Three Concepts of Competitiveness Measures for Livestock Production in Central and Eastern Europe

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SUMMARY

This paper provides the overview of competitiveness measures applied in measuring competitiveness of livestock production in Central and Eastern European (CEE) countries. Three concepts of competitiveness are presented that are based on (i) Porter's diamond of competitive advantage, (ii) competitiveness measures based on accountancy data and Policy Analysis Matrix (PAM) approach, and (iii) competitiveness measures based on international trade data. On the basis of the presented results the paper evaluates competitiveness of livestock production in CEE countries focusing on policy implications of transition and integration of CEE's countries livestock sectors into the Single European Market. Low international competitiveness in CEE countries is for beef and milk, but with some indices of most recent improvements. Pork production (e.g. in Bulgaria) and sheep production (e.g. in Slovakia) may become internationally competitive. Less clear pattern is for the poultry sector. Some improvements may arise as result of a deep restructuring, quality, technology and efficiency improvements and rationalisation of costs, including in food processing.

KEY WORDS

competitiveness, livestock sector, Central and Eastern Europe

INTRODUCTION

There are several concepts of competitiveness and different indicators for measuring of competitiveness have been developed in literature (e.g. Frohberg and Hartmann, 1997). This is a reason that also different indicators of competitiveness have been applied in the analysis of competitiveness in Central and Eastern European (CEE) countries agro-food sectors by products, ownership and size of farms/enterprises, sectors, regions, and countries (e.g. Tillack and Pirscher, 2000).

We are focusing on three concepts of competitiveness relevant for livestock production in CEE countries: Porter's (1990) diamond of competitive advantage, competitiveness measures based on accountancy data and Policy Analysis Matrix (PAM) approach focusing on domestic resource cost (DRC) measure, and measures of competitiveness on the basis of trade data (degree of external integration on the basis of intra-industry trade – IIT index, quality of traded animal products on the basis of export-to-import price ratio, and export, import, and trade revealed comparative advantage measures). The overview of the each of the concepts is presented as the separate section focusing on

Independent Research Organisation, Ljubljana, Slovenia
Received: June 13, 2003

the existing literature with presenting main results. In the second section based on the Porter's diamond of competitive advantage the results for wide range CEE countries are presented in comparison with global livestock developments. In the third section the DRC measure of competitiveness is presented for seven CEE countries the first members of the Central European Free Trade Agreement (CEFTA-7: Hungary, Poland, the Czech Republic, Slovakia, Slovenia, Romania, and Bulgaria).[1] In the fourth section the paper reviews the results of measures of competitiveness on the basis of trade data for Slovenia as well as for other CEE countries. The final section summaries and concludes with policy implications.

PORTER'S DIAMOND OF COMPETITIVE ADVANTAGE

Porter's (1990) diamond of competitive advantage is a concept often used for investigating of factors of competitive advantage of nations and economy sectors. It comprises from four elements:

- factor conditions,
- demand conditions,
- related and supporting industries,
- firm strategy, structure and rivalry.

These four elements form the national diamond of competitive advantage as a mutual-reinforcing system: the effect of one of the elements always depends on the state of the others.

The importance of factor conditions was already underlined in the standard theory of international trade. Competitive advantage of nations or sectors is associated with basic production factor endowments such as land and natural resources, labour, human capital, physical capital, and infrastructure. Besides stock and qualitative characteristics of basic production factors, crucial for competitiveness is a dynamic ability of a nation to create, upgrade and to make efficient use of its production factors.

The impact of demand conditions on competitiveness is through quantitative and qualitative causalities associated with consumer preferences and needs. Consumer preferences in quantitative terms can induce static efficiencies by providing incentives for development of competitive advantages and using economies of scale. Consumer needs in qualitative terms can induce dynamic efficiencies. For example, the critical domestic consumers and anticipatory home market can be good incentive for a higher level of innovation and thus for upgrading competitive advantage. Of course, domestic enterprises should be able to properly react on these consumer/demand signals.

The existence of related and supporting industries is crucial for economic efficiency and competitive advantage. Domestic supplier industries are important for efficient and on time access to high quality intermediary inputs at internationally competitive price conditions due to transport cost advantage vis-à-vis foreign suppliers. Besides related supplier industries for raw, intermediary inputs, the competitiveness depends also on related and supporting efficient institutions such as banking and credit institutions.

The firm strategy, and structure of firm markets and rivalry are keystones of theories in the fields of industrial organisation, managerial economics, management and marketing sciences and competition at micro- and sector-levels. Goals of firms, firm business strategies and organisational characteristics, management and managerial practices, entrepreneurial spirit in taking risks and capability in providing incentives and training for labour, and firm sale orientation (domestic vs. international markets) are important for competitive advantage for firms. Firm market structures in terms of quality and price competitiveness, barriers to entry and intensity of competition between firms in the market or number of rivalries firm is facing in the market, and extent of vertical integration are important for competitiveness and competitive advantage for firms, sectors and for nations in long-term.

These four elements are connected in the causal system with two enabling elements:

- government, and
- chances.

The »good« or »bad« government policies and government institutions can influence each of the four elements positively or negatively. Of course, there are also possible feedback effects from the four elements on the government trough lobbying and election processes. Government price, trade, competition and other policies have important role on domestic markets and on international competitiveness.

The chances are in interaction with the four basic elements and represent opportunity and threats for enterprises, sectors, and nations for competitive advantage and development.

