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The International Competitiveness of CEEC Agriculture

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ABSTRACT

The paper surveys the price competitiveness of agricultural production in Central and East European Countries (CEECs). It draws together empirical work conducted by the authors and other studies that have estimated domestic resource cost (DRC) ratios for agriculture in various CEECs. The paper identifies that in general CEEC crop production is more internationally competitive than livestock farming. During the mid-1990s, wheat production in Bulgaria, the Czech Republic, Hungary, Romania and Slovakia was internationally competitive. In contrast, during the same period, milk production was not internationally competitive. However, there is also a considerable degree of variation from country to country; very little of Slovenia's agricultural production is internationally competitive. In the livestock sector the greatest problems lie where large herds have been broken up resulting in fragmented production. This has particularly affected beef and milk production. Considering variations in DRCs by farm type, larger private farms in Hungary and the Czech Republic are more internationally competitive than smaller private farms in crop production. If CEEC producers faced average EU prices for their traded inputs and output, most could be price competitive. However, the conclusions should be treated with caution due to sensitivity of DRC ratios to changes in international prices and the choice of the shadow prices for non-tradable inputs.

KEY WORDS

International Competitiveness, Agriculture, DRCs, CEECs

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1. INTRODUCTION

In 1996 agriculture accounted for 7 per cent of GDP and employed more than ten million people in the ten Central and East European Countries (CEECs) which are applicants for EU membership (European Union, 1998).[2] The ability of this sector to deal with increasing competitive pressures from trade liberalisation and likely accession to the EU will, thus, have a bearing on the overall macroeconomic fortunes of the CEECs. Changes in competitiveness compared to international markets and the incumbent members of the EU will impact on the future development of agriculture, the spatial location of activities and standards of living in the region.

This paper tackles two questions. First, how internationally competitive is CEEC agriculture and, second, how does competitiveness vary between countries, markets and farm structures? The paper only surveys the price competitiveness of CEEC agricultural producers in key commodity markets and does not deal with the issue of quality competitiveness. The quality competitiveness of CEECs has been studied extensively by the Vienna Institute for Comparative Economic Studies (Landesmann and Burgstaller, 1998; Aiginger, 1998). However, these studies focused on manufacturing industries rather than agricultural commodities.

The competitiveness of CEEC food processing has been studied by the Institute of Agricultural Development in Central and Eastern Europe in Halle (IAMO). This research has started to fill a substantial gap in the knowledge about the extent to which the food industries in the CEECs could cope with the competition in the EU single market post-accession. IAMO studies focus on trade rather than cost indicators (Eiteljorge and Hartmann, 1999). In contrast, the present paper uses a cost approach and employs Domestic Resource Cost (DRC) ratios as indicators of comparative advantage/disadvantage. It focuses on the main agricultural commodity systems. It draws on empirical work by the authors and other similar studies to present an overall assessment of the regional competitiveness of agriculture in Central and Eastern Europe (CEE).

The paper is organised as follows. The concept of competitiveness is discussed in section 2. Studies that have estimated Domestic Resource Cost ratios as a measure of international competitiveness of CEEC agriculture are discussed in Section 3. The results of these studies are interpreted in section 4 and the main conclusions are discussed in the final section.

2. COMPETITIVENESS: DEFINTIONS AND THEORETICAL APPROACHES

As Banse et al. (1999: 1) argue 'no single measure or definition of competitiveness has gained the universal acceptance of either economists or management theorists.' The profusion of definitions has been assisted by the concept of competitiveness being

[2] These countries are Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia.

applied to different organisational and spatial entities (firm, sector/industry, region and state) and measured using an array of proxies (balance of payments, market share, costs, job creation) (Banse et al. 1999).

There are several authors who deny the role of the concept at a national level, particularly in the post-World War Two world of floating currency systems. For example, Porter (1990: 6) claims that 'the only meaningful concept at the national level is national productivity.' Likewise, Krugman (1994) also questions the usefulness of the concept at a national level.

