed food. They showed that FDIs directed toward privatising, restructuring and modernising the food-processing sector (particularly in Hungary) substantially improved competitiveness (Table 5). They calculated the DRCs for 1995, while

**Table 5.** DRCs in Hungarian and Polish Agriculture and Food Processing Industries

| | **Hungary** | | | **Poland** | | |
|---|---|---|---|---|---|---|
| | **1995** | **2005** | | **1995** | **2005** | |
| | | **"Acce-ssion"** | **"Accession plus FDI"** | | **"Acce-ssion"** | **"Accession plus FDI"** |
| Cereals | 0.98 | 0.99 | 0.59 | 0.95 | 0.98 | 0.72 |
| Oilseeds | 0.98 | 0.65 | 0.38 | 1.05 | 1.02 | 0.78 |
| Fruits | 0.94 | 1.05 | 0.58 | 1.01 | 0.94 | 0.83 |
| Vegetables | 1.00 | 0.93 | 0.46 | 1.03 | 0.96 | 0.65 |
| Eggs | 0.94 | 0.99 | 0.59 | 1.10 | 1.21 | 1.05 |
| Beef and veal | 1.24 | 1.44 | 1.14 | 1.11 | 1.33 | 0.93 |
| Pork | 1.07 | 1.05 | 0.90 | 1.03 | 1.06 | 0.87 |
| Poultry | 1.05 | 0.97 | 0.54 | 1.08 | 1.20 | 0.85 |
| Other meat | 1.01 | 0.97 | 0.47 | 1.04 | 1.13 | 0.85 |
| Meat processing | 0.90 | 0.96 | 0.63 | 0.94 | 1.25 | 1.01 |
| Poultry processing | 0.79 | 0.79 | 0.49 | 0.91 | 1.30 | 1.16 |
| Dairy | 1.16 | 1.37 | 0.97 | 1.11 | 1.02 | 0.94 |
| Canning industries | 0.91 | 0.94 | 0.59 | 0.96 | 0.98 | 0.74 |
| Milling | 0.95 | 0.98 | 0.72 | 1.02 | 1.04 | 0.82 |
| Potato processing | | | | 1.05 | 1.19 | 1.10 |
| Baking | 0.88 | 0.83 | 0.46 | 0.98 | 1.08 | 0.74 |
| Sugar industries | 1.13 | 1.20 | 1.00 | 1.08 | 1.15 | 1.07 |
| Sweets and confectionery | 0.98 | 1.09 | 0.83 | 0.97 | 1.10 | 0.99 |
| Vegetable oil processing | 0.95 | 2.18 | 1.43 | 0.85 | 0.84 | 0.59 |
| Spirits | 0.90 | 0.97 | 0.65 | 0.95 | 1.00 | 0.97 |
| Wine | 0.74 | 0.62 | 0.36 | 1.02 | 1.03 | 0.90 |
| Beer | 0.91 | 0.92 | 0.88 | 1.02 | 0.94 | 0.67 |
| Soft drink industries | 0.95 | 0.97 | 0.71 | 0.98 | 1.00 | 0.68 |
| Tobacco | 1.13 | 1.29 | 0.82 | 1.02 | 1.01 | 0.83 |

*Source:* Banse et al. (1999, 2000a, and 2000b).

development of competitiveness (DRC in 2005) was simulated within the CGE model under two scenarios. First, the policy effects of change levels of protection by adopting EU agricultural policies and second, the FDI effect owing from greater inflows of FDI. They assume that FDI inflows shall be under a similar dynamics and patterns as the development in Spain and Portugal upon accession to the EU (e.g. from 1986 to 1990) showing a positive spill-over effect of FDIs as gains on agro-food competitiveness.

Cereals production is recorded to be internationally competitive in Poland; crop production as a whole (cereals and oilseeds) internationally competitive in Hungary; and livestock production, except for eggs in Hungary, internationally non-competitive in both Hungary and Poland.[5] Food processing activities in Hungary are found to be internationally competitive except in the case of protected products such as dairy, sugar and tobacco. The Hungarian food processing sector is found to perform better internationally than in the domestic economic environment, and vice versa in Poland. Except for meat processing, lower stages of food processing in Poland are recorded as internationally non-competitive. In both countries international competitiveness of the food sector is increasing with the increasing the degree of processing during transition. For Hungary, this finding is reversed what Borszeki et al. (1985) recorded for the pre-transition period suggesting that the greatest success in improving agro-food efficiency has been achieved in the higher stages of food processing, where the impediments to efficiency during the communist system were the greatest. However, the international competitiveness of higher stages of processing is still lagging behind the EU. International competitive-ness upon accession increases for products facing a reduction of protection (oilseeds) and declines for products receiving higher protection (beef, meat processing, and sugar). While international competitiveness of agriculture and lower stages of processing with high share of agricultural inputs deteriorates, technical progress associated with FDI inflows to individual food industries improves international competitiveness in both countries. Agricultural activities gain from FDIs indirectly by greater demand for agricultural produce by food processors. The simulated FDI effect was greater in Hungary than in Poland due to greater increases international competitiveness with associated positive spillover effects to agriculture.

## Conclusions and Policy Implications

The social profitability measures and DRC ratios for agricultural and food products in CEECs are nicely illustrated as an issue important for EU accession and as an issue of sustainability within a long-term competitive international environ-ment. They are valuable evidence for policy design and policy formulation to cope with increasing competitive pressures arising from trade liberalisation and EU accession. Some caution in the cross-country comparisons of different studies may be related to different calculation assumptions and sensitivity of DRC results to technological, quality, and macroeconomic-policy variables.