Hartmann (1998) presented some basic stylised facts of the Porter's diamond of competitive advantage for agriculture in CEE countries, including for livestock sectors. With some extensions and updates it is summarised in Table 1.[2]

As illustrated in Figure 1, during the last decade livestock production on the global scene increased

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[1] Also Croatia is currently the member of CEFTA but at the time of the writing of this paper the DRC results for the livestock sector in Croatia were not available.

[2] In the case of the Slovenian food-processing sector, see also Erjavec and Kuhar (2000).

Table 1. Advantages and Disadvantages for CEE countries Agriculture/Livestock Sectors

Porter's Diamond of Competitive Advantage	Advantages	Disadvantages
Factor conditions	• Favourable endowment with land measured by agricultural land or arable land per capita • Lower wages • Lower feed prices	• Higher capital costs • Lower labour productivity • Lower productivity of breeds and seeds • Lower quality of fodder • Differences in soil quality across CEE countries and high sensitive on climatic conditions (e.g. high summer and low winter temperatures)
Demand conditions	• Income growth and rise in demand for greater variety, higher quality and healthier products • Larger markets with European integration processes	• Decline in consumption of food products due to reduction of food subsidies • Low purchasing power of the population • Specific demand in quantity and structure with lower quality orientation on more expensive meats and animal products
Related and supporting industries	• Opportunities for improvements in input markets • Opportunities for better utilisation of economies of size and economies scale • Opportunities for market orientation in food chains • Opportunities for new product varieties and intermediary inputs satisfying higher quality standards	• Persistence of inefficient organisations and outdated technology • Overcapacities and lack of market orientation in quality and variety • Faster rise in labour costs than in labour productivity • Lack of finance, high indebtedness, and high costs of capital borrowing
Firm strategy, structure and rivalry	• Firm privatisation, restructuring and marketisation • Better utilisation of economies of scale • Greater entrepreneurial spirit and better management practices • Increased competitive pressures and demonopolisation • Greater external, export orientation	• Unfourable labour, elderly and low-skilled labour in agriculture • Persistence of hidden entry barriers and persistence of market power in food chains • Lack of market orientation in terms of product varieties, food quality and environmental standards
Government	• Adjustments of legal and regulatory framework and standards towards the EU • Opportunities for better information system • Opportunities for better contract and property right enforcement	• Institutions still not fully compatible yet with market economies and EU requirements • Problems with setting up and implementation of grading systems, standards and market information systems • Unpredictable legal and court system clarifying and securing property rights
Chances	• Environmentally friendly and sustainable livestock production • EU accession and trade creation on larger Single European Market • Free movements of labour, capital, goods and services • Direct cooperation and joint investments with EU and other foreign partners • EU policies and funds	• Lack of competitiveness in livestock sector • Lower competitiveness in food chains, particularly in food processing • Ecological (e.g. large-scale pigs and poultry problems, slaughterhouses) and animal quality standards

Source: Hartmann (1998) and the author.

particularly in South, Central and North America, while the largest decline is recorded for Eastern Europe by almost 30 percentage points. Livestock production in the EU-15 experienced more stable developments with a slight increase less than 3% percentage points over the analysed period.

The republics of the former Yugoslavia experienced quiet different stories in the development of livestock production after the collapse of the former Yugoslavia in 1991. There was a rapid decline in livestock production in Croatia and particularly in Bosnia in Herzegovina. Livestock production in the mid-1990s

increased in Serbia and Montenegro. It peaked in 1996 to the level about 10 percentage points greater than in the pre-transition period, but since then it declined to about 20 percentage points less than in the pre-transition period. The steady declines with some sings of recovery are recorded for the former Yugoslav Republic of Macedonia. Only Slovenia increased its livestock production by about 10-percentage points vis-à-vis the initial pre-transition level.[3]

In the Baltic states (Estonia, Latvia, and Lithuania) and other former Soviet Union Republics (e.g. Russian Federation, the Ukraine, and the Republic of Moldova) the livestock production rapidly declined until 1999 when it stabilised or slightly recovered, but at about half of the pre-transition levels in Russian Federation, Lithuania, and most recently the Ukraine, and at about one-third of the pre-transition levels in Estonia, the Republic of Moldova, and Latvia.

During transition to a market economy, livestock production declined in Hungary, Poland, Romania, the Czech Republic and particularly in Bulgaria and Slovakia. On the other hand, as interesting, livestock production during the same period almost doubled in Albania where radical land reform and farm restructuring towards small-scale farms were carried out.

COMPETITIVENESS MEASURES BASED ON FARM ACCOUNTANCY DATA AND POLICY ANALYSIS MATRIX (PAM) APPROACH

The Policy Analysis Matrix (PAM) compares revenues, costs of traded intermediary inputs, costs of non-traded intermediary inputs and primary domestic resources (land, labour, and capital), and profitability (the differential between the revenue and all costs) at private (domestic) and economic (social) prices (Monke and Pearson, 1989). The PAM structure, indicators of profitability at private (domestic) prices and economic (shadow or social) prices, measures of protection and competitiveness are described in Table 2.