In this paper there is neither an attempt to measure the competitiveness of a nation as a whole, nor of a sector (agriculture) in relation to the remaining sectors in the economy.[3] Rather, the question of competitiveness is discussed with regard to different agricultural commodity systems. The paper is based on one of the most widely quoted definitions, which has also been adopted by the European Commission. It defines competitiveness as the ability of a country to increase its share of domestic and export markets where '…a country has a comparative advantage in a product when it can produce at a lower opportunity cost than other countries' (European Commission, 1993: 164).

There are two main factors underlying international competitiveness. The ability to compete in international markets depends on price competitiveness or on product quality. In the former case, long run competitive advantage depends on securing a lower comparative cost structure (Porter, 1990). A differential strategy based on product quality will be successful where customers are willing to pay a premium for higher or more uniform quality, branding or service (Porter, 1990).

One measure of international price competitiveness is the domestic resource cost (DRC) ratio. The DRC compares the opportunity costs of domestic production to the value added it generates (Tsakok, 1990). The numerator is the sum of the costs of using domestic primary resources - land, labour and capital (non-internationally traded inputs) valued in terms of shadow prices. The denominator is the value-added (value of output minus tradable input costs per unit of output) in border prices. The DRC for the production of commodity *i* can therefore be defined as:

$$DRC_i = \frac{\sum_{j=k+1}^{n} a_{ij} V_j}{P_i^r - \sum_{j=1}^{k} a_{ij} P_j^r} \qquad [1]$$

[3] In its Transition Report for 1999, the European Bank for Reconstruction and Development (EBRD) used the trade related indicator, Revealed Comparative Advantage (RCA), to assess competitiveness and the direction of its changes in transition economies of Central Europe and the Former Soviet Union. The national economies were divided into five sectors: agriculture, labour intensive, capital intensive, natural resources and skill-intensive sectors. Details about this classification are available in EBRD (1999).

where a_{ij}, $j=k+1$ to n are the technical coefficients for domestic resources and non-tradable inputs and V_j are the shadow prices of domestic resources and non-tradable inputs, necessary to estimate the opportunity costs of domestic production. P^r_i are the border / reference prices of traded output, a_{ij} j=*1* to *k* are the technical coefficients for traded inputs and P^r_j are the border / reference prices of traded inputs. When the DRC is smaller than 1, domestic production is efficient and internationally competitive, because the opportunity cost of domestic resources is smaller than the net foreign exchange it gains in export or saves by substituting for imports (Gorton et al. 2000). The opposite is true when the DRC is larger than 1. However, it should be noted that DRCs are sensitive to the choice of shadow prices for non-tradable inputs and to the choice and changes in exchange rate and international prices.

The next section considers the application of the DRC methodology to analysing the competitiveness of CEEC agriculture.

3. DRC BASED STUDIES OF CEEC AGRICULTURE

DRCs have been widely used in the analysis of CEEC agricultural policy and for identifying potential opportunities for enhanced export marketing and areas in which productivity should be improved. Table 1 identifies nine studies on agriculture in the CEECs that have applied the DRC methodology. The commodities analysed and data sources used in each study are summarised in Table 1.

The application of the DRC methodology to individual countries requires a number of assumptions. The approach taken in each study is different and it is important that these differences are accounted for in any discussion of cross-country comparisons. The assumptions made can be divided into five key areas: the choice of social prices for output and tradable inputs; the estimation of the social cost of labour and land; bilateral comparison to the EU; the choice of production structures and the conduct of sensitivity analysis.

Social prices of output and tradable inputs

All the studies detailed in Table 1 measure social prices for outputs and tradable inputs as border prices (export / import parity prices) and most adjust these prices to the farm level. For products for which the country in question was a net exporter during the analysed period, an average f.o.b. export parity price is usually taken as the unadjusted reference price. For products for which the country was a net importer, average c.i.f. import parity prices are applied. The adjustment of prices from border to farm should account for, where appropriate, port and handling charges, transport, storage and maintenance costs. All the studies, apart from the Slovakia study (Bozik et al. 1998), use this border to farm adjustment in their respective analysis.[4]

[4] Kuhar (1999) adjusts only export parity prices, arguing that given the small size of Slovenia the required adjustment to any import parity prices would be marginal.