The paper aimed to identify products which potentially can become niche markets, and products where is less likely to keep the present level of production without considerable improvements in efficiency requiring restructuring, reallocation of resources and new investments to improve international competitiveness. Among agricultural produce, crops (e.g. wheat and sunflower) in CEECs tend to be more

competitive internationally than livestock products. For crops, there are instabilities over time suggesting that it is important to stabilise or increase yields. The results, however, differ by CEECs, studies, products, and years. The ownership, the size of the farm and regional location of the farm also record the differences. The international competitiveness of food processing activities increased during transition. Among the most striking finding for Hungary is that the increase in international competitiveness was positively associated with the greater degree of processing with embodied a greater value added per unit of output where the greatest impediments to economic efficiency during the pre-transition period were recorded. Restructuring, modernisation and new investments, particularly FDIs, have proved as one of the crucial factors for improving international competitiveness of food processing. Efficiency improvements and gains arising from restructuring, modernisation, technological and quality improvements in the food processing sectors were offsetting some negative welfare implications from policy changes.

The DRC calculations for agricultural produce may be biased on the technological input-output coefficients using a sector-level input-output data and a farm accountancy survey data of farms. Similarly, the calculations for the food-processing sector may be biased on a sector-level input-output data and on evidence obtained from food processing enterprises. The technological input-output coefficients on the basis of a farm accountancy surveys for agricultural produce are more likely to be biased towards large and more efficient farms. Smaller farms are more likely to be less competitive than larger private farms in crop production. For food processing enterprises, there is a considerable shift in technology improvements and quality adjustments following privatisation, restructuring and engagement of strategic investors. Under the competitive import pressures and new market entries also the quality was improved and product diversification gained in importance.

The DRC calculations may be biased by the choice of social prices for output, tradable inputs, and primary factors. The shadow prices of primary domestic factors (land, labour and capital) are likely to change further upon accession to the EU depending on both market and policy changes. Shadow prices of primary domestic factors are important for international cost competitiveness, but they also influence potential substitution changes in used technologies. In the initial studies on the social profitability land and fixed capital were considered as sunk costs in a short-term. Even later, most of DRC studies considered the initial zero cost of land, but with the introduction of new policy measures, particularly land based direct payments owing from policy harmonisation between the CEECs and the EU, the opportunity costs for using land are likely to increase owing from increases in land prices and rental values in some CEECs. As there are needs for renewal and modernisation of machinery and equipment, the opportunity costs of fixed capital are likely to increase. On the other hand, the shadow prices of working capital are likely to decline owing from the increased competitive pressures in the banking sector shrinking real interest rates on loans for working capital. Shadow prices of labour are still far below the EU levels, with some variations across CEECs, as a reflection of a gap in labour productivity.

The shadow costs of primary factors are likely to rise with economic growth and liberalisation of non-tradable sectors. A further macro-economic adjustment in factor prices is likely to influence patterns in development of international competitiveness. As the prices of agro-food primary factors upward aligned closer to world market conditions, the DRC ratios are likely to increase in several CEECs as suggested in

the studies for Bulgaria, the Czech and Slovak Republics. Yet, the exchange rate adjustments via real exchange rate appreciation may tend to deteriorate development of international competitiveness in the CEECs as well. To capture some of these potential calculation biases, several studies provided different sensitivity analysis of the assumptions used regarding the choice of macroeconomic policy variables and production input-output structures vis-à-vis a benchmark of comparison and scenarios tested.

The direct and indirect pressures for the DRC increases should be offset by lower cost of working capital, modernisation, technical change and productivity improvements. Greater improvements in the competitiveness increases may be expected from the food processing sector with the attraction of FDI inflows playing an important role in modernisation of equipment, improving technology and product quality towards higher value-added products in the agro-food sector.

## Notes

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2. The Hungarian study by Borszéki et al. (1985) seems to be the first in-depth study of agro-food efficiency and international competitiveness in any former socialist country, which was conducted by a national research team. The data used were for large-scale state farms and agricultural co-operative farms, and state food processing enterprises. The small-scale agricultural household farms (household plots) were excluded from the analysis. Some similar studies appeared also in the former Yugoslavia, particularly in Slovenia, which were aiming to quantify distortions in agriculture and food processing and their relevance for economic policy (Bojnec, 1999 and 2001).
3. It is worth mentioning that different other indicators of competitiveness have been developed in literature (e.g. Frohberg and Hartmann, 1997) and applied in the analysis of competitiveness in the CEEC agro-food sectors by products/sectors, ownership and size of farms/enterprises, regions, and countries (e.g. Tillack and Pirscher, 2000). Yao (1997) conducted the DRC calculations for Estonia for the initial stage of transition (1993-1994). Some crops (e.g. wheat and barley), potatoes, and milk seem to be closer to be internationally competitive.
4. According to ownership and size of the farms, the Czech individual farms greater than 50 hectares performed better than smaller farms in production of arable crops, while larger co-operatives performed better than farming companies with poorer assets (see Ratinger at al., 1999).
5. In addition to the sector/product-level DRC results, Banse et al. (1999; 2000a; 2000b) recorded farm-level DRC results for Hungary according to farm ownership and farm size under world market and EU's conditions. Larger farming companies and co-operative farms were recorded as the most competitive in crop

production (wheat, barley and maize). On the other hand, individual private farms between 15 and 30 ha of arable land were recorded, as the most competitive in animal production, while farming companies were much less competitive.

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