The presentation of empirical results on efficiency and international competitiveness in this paper is limited on the presentation of the results on the basis of domestic resource costs (DRC) measure (e.g. Scandizzo and Bruce, 1980; Tsakok, 1990):[4]

$$DRC_i = \frac{\sum_{j=k+1}^{n} a_{ij} V_j}{P_i^b - \sum_{j=1}^{k} a_{ij} P_j^b} \qquad (1)$$

The DRC compares the opportunity costs of using domestic primary resources (land, labour and capital) and of non-traded inputs to the value-added in economic (social or border) prices 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, 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 economic 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 economic price (world market price) of output i, and P_j^b is the economic price of input j. The exchange rate used in the DRC calculations is the opportunity cost benchmark. When DRC is less than 1, but greater than 0, this implies internationally competitive production, while DRC greater than 1 implies that a certain product is not competitive internationally. When DRC is less than 0, this implies very unprofitable, internationally loss-making activity.

In spite of some differences among studies, the results show that livestock production in CEE countries, except to a lesser degree in Slovenia and Poland, tends to be internationally less competitive than crop production (Table 3). More capital-intensive livestock production experienced greater negative implications of disorganisation and disruptions during transition. International competitiveness in poultry production deteriorated and largely become internationally uncompetitive. International competitiveness in pork production in Bulgaria is unstable over time, but the DRC was greater than 0 and less than 1 suggesting internationally competitive pork production. International competitiveness in beef and milk production first deteriorated, but improved later particularly in beef production. Animal production (milk, beef and pork) in the Czech Republic is recorded as internationally non-competitive, but with some improvements as result of restructuring and milk is likely to be competitive under the EU price structures. Considerable differences are in Hungary and in Slovakia between much more internationally competitive crops than animal products (milk, beef and pork), which are recorded, as internationally non-competitive.[5] Unlike for most CEE countries, milk and to a lesser extent beef production in Poland are recorded as internationally competitive particularly on larger farms. More protected pork and poultry production are internationally uncompetitive. Internationally less competitive animal production (milk, beef, pork and poultry) is recorded for

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[3] More about the Slovenian livestock sector challenging accession to EU see in Kavčič et al. (1999).

[4] The results of nominal protection rates for CEE-10 are presented in Bojnec and Swinnen (1997), while some more recent results of nominal and effective protection rates for Bulgaria, Hungary, Slovakia, and Poland in Poganietz et al. (2000).

[5] More about the Slovenian livestock sector challenging accession to EU see in Kavčič et al. (1999).
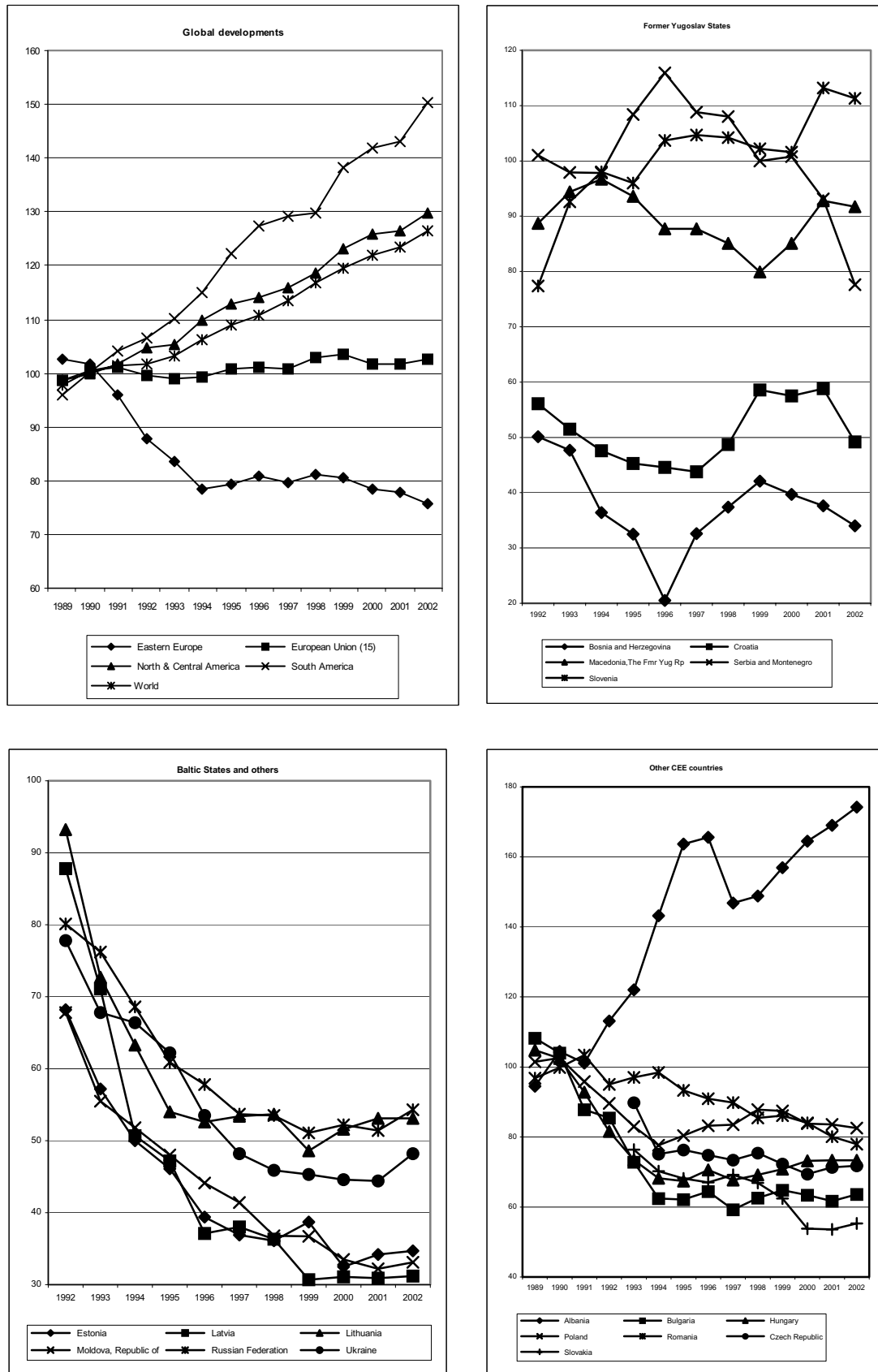
Figure 1. Indices of livestock production (Net PIN base 1989-91)