Shadow Price of Labour and Land

The social cost of labour should be measured in terms of its opportunity cost. Banse et al. (1999) use the average wage paid in manufacturing as a proxy for this. Gorton et al. (2000, 2001), and Gorton and Deaconescu (1998) modify this by separating labour input into skilled and unskilled and derive different social values for each.

The social price of land is typically measured as its rental value in the most profitable alternative agricultural use. For example, if maize production represented the only alternative to wheat production, the social cost of land for wheat would be represented by the social profits (excluding land) from the production of maize (Monke and Pearson, 1989). However, a single clear alternative is often not evident as systems vary in terms of riskiness and the desirability of crop rotation. For example, vegetable crops often provide higher returns on average than staple food crops, yet many producers continue to grow food crops because of their greater price stability over time and the limited demand for specialist crops (Monke and Pearson, 1989). In this situation, land values do not rise so high that staple crop production is eliminated, and land of identical quality produces a variety of crops. To account for this, Banse et al. (1999), Gorton et al. (2000, 2001), Gorton and Deaconescu (1998), Ratinger (1997) and Ratinger et al. (1999) took an average of suitable commodity alternatives for deriving shadow land prices. The assumption is that social land values would fall somewhere within this range.

Production Structure

The technical coefficients used in any of the analyses discussed have been subject to biases in farm level surveys. For example, the figures for Bulgaria were skewed toward large farms, which are over-represented in Gorton et al.'s (2000) analysis. Kuhar (1999) reports a similar problem in his calculations for Slovenia. Where data are available, attempts have been made to consider variations between farm types. Banse et al. (1999) and Ratinger et al. (1999) distinguish between individual private farms, co-operatives and farming companies, while Gorton and Deaconescu (1998) demarcate between individual farms, informal co-operative associations and formal co-operative associations.[5] For Poland, accounting data drawn from a sample of just over 1,000 private farms was used, with sample broken down into three farm sizes (Gorton et al. 2001). It should be noted that none of the studies made any adjustments for possible producer reactions to increases or decreases of profitability. In other words, the DRC estimates are based on constant input-output coefficients.

Comparison with the EU

The relevance of DRC studies for the estimation of the international competitiveness of CEEC agriculture has been questioned in terms of their reliance on border prices as the main benchmark. It has been argued that studies should also consider the ability of CEEC producers to operate at EU tradable input and output prices, especially in the wake of negotiations for accession to the EU. Ratinger (1997), Banse et al. (1999) and Gorton et al. (2000) have adopted adjustments for competitiveness to the EU. In their

[5] The classification of farm types used by Gorton and Deaconescu (1998) reflects the one used in Romania. Informal co-operative associations are similar to partnerships, whilst the formal ones are closer to traditional producer co-operatives.

analysis the DRC estimation is modified, so that a rate of bilateral competitiveness (RBC) is derived:

$$RBC_{i}^{ce,eu} = \frac{\sum_{j=1}^{k} a_{ij}^{ce} V_{j}^{ce}}{P_{i}^{eu} - \sum_{j=k+1}^{n} a_{ij}^{ce} P_{j}^{eu}} \qquad [2]$$

where superscription *ce* denotes our country of interest (e.g. *Central / East Europe*) and *eu* the respective benchmark (European Union). $RBC^{ce,eu}_{i}$ refers to the ability of producers of commodity *i* in the CEEC country in question to be profitable when faced with average EU output and tradable input prices with the costs of the factors of production measured again in terms of their opportunity costs within the CEEC country. If $RBC^{ce,eu}_{i}$ is less than one it indicates that CEEC production of commodity *i* is profitable if operating under EU output and tradable input prices with domestic resources valued in terms of domestic opportunity costs.

Sensitivity Analysis

Sensitivity analysis provides a way of assessing the impact of changes in the main variables (such as exchange rates and international prices) on both private and social profitability. The closer the DRC to 1, the more marginal is a country's comparative advantage or disadvantage in the production of that particular commodity. Producers in this range are most susceptible to changes in the comparator prices and exchange rates. It is useful, therefore, to conduct sensitivity analysis, considering the impact of changes in exchange rates (which have been unstable in many CEECs) and comparator prices. Banse et al. (1999) and Gorton and Deaconescu (1998) have undertaken such analysis.

4. DRC ESTIMATIONS BY COUNTRY, FARM TYPE AND COMPARISON WITH THE EU

The results of the DRC based studies are presented by commodity, farm type and in comparison to the EU in Tables 2 to 4 respectively.

Commodity Comparisons

The results presented in Table 2 highlight that crop production in the region has generally been more internationally competitive than livestock farming. From the seven studies quoted, 134 cases are presented. From these 134 cases, there are 60 instances of DRCs of less than 1 (internationally price competitive). If one compares livestock with arable production, a clear distinction is evident. Out of 61 cases in the livestock sector, only 7 instances of DRCs below 1 are reported. In contrast, 53 cases of international competitive arable production are reported (out of 73 cases).

However one must consider the degree to which the comparative advantage or disadvantage in a particular case is marginal. The problems mentioned about social

prices of domestic factors, biases in farm surveys and exchange rate sensitivity suggest that results about marginal cases might be misleading. There are cases of large variations from year to year in the same crop and country that one should these figures with caution.

Within the arable sector, the most competitive crops were wheat and oilseeds (rapeseed in the north and sunflowers in the south). Wheat producers benefited from comparatively high international prices during the period analysed, especially in 1996. In this year, DRCs for wheat production were less than 1 for Bulgaria, the Czech Republic, Hungary, Poland, Slovakia and Romania. After 1996, the pattern has been less pronounced. In 1997 grain prices were generally lower than in 1996. For example, average world wheat prices decreased by more than 10 per cent. This fall reduced the measured competitiveness of CEEC grain production by making the traded output less valuable, and increased the competitiveness of livestock production by reducing the traded input cost of fodder.

Sunflower production was competitive in all years analysed for Hungary, Slovakia and Romania. Due to climatic conditions and increasing private profitability, the production area devoted to sunflower has grown in all three countries. This indicates a degree of responsiveness to changes in the operating environment of farmers. In Hungary, the area devoted to sunflower rose by approximately 50 per cent between 1991 and 1996 and over the same time period a 20 per cent rise was recorded in Romania (Banse et al. 1999; Gorton and Deaconescu, 1998).

The only country that does not record any instances of internationally competitive crop production is Slovenia. However, the analysis suffers from the paucity of data, although the figures for Slovenia are consistent with the results of other measures of competitiveness, which reveal domestic production to be highly protected and predominantly non-competitive on international markets (Sarris, 1998). Agricultural production in Slovenia is hampered by unfavourable natural conditions, fragmented farm structures and the relatively high costs of domestic factors (especially labour and capital).

At first glance, Bulgaria appears to be the most competitive arable producer in the region. However, one should be careful in interpreting the results on two counts. First, the technical coefficients supplied by the Ministry of Agriculture, on which the Bulgarian analysis is based, are biased toward large farms. Smaller farmers are likely to be less competitive (Hughes, 1998). Second, during the analysed period the domestic prices for wheat and barley were kept below world market prices through the use of various impediments to export. In other words, farmers were effectively taxed in an environment of an unstable exchange rate and macroeconomic crisis. As the real cost of factors of production rises with economic recovery and distortions start to be removed, DRCs are likely to increase.