Table 2. Policy Analysis Matrix (PAM), indicators of profitability, protection, and efficiency (international competitiveness)

	Revenue	Traded intermediary costs	Primary domestic resource costs	Profitability
Private (domestic) prices	A	B	C	D = A - B - C
Economic (shadow) prices	E	F	G	H = E - F - G
Policy transfers	I = A - E	J = B - F	K = C - G	L = D - H = I - J - K

Private profitability	D = A - B - C
Economic profitability	H = E - F - G
Transfers to output	I = A - E
Transfers to traded intermediary inputs	J = B - F
Transfers to primary domestic resources	K = C - G
Net transfers	L = D - H = I - J - K
Nominal protection rate (NPR)	NPR = [(A / E) - 1]*100
Effective protection rate (EPR)	EPR = [((A-B)/(E-F)) - 1]*100
Social cost-benefit ratio (SCBR)	SCBR = (F+G)/E
Domestic resource cost (DRC)	DRC = G/(E-F)
Private cost ratio (PCR)	PCR = C/(A-B) or G/(A-B)

Sources: Monke and Pearson (1989); Tsakok (1990); and Bojnec (2001a).

Table 3. DRC Calculations for Livestock Products and Country

	Bulgaria					Czech Republic			Hungary					
	1989	1997	1994	1995	1996	1994	1992	1996	1978–83[a]	1990–92	1993	1994	1995	1996
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														

	Poland				Romania		Slovakia				Slovenia			
	1992	1993[b]	1994[b]	1995[b]	1996	1998	1992–93[c]	1994	1995	1996	1995	1997	1995[d]	1998
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	1.05	1.09		1.37
Live cattle		1.04; 0.92	.99; .89	1.03; .92							2.64	1.70		
Beef					–1.33	1.15	–0.32; –2.38; –1.76	–4.00	–19	11.9				
Live pig		1.00; 0.98	.96; .93	1.93; 2.36							1.20	1.47	0.63(0.45)	1.21
Pork	–.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					1.29		
Mutton														
Chicken	1.12				2.66	1.20		–0.50	–0.40	–1.50	1.28	1.70	0.81(0.44)	
Eggs	2.01							1.30	–1.70	.49	2.08	2.42	1.96(1.31)	

Year-to-year oscillations are not considered. [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. [d] In the brackets presented sensitivity analysis of lower economic costs for land and capital. Source: Studies collated by Bojnec (2001a) for Slovenia and Bojnec (2002) for other CEE countries.

Romania, but with some improvements closer to be internationally competitive particularly for pork. While large-scale pig and poultry production in Slovenia tend to be internationally competitive, there is an ecological concern regarding large-scale animal farms. Milk is recorded as an agricultural product, which may become internationally competitive.

MEASURES OF COMPETITIVENESS ON THE BASIS OF TRADE DATA

Degree of external integration: Intra-Industry Trade (IIT)

Similar product is often exported and imported at the same time. Trade in the same product group is in literature known as intra-industry trade (IIT) in

Table 4. Evolution of GLIIT in Agriculture and Food Products in Slovenia, 1992-1997*

		1992	1993	1994	1995	1996	1997
Agriculture and food – total trade	Total	0.374	0.298	0.311	0.264	0.264	0.251
	EU	0.186	0.170	0.174	0.136	0.136	0.127
	YUG	0.336	0.254	0.235	0.225	0.225	0.220
Meat and meat preparations (SITC 01)	Total	0.261	0.229	0.300	0.191	0.191	0.172
	EU	0.143	0.085	0.293	0.157	0.157	0.065
	YUG	0.326	0.179	0.095	0.069	0.069	0.048
Dairy and eggs (SITC 02)	Total	0.352	0.249	0.212	0.252	0.252	0.275
	EU	0.304	0.107	0.065	0.156	0.156	0.169
	YUG	0.308	0.214	0.066	0.081	0.081	0.097

* YUG – former Yugoslav republics. A value of the GLIIT index close to one indicates the intra-industry trade (IIT) variety, and a value of the GLIIT close to zero indicates the inter-industry trade type. Source: Sarris, 1998, pp. 89-92.