Looking at year on year changes, the DRC estimations indicate that wheat production in Bulgaria, Czech Republic, Hungary and Slovakia became more internationally competitive between 1994 and 1996. This was primarily due to rising international grain prices: US hard winter wheat prices rose from an average of $143 USD per

tonne in 1993/4 to $216 in 1995/6 (FAO, 1998).[6] The international competitiveness of Bulgarian, Czech and Slovak barley production showed a similar improvement, as did maize in Hungary and Slovakia. Again, this reflected a rise in international prices. After 1996, international commodity prices fell and this accounts for the worsening competitiveness of Polish agriculture.

While DRCs have shown that, by and large, arable production was competitive, the results for Bulgaria, Hungary and Romania indicate that in general producers are paying above world market levels for their tradable inputs. Privatisation of seed, fertiliser and plant protection chemicals has been comparatively slow in Bulgaria and Romania and tariffs on these products are significant throughout the region. If farmers are expected to operate in a low-subsidy environment without price support, it is essential that inputs are available at internationally competitive prices.

Finally, for estimates of the future competitiveness of crop production it should be noted that in some cases the low absolute amount of chemical and fertiliser inputs used has been at the expense of future soil fertility (Köckler and Quiring, 1997). To stabilise or increase yields in the future, an over-proportional application of these current inputs may be necessary. This means that in many cases current competitiveness has been reached by an over-exploitation of resources and short-term gains have been realised at the expense of long-run soil fertility.

Turning to animal production, the performance has been much worse. The DRCs for beef and milk production in every case reported were greater than 1. Relatively low international prices, high labour and feed use as well as disadvantageous farm structures have all contributed to this situation. At the beginning of transition the large herds maintained by state and co-operative farms were often broken up and either distributed to members or directly slaughtered. This led to a significant decrease in the stock of animals and fragmentation of production: in Romania and Bulgaria the average dairy herd size in 1996 was less than 1.8 and 1.4 cows respectively (Gorton and Davidova, 2000). As a result, the sector has been plagued by high transaction costs, unrealised economies of scale and an erratic and poor quality of supply. Even with the removal of price and budgetary supports in both countries, domestic milk prices are high by international standards. In Hungary and the Czech Republic the situation has been slightly better due to higher real incomes and the attraction of greater levels of foreign direct investment (FDI) in the dairy sector. In these countries foreign owned dairies have provided investment credits and other support to larger dairy farmers to help ensure regular supplies (Szabó, 1999).

The results for pork production reflect the fluctuations in international pig prices and changes in supply brought about by shifts in the input/output price ratio. Overall, in the region the situation for pork is better than for milk and beef, as less fragmentation of production has occurred. Considering annual fluctuations, the DRC estimates followed the changes in the ratio between domestic and world market prices. In years when international prices were comparative low, DRCs throughout the region were greater than 1. For example the international competitiveness of Bulgarian, Czech and Slovak beef production fell in 1996 (compared to 1995). In 1996 international beef

[6] Based on Fob US Gulf port prices.

prices fell due to the BSE crisis, before partially recovering in 1997 (FAO, 1998). In contrast, international pork prices rose moderately as reflected in the improving DRCs for Bulgarian, Czech, Hungarian and Slovak pork production.

Overall, it can be concluded, that when international prices are used as a benchmark, CEEC crop production tends to be more competitive than animal production. Two factors are important for this result. First, international grain prices were comparatively high in the mid-1990s. However, since 1996 international cereal prices have fallen and this has diminished the competitiveness of CEEC crop production. Second, while input and output intensity has decreased during transition, the fall in input use has been greater (Banse et al. 1999). Labour input has fallen as, typically, employees that left former state and co-operative farms have not been replaced (OECD, 1999). The fall in labour input has been particularly pronounced in Slovakia (Bozik et al. 1998).

Variations by Farm Type

Table 3 details the DRCs estimated for the Czech Republic, Hungary and Romania by farm type. The calculations for the Czech Republic and Hungary by farm type were for 1997, while the commodity analysis (Table 2) covered the years 1994-1996. As the time periods differ, one would expect varying results.