Table 5. The Magnitude and Evolution of GLIIT in Agriculture and Animal Products in Slovenia, 1993-1997

	1993	1994	1995	1996	1997
Bovine meat	0.62	0.93	0.98	0.89	0.36
Pork	0.71	0.80	0.74	0.91	0.71
Poultry meat	0.32	0.06	0.08	0.37	0.47
Eggs in the shell	0.14	0.24	0.42	0.50	0.63
Sausages	0.15	0.10	0.17	0.11	0.15
Cheese and curd	0.58	0.73	0.66	0.69	0.94
Milk powder	0.21	0.11	0.16	0.72	0.95
Butter	0.19	0.03	0	0.18	0.25

Note: For Bulgaria, Estonia, Hungary, the Czech Republic, Latvia, Lithuania, Poland, Romania and Slovakia see in more detail Bojnec (2001b). Source: Bojnec, 2001b.

comparison with inter-industry trade (Grubel-Lloyd, 1975). The weighted Grubel-Lloyd (1975) index of intra-industry trade (GLIIT) is defined as:

$$GLIIT_i = 1 - \frac{\sum_j \left| X_{ij} - M_{ij} \right|}{\sum_j (X_{ij} + M_{ij})} * 100 \qquad (2)$$

where X_{ij} and M_{ij} are values of exports and imports respectively of product j in product group i. GLIIT is defined between 0 and 1 (or between 0% and 100%). GLIIT is equal 0 when all trade inside product group i is inter-industry type (for example, only exports or only imports). GLIIT is equal 1 (100%) when all trade inside product group i is intra-industry type (for example, exports is equal imports). Sarris (1998) examined Slovenian agricultural and food trade and the GLIIT index by using the Slovenian foreign trade data for selected Standard International Trade Classification (SITC) 5-digit SITC sections, which are aggregated at the 2-digit SITC level (Table 4). He presented the evolution of the GLIIT index for total trade and separately for trade with the main Slovenian agricultural and food trade partners: the EU on the import side and the former Yugoslavia on the export side. He found unbalance patterns in agricultural and food trade as Slovenian agricultural and food exports declined and Slovenian agricultural and food imports increased suggesting declining international competitiveness during the 1990s. The deterioration of Slovenian agricultural and food trade was found both in quantitative and qualitative terms. Low amount of trade is in similar products, which means the low proportion of trade is intra-industry trade (IIT) and the proportion of IIT in agricultural and food trade further declined over time. The proportion of the IIT was particularly low in trade with the EU. Trade in meat and meat products, dairy and eggs, and animal feeds deteriorated and the low proportion of IIT declined over time.

Bojnec (2001b) using FAOSTAT data for ten CEE countries (e.g. Bulgaria, Estonia, Hungary, the Czech Republic, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia),[6] revealed main patterns of IIT for agricultural and food products for Slovenia found by Sarris (1998). For most agricultural and food products, the GLIIT measures are low (less than 0.5) and often declining over time such as for poultry meat and sausages (Table 5). The GLIIT measure for butter ranged between close to zero and 0.25. The GLIITs are greater than 0.5 and increasing over time for pork, and cheese and curd. The rapid increase in the GLIIT measure over time was found for eggs in the shell from 0.14 in 1993 to 0.63 in 1997 and

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[6] For other CEE countries see more detail in Bojnec (2001b).

Table 6. The GLIIT indexes for live animals, meat and meat preparations, and dairy and eggs in Slovenia at the weighted two-digit SITC levels, 1992-1999*

	1992	1993	1994	1995	1996	1997	1998	1999	2000
SITC 00 – live animals	23.6	11.0	4.1	3.1	5.2	3.7	5.4	4.4	4.2
- EU-15	13.4	13.9	9.1	6.9	13.4	8.6	21.0	23.5	19.4
- Other OECD	0	0	66.1	0	0	36.6	11.2	1.8	4.3
- Former Yugoslavia	41.5	36.3	25.8	24.8	9.3	1.4	10.3	5.2	5.8
- CEFTA and other CEECs	0.1	0.0	0.5	0.1	0.0	0.0	0.0	0.0	0.0
- Rest of the world	0	55.3	88.6	0	3.4	68.9	27.9	95.0	57.6
SITC 01 – meat and meat preparations	20.3	11.7	18.2	15.9	7.7	4.5	5.7	7.5	5.0
- EU-15	14.3	8.5	29.3	31.2	15.7	6.6	6.9	11.0	6.4
- Other OECD	2.1	1.3	0.6	2.6	0	0.0	0	3.9	0.0
- Former Yugoslavia	32.6	17.9	9.5	10.9	6.9	5.0	6.4	8.1	5.9
- CEFTA and other CEECs	8.2	10.3	7.2	1.4	1.7	1.9	1.3	0.8	0.9
- Rest of the world	0.0	0.8	5.2	0	5.0	0.0	0	0.3	0.0
SITC 02 – dairy and eggs	29.5	15.5	6.4	6.1	10.9	13.9	13.4	16.3	12.5
- EU-15	30.4	10.7	6.5	6.5	15.6	17.6	18.8	27.0	11.4
- Other OECD	16.7	0	0.9	17.4	9.3	41.3	25.0	24.4	33.7
- Former Yugoslavia	30.8	21.4	6.6	5.5	8.1	10.0	9.8	11.4	12.3
- CEFTA and other CEECs	2.5	4.1	12.2	4.7	2.2	5.4	1.6	0.0	0.9
- Rest of the world	0	0	3.5	0	26.8	5.5	0	7.6	0.0

Note: CEECs – Central and Eastern European countries. OECD – Organisation for Economic Cooperation and Development. A value of the GLIIT index close to 100 indicates the intra-industry trade (IIT) variety, and a value of the GLIIT close to zero indicates the inter-industry trade type. The GLIIT zero denotes one-way trade.; Source: Bojnec and Hartmann (2001).

for milk powder from 0.21 to 0.95 over the same time period. On the contrary, the GLIIT measures fall rapidly for bovine meat.

The calculations of the Grubel-Lloyd (GLIIT) indexes revealed relatively low level of integration of Slovenian agricultural and food products in international trade (Bojnec and Hartmann, 2001).[7] There are, however, differences by individual products and product categories, and by countries/regions (see Table 6). The GLIIT index for live animals (SITC 00) declined considerably. The GLIIT for meat and meat preparations (SITC 01) declined with a slight increase in 1998 and 1999, but with another decline in 2000. It clearly illustrates inter-industry trade. The GLIIT indexes for dairy products and eggs (SITC 02) are relatively low too. The GLIII index initially declined and after then it is possible to notice a slight increase in the GLIIT index, but in 1999 it remained at less than 17% (less than 13% in 2000). As most of trade in dairy products is still inter-industry type, reallocation of factors and restructuring of dairy industry is likely to occur upon EU accession.

Quality of traded animal products: Export-to-Import Price Ratio

The quality differences in intra-industry trade are assessed by the use of unit value of exports to unit value of imports. The export f.o.b. unit value (UVX_{ij}) and the import c.i.f. unit value (UVM_{ij}) are derived on the basis of export (import) values and export (import) quantities of a given product j within product group i. The ratio of the export to import unit values per tone ($IATT_{ij}$) for a particular product j in the group i is defined as:

$$IATT_{ij} = \frac{UVX_{ij}}{UVM_{ij}} \tag{3}$$

The weighted unit values of matched exports ($UVMX_i$) and the weighted unit values of matched imports ($UVMM_i$) at the product group i are defined as:

$$UVMX_i = \sum_j UVMX_{ij}\left(\frac{LIIT_{ij}}{LIIT_i}\right) \tag{4}$$

$$UVMM_i = \sum_j UVMM_{ij}\left(\frac{LIIT_{ij}}{LIIT_i}\right) \tag{5}$$

where the weight is the level of IIT of product j in group i ($LIIT_{ij}$) in total level of IIT of product group i ($LIIT_i$). The ratio between the $UVMX_i$ and $UVMM_i$ is defined as:

$$IAMTT_i = \frac{UVMX_i}{UVMM_i} \tag{6}$$

which is an indicator of the relative quality of exports vis-à-vis imports. A ratio greater than one indicates matched exports to be more expensive and of higher quality than matched imports, and vice versa when

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[7] Bojnec and Hartmann (2003) investigated also marginal intra-industry trade for agricultural and a food product in Slovenia and found relatively low degree of IIT in marginal trade flows.

Table 7. Ratio of export-to-import unit values for live animals, meat and meat preparations and dairy and eggs in Slovenia at the weighted two-digit SITC levels, 1992-1999.

	1992	1993	1994	1995	1996	1997	1998	1999
SITC 00 – live animals	1.086	0.702	1.214	0.594	0.597	0.560	0.350	0.474
– EU–15	1.338	0.547	0.828	0.537	0.529	0.486	0.545	0.317
– Other OECD	–	–	0.633	–	–	0.157	0.627	1.894
– Former Yugoslavia	0.997	0.282	0.908	1.332	0.515	0.088	2.883	0.078
– CEFTA and other CEECs	16.766	1.136	0.690	0.940	1.148	–	5.310	0.541
– Rest of the world	–	19.460	6.355	–	11.936	0.836	0.061	3.852
SITC 01 – meat and meat preparations	0.876	0.765	1.256	1.189	1.245	1.102	1.174	1.300
– EU–15	1.510	1.200	1.638	1.572	1.621	1.363	1.470	1.765
– Other OECD	0.569	1.709	0.148	0.823	–	0.360	–	3.346
– Former Yugoslavia	0.701	0.616	0.628	0.625	0.998	0.859	0.809	0.780
– CEFTA and other CEECs	1.249	0.554	0.590	0.504	0.569	0.781	0.908	1.106
– Rest of the world	2.861	2.625	0.785	–	1.765	0.923	–	0.488
SITC 02 – dairy and eggs	0.778	0.975	1.053	1.009	0.828	0.782	0.726	0.719
– EU–15	0.567	0.717	1.114	1.175	0.906	0.592	0.629	0.696
– Other OECD	1.166	–	0.503	0.817	0.878	1.450	1.515	1.260
– Former Yugoslavia	0.851	1.092	1.111	0.946	0.769	0.839	0.747	0.680
– CEFTA and other CEECs	2.518	2.752	0.315	0.269	0.623	0.602	0.627	0.114
– Rest of the world	–	–	0.292	–	0.479	–	–	1.109

Note: CEECs – Central and Eastern European countries. OECD – Organisation for Economic Cooperation and Development. A ratio of export to import unit values greater than 1 implies that unit of exports are more expensive than unit of imports implying that exports are of higher quality than imports, and vice versa, when the ratio of export to import unit values is less than 1. The symbol "–" denotes no matched two-way trade. Source: Bojnec and Hartmann (2001).

the ratio is less than one. Export-to-import price ratio close to one indicates that export price is equal to import price of a similar product, which suggests that there is no substantial quality difference between exported and imported product.