In the Czech Republic larger individual farms (defined as farms with above 50 hectares) performed better than their smaller counterparts in the production of arable crops. This finding concurs with total factor productivity (TFP) analysis that has pointed to larger farms in the Czech Republic being more efficient (Hughes, 1998). Likewise, co-operatives have tended to perform better than farming companies in the Czech Republic. Part of the reason for the latter finding is the larger average size (2,500 hectares) of co-operatives in the Czech Republic and their historical importance. Farming companies were predominately new in 1997 and were formed with a poorer asset base. The larger individual private farms and farming companies that now exist are a new phenomenon with the latter incorporating many transformed (bankrupt) co-operatives (Hughes, 1998).

In Hungary, as in the Czech Republic, larger private farms are more internationally competitive than smaller private farms in crop production. The larger corporate farms use fewer units of non-traded factors of production per unit of tradable cost than the independent private farms (Banse et al. 1999). However, this pattern is sensitive to the shadow cost of land adopted. A higher shadow price of land tends to reduce the tendency for the larger structures to have lower DRCs (Hughes, 1998).

In both Hungary and the Czech Republic the importance of farm size in the DRC calculations, as measured by hectares operated, does not hold for livestock production. Given that the number of hectares managed is a very imperfect measure of the size of livestock farms, one would expect these less clear-cut results. To fully investigate the relationship between farm size and DRC calculations for livestock products, a re-estimation by output per farm is required. The Romanian calculations are not discussed, as they suffer from lack of data and the fact that the calculations for particular farm types (such as informal associations or private farms) have not been subdivided by farm size.

The DRCs by farm type broadly reflect the commodity estimates recorded in Table 2, except for Hungarian livestock production. In the latter case, while the farm type calculations indicate that all structures in 1997 were internationally competitive in pork and beef production (except beef produced by individual farms larger than 30 hectares), the appropriate DRCs for 1994 to 1996, recorded in Table 2, are all greater than 1.). Two reasons may account for discrepancy. First, the estimations used different data sets. The Hungarian DRCs in Table 2 are based on a sector level input-output model while the estimates in Table 3 are based a farm accounting survey administered to over 400 farms by the AKII institute (Banse et al. 1999). It is thought that AKII farm survey is biased to more efficient farms (Hughes, 1999). Second, between 1996 and 1997, grain prices (and thus fodder costs) decreased so that one would expect some improvement in the DRCs between 1996 and 1997, although maybe not to the extent displayed.

The Polish results reveal a consistently inverse relationship between DRCs and farm size that held for all commodities and all years (Gorton et al. 2001). This is an important result as Polish production is relatively fragmented and the degree of structural change has been slow. For example, 32 per cent and 41 per cent of the Polish wheat and rye crop are grown on small farms (less than 10 hectares) respectively. There is a bulk of small units cultivating up to 5 ha and a limited number of larger units with over 25 ha of arable land. A similar problem is apparent for milk production. The average Polish dairy farm (in most cases milk is not the main or only activity) has 5.2 ha of agricultural land with 3.4 milk cows. For the period analysed, many commodities were privately and socially uncompetitive and overall, agriculture is a loss-making sector (GUS, 2000). Many enterprises have responded to falls in margins by reducing the use of tradable inputs. This can only however be a short-term response. In the long term competitiveness can only be improved by supporting the modernisation of production, amalgamation of farm units and encouraging the establishment of appropriate marketing organisations to improve value added and guide improved output mixes.