Bojnec (1998) indicated substantial differences in border prices related to Slovenian trading with different regions/countries. As a rule, the Slovenian export f.o.b. prices were higher in trade with the CEE countries than with the EU-15 as an indication of different composition of trade and quality differences, and different competition and protection in different markets. On the other hand, the conclusion about the level and pattern in development of import c.i.f. prices for imports into Slovenia from different regions/countries is less straightforward. It seems that the Slovenian importers were economically rational in searching for the best opportunities by choosing to import from that country/region which offered the most favourable price. There are certain products for which the Slovenian export f.o.b. prices were substantially higher than the Slovenian c.i.f. import prices of the similar product (e.g. for live poultry; fresh beef meat, especially in trade with the EU-15), and vice versa for many other products (e.g. fresh sheep meat; milk and cream with a fat content of 1% to 6%; non-grated or powdered cheese; and fresh eggs).[8] The ratio between the Slovenian export f.o.b. and the Slovenian import c.i.f. prices increased for fresh cheese (especially in 1994). However, at the same time it decreased for a wider range of products:

for live poultry (especially in trade with the former Yugoslavia), fresh pork (after 1993), butter, grated or powdered cheese, non-grated or powdered cheese, other cheese (especially in trade with the EU-15), and fresh eggs. The ratio remained rather stable for fresh beef meat. The ratio of export versus import prices explored the high variability for fresh poultry.

Bojnec and Hartmann (1991) found that the ratio of export-to-import prices for Slovenia declined for live animals (SITC 00), which was largely caused by the decline in terms-of-trade with the EU-15 (Table 7).

The ratio increased from less than 1 to more than 1 for meat and meat preparations (SITC 01). With the EU-15, the ratio above 1 increased further, and the

[8] Bojnec (2000) also decomposed the Slovenian IIT in agricultural and food products in its two components: on vertical IIT and horizontal IIT. The distinction on vertical IIT and horizontal IIT was made on the basis of import-to-export price ratios. The Slovenian trade in agricultural and food products with Hungary, Poland, the EU, Romania, and Bulgaria is largely inter-industry type. Yet, for several products, there is no trade with certain countries such as with the CEFTA members. In trade with the EU there is a high percentage of one-way, import flows. More than two-thirds of IIT is vertical IIT with either very high or very low export to import price ratios. The lower the IIT, the greater adjustment and reallocation after trade liberalisation is expected, and the greater the export-to-import price ratio, the greater quality differences in traded goods, which are important factors contributing to diversification of supply for consumers and creating pressures for restructuring and reallocation of production sectors.

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increase in the ratio is also found in trade with the other OECD countries. The ratio is less than 1 with the former Yugoslav republics and often less than 1 with the CEFTA and other CEE countries. With the rest of the world the ratio declined from greater to less than 1.

For dairy and eggs (SITC 02) the ratio first increased from less than 1 to more than 1, and then declined again to less than 1. The ratio declined rapidly with the CEFTA and other CEE countries. With the former Yugoslav republics the ratio increased over 1 in 1993 and 1994, and declined later to less than 1. With the EU-15, the ratio was low initially, but increased after then, with the decline to less than 1 since 1996. Since 1995, Slovenia has exported to the EU-15 cheaper products than imported. Slovenia achieved better export-to-import price ratio with the other OECD countries. The additional efforts are needed in order to further increase quality of exports and quality of production towards the increasing competitive pressures arising from trade liberalisation and adjustments on conditions in the Single European Market.

Export, Import, and Trade Revealed Comparative Advantage Measures

The relative revealed comparative export advantage index (XRCA) is defined as (see, e.g., Eiteljörge and Hartmann, 1999):

$$XRCA_{ij} = (X_{ij} / \sum_{l,l \neq j} X_{il}) / (\sum_{k,k \neq i} X_{kj}) / (\sum_{k,k \neq i} \sum_{l,l \neq j} X_{kl}) \qquad (7)$$

The subscripts i and k denote agricultural products and merchandise goods, respectively, and the subscripts j and l denote the subject country and the world, respectively. Value of world exports of total merchandise goods, X_{kl}, is used as the benchmark. To avoid double counting, the subject country's exports of merchandise goods (X_{kj}) and world agricultural exports (X_{il}) are excluded from the calculation of the X_{kl}. The subject country is excluded from the calculation of world agricultural exports (X_{ij} is deducted from X_{il}). An XRCA greater than 1 indicates a relative revealed comparative export advantage in agricultural products in the world market, and vice versa when the XRCA is below 1 (a relative revealed comparative export disadvantage in agricultural products).

The relative revealed import penetration index (MRCA) is defined as:

$$MRCA_{ij} = (M_{ij} / \sum_{l,l \neq j} M_{il}) / (\sum_{k,k \neq i} M_{kj}) / (\sum_{k,k \neq i} \sum_{l,l \neq j} M_{kl}) \qquad (8)$$

where value of world imports of total merchandise goods, M_{kl}, is used as the benchmark. The subject country is excluded from the calculation of world agricultural imports (M_{ij} is deducted from M_{il}). The

subject country's imports of merchandise goods (M_{kj}) and the difference between M_{il} and M_{ij} are excluded from world imports of total merchandise goods (M_{kj} and the difference between M_{il} and M_{ij} are deducted from M_{kl}). An MRCA below 1 indicates a relative comparative advantage in import penetration in agricultural products, and vice versa when the MRCA is greater than 1 (a relative comparative disadvantage in import penetration in agricultural products).