Comparison with the EU

Overall, agriculture in the CEECs is more price competitive when average output and tradable input prices of the EU are adopted in the calculations, although this is not universally true (Table 4). Out of the 48 bilateral DRCs estimated with the EU, there are only 10 cases of DRCs above 1. In the Bulgarian and Czech analyses there are only two cases (milk in Bulgaria for 1995 and beef production in the Czech Republic in 1996) where DRCs above 1 have been recorded. In Hungary the situation is less clear, as while producers would benefit from belonging to the EU in terms of higher average output prices, in some cases this would be more than offset by higher tradable input prices. However, two caveats should be noted. First, these estimates assume that quality is homogenous. No adjustments were made for differences in standards between the CEECs and the existing EU members.[7] Second, none of the bilateral DRCs reported in Table 4 account for direct payments. If direct payments were

[7] A difference in the quality of good produced by domestic and international producers is also an issue in the estimation of conventional DRCs where an import parity price is taken. Where an export parity price is used, one would expect that differences in quality should be reflected in the unit values of exports.

available (so if not only price alignment, but also policy harmonisation between the CEECs and the EU is assumed), then the lack of private profitability reported for Hungarian sunflower, wheat and barley production in 1996 would have been reversed (Banse *et al.* 1999).

5. CONCLUSIONS

The calculation of domestic resource cost ratios (DRCs) allows for the comparison of efficiency between systems that produce unlike outputs and gives an indication of international competitiveness. This methodology has been widely applied to CEEC agriculture, albeit with wide variations in the assumptions employed. These calculations are sensitive to the choice of shadow prices and are of most use when a spectrum of scenarios are tested, considered over a number of years and the degree of sensitivity to changes in international prices and the opportunity costs of factors of production considered. Therefore, the conclusions from the cross-country comparisons should be treated with caution.

From the results of the nine studies of agricultural competitiveness in the CEECs, which have applied the DRC methodology, it appears that in general CEEC crop production is more internationally competitive than livestock farming. This pattern was particularly true for the period 1994 to 1996. However, one must interpret the results carefully as a number of the studies are biased to large farm structures and do not consider effect of present farming practices on long-run soil fertility.

There is also a considerable degree of variation in the region; for example the production of all the commodities analysed in Slovenia was non-competitive. Unfavourable natural conditions, the fragmented farm base and the relatively high cost of non-tradable factors of production hinder Slovenian agriculture. Given current trends, very little agricultural production in Slovenia can be competitive at international prices.

In the livestock sector the greatest problems lie where production has been fragmented and large herds broken up. In its present form Bulgarian and Romanian milk sectors are also not likely to be competitive in international terms in the foreseeable future. The competitiveness of CEEC pork production has fluctuated with oscillations in international pig prices, which were considerable in the 1990s.

CEEC agriculture is more price competitive when the average output and tradable input prices that operate in the EU are adopted in the calculations. However, this is not universally the case. In some instances the gains which farmers would receive from operating at output prices equivalent to an EU average would be more than offset by higher tradable input costs, if EU averages were likewise applied. However, none of the bilateral DRCs account for direct payments, which if received by CEEC producers, would significantly augment the private profitability of production.

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Table 1: DRC-based Studies of the International Competitiveness of CEEC Agriculture

Country	Author	Years Covered	Data Source(s)	Remarks
Bulgaria	Gorton et al. (2000)	1994-1996	Ministry of Agriculture, farm survey	5 products, variations between competitiveness on EU and world markets
Czech Republic	Ratinger (1997)	1994-1996	Ministry of Agriculture, OECD and research institute (VUZE) farm survey	5 products, variations between competitiveness on EU and world markets
Czech Republic	Ratinger et al. (1999)	1997	Farm Accountancy Data Network (FADN) farm survey, OECD reference prices	9 products, variations between farm types considered
Hungary	Banse et al. (1999)	1990 to 1996	Sector level input - output model and farm accounting survey.	8 products. Variations between (i) competitiveness on EU and world markets and (ii) farm types.
Poland	Gorton et al. 2001	1996 to 1998	IERiGZ farm accounts and own survey	8 products. Variation between farm sizes considered.
Romania	Gorton and Deaconescu (1998)	1996 and 1998	Ministry of Agriculture, World Bank private farm survey	8 products, impacts of one type of policy (voucher scheme) considered.
Slovakia	Michalek (1995)	1992/3	Bookkeeping farms	14 products and three regions (West-, Middle- and East-Slovakia)
Slovakia	Bozik et al. (1998)	1991-1996	Bookkeeping farms, Research institute (RIAFE) database	14 products.
Slovenia	Kuhar (1999)	1998	Ministry of Agriculture and the Bank of Slovenia	4 products.