The relative revealed trade advantage (RTA) is defined as:

$$RTA_{ij} = XRCA_{ij} - MRCA_{ij} \qquad (9)$$

The RTA greater than 0 indicates a relative revealed trade advantage in agricultural products, and the RTA less than 0 indicates a relative revealed trade disadvantage in agricultural products.

Eiteljörge and Hartmann (1999) conducted the most extensive and in-depth analysis of export, import, and trade revealed comparative advantage measures for agri-food products in CEE countries, which results for livestock products are presented in Table 8. There are only few examples where the livestock chain is clearly competitive (e.g. milk chain in Latvia and to a lesser extent in Lithuania) or clearly uncompetitive (e.g. chicken chain in Estonia). There are several cases where livestock chain is only partly competitive such as pork-meat and chicken in Bulgaria, beef/veal and milk in Belarus, pork-meat, butter and cheese in Estonia, cattle, pork-meat and poultry meat in Hungary, pork-meat preparations in Latvia, beef/veal and pork-meat preparations in Lithuania, cattle, chicken and butter in the Czech Republic, cattle and pork-meat preparations in Poland and Romania, cattle and cheese in Slovakia, dried beef, pork-meat preparations, poultry meat and cow milk in Slovenia, and beef/veal and butter in Ukraine. There are even more numerous cases where the results are mixed and where no clear statement regarding competitiveness can be derived.

As expected findings on the basis of accountancy data and trade data are not always necessary consistent and therefore there is a need for their careful comparisons when making conclusions and policy recommendations.

CONCLUSION AND IMPLICATIONS OF THE RESULTS

The advantages and disadvantages in the livestock sectors in CEE countries are presented using the Porter's diamond of competitive advantage. They are reflected in the livestock sector developments. Except in Albania and in Slovenia, with the transformation processes and restructuring in agriculture during transition to a market economy, the livestock sectors

Table 8. Competitiveness in livestock-food chains in selected CEE countries

		Cattle-beef-meat chain			Pig-pork-meat chain			Chicken chain		Milk-butter-cheese chain		
		Cattle	Beef Veal	Beef dried	Pigs	Pig Meat Pork	Meat preparations	Chicken	Poultry meat	Cow milk	Butter	Cheese
Bulgaria	1995	+−	−	+−	+−	+−	+	−	+	+−	+−	+−
	1996	+−	+−	+−	+−	+	+	−	+	+−	+−	+−
	1997	+−	−	+−	+−	+	+	−	+	+−	+−	+−
Belarus	1995	+−	+	+−	+−	+−	+−	+−	+−	+−	+	+
	1996	+−	+	+−	+−	+−	+−	+−	+−	+−	+	+
	1997	+−	+	+−	+−	+−	+−	+−	+−	+−	+	+
Estonia	1995	+−	+−	+−	+−	+−	+	+	−	−	+	+
	1996	+−	−	+−	+−	−	+	−	−	+	+	+
	1997	+−	+−	+−	+−	−	+	−	−	−	+	+
Hungary	1995	+	+−	+−	+−	+	+	+	+	+−	+−	+−
	1996	+	+−	+−	+	+	+	+	+	+	+−	+
	1997	+	−	+−	+	−	+	−	+	+	−	−
Latvia	1995	+−	+−	+−	+−	+−	+	−	+−	+	+	+
	1996	+−	+−	+−	+−	+−	+	−	+−	+	+	+
	1997	+−	+−	+	−	+−	+	−	+−	+	+	+
Lithuania	1995	+−	+	+−	+−	+−	+	+	+−	+−	+	+
	1996	+−	+	+	+−	+−	+	+−	+−	+	+	+
	1997	+−	+	+	+	+−	+	+−	−	+	+	+
Czech Republic	1995	+	+−	+−	+−	+−	−	+	+−	+−	+	+−
	1996	+	+−	+−	+−	+−	−	+	+−	+−	+	+−
	1997	+	+−	+−	+	+−	+−	+	+−	+−	+	+−
Poland	1995	+	+−	+−	+−	−	+	−	+−	+−	+	+−
	1996	+	+−	+−	+−	+	+	−	+−	+−	+	+−
	1997	+	+−	+−	+−	+	+	−	+	+−	+−	+
Romania	1995	+	+−	+−	−	+	−	+−	−	+−	+−	+−
	1996	+	+−	+−	+−	+	+−	+−	+−	+−	+−	+−
	1997	+	+−	−	+−	+	−	−	−	+−	+−	+−
Russia	1995	+−	−	+−	+−	−	−	+−	−	+−	−	−
	1996	+−	−	−	+−	−	−	+−	−	+−	−	−
	1997	+−	−	−	+−	−	−	+−	−	+−	−	−
Slovakia	1995	+	+−	+−	+−	+−	−	−	+−	+−	+−	+
	1996	+	+−	+−	+−	+−	−	−	+−	+−	+−	+
	1997	+	+−	+−	+−	+−	−	−	+−	+−	+−	+
Slovenia	1995	−	+−	+	−	−	+	+−	+	+	+−	+−
	1996	+−	+−	+	+−	−	+	+−	+	+	+−	+−
	1997	+−	+−	+	−	−	+	+−	+	+	+−	+−
Ukraine	1995	+	+	+−	+−	+−	−	+−	−	+−	+	+−
	1996	+	+	+−	+−	+−	−	+−	−	+−	+	+−
	1997	+−	+	+−	+−	+−	+	−	−	+−	+	+−

Note: (+) indicates competitive