Table 2: DRC Calculations for CEEC Agriculture by Commodity

	Bulgaria			Czech Republic			Hungary			Romania		
Year	**1994**	**1995**	**1996**	**1994**	**1995**	**1996**	**1994**	**1995**	**1996**	**1996**	**1998**	**199**
Wheat	0.45	0.32	0.26	0.82	0.49	0.47	0.64	0.71	0.89	0.23	0.78	0.76
Maize							1.28	0.90	0.82	0.32	0.90	1.05
Barley	0.80	0.70	0.41	1.49	0.76	0.54	1.21	0.77	1.27			2.27
Sunflower							0.76	0.72	0.80	0.52	0.80	0.77
Sugar beet										3.48	2.41	0.63
Rye												1.37
Rapeseed												0.44
Potatoes												0.79
Milk	1.40	1.68	1.15	2.54	1.89	1.96	6.90	6.13	13.98	5.14	1.15	5.48
Beef	1.61	1.38	0.35	2.16	1.76	1.93	1.31	2.53	2.53	-1.33	1.15	-4.00
Pork	0.92	0.68	0.64	3.10	1.74	1.40	5.41	-3.84	2.88	3.37	0.97	-0.70
Chicken										2.66	1.20	-0.50
Eggs												1.30

Source: Gorton et al. (2000), Ratinger (1997); Banse et al. (1999), Bozik et al. (1998), Gorton and Deaconescu (1998), Kuha

Table 3: DRCs by Farm Type and Commodity

	Czech Republic (1997)				Hungary (1997)					
Commodity	**Ind. Farms <50ha**	**Ind. farms >50 ha**	**Co-ops**	**Farming Comp'nies**	**Ind. Farms <15ha.**	**Ind. Farms 15-30ha.**	**Ind. Farms >30ha**	**Farm Comp'nies**	**Co-ops**	**I fa (3-1**
Wheat	0.89	0.71	0.62	0.73	0.93	1.02	0.76	0.54	0.67	1
Maize					1.29	1.03	0.62	0.56	0.56	
Barley	0.99	0.82	0.63	0.77	1.77	0.99	1.31	0.60	1.11	
Rape seed	0.82	0.54	0.75	0.86			0.64		1.06	1
Sugar beet	1.71	2.85	2.00	2.25	1.67	0.74	0.92	0.29	0.84	4
Sunflower						1.74	1.04			
Milk	1.73	1.53	2.02	2.1				0.29	0.75	4
Beef	1.57	1.57	1.80	1.70		0.38	1.04	0.29	0.58	4
Pork	1.35	0.99	1.22	1.12	0.71	0.44	0.66	0.66	0.85	2
Chicken			8.71	9.52						

Source: Ratinger et al. (1997), Banse et al. (1999), Gorton et al. (2001) and Gorton and Deaconescu (1998)

Table 4: Estimates of Bilateral DRCs with the EU

	Bulgaria			Czech Republic			Hungary		
Commodity	**1994**	**1995**	**1996**	**1994**	**1995**	**1996**	**1994**	**1995**	**1996**
Wheat	0.39	0.28	0.25	0.52	0.46	0.66	0.43	0.62	1.06
Maize							0.73	0.63	0.69
Barley	0.43	0.52	0.39	0.68	0.62	0.68	0.50	0.75	1.16
Sunflower							0.91	1.05	1.73
Milk	0.75	1.16	0.89	0.85	0.73	0.87	0.65	0.80	1.07
Beef	0.52	0.68	0.34	0.90	0.82	1.18	0.54	1.04	1.50
Pork	0.50	0.49	0.64				1.89	4.46	0.94

Source: Gorton et al. (2000), Ratinger (1997), Banse et al. (1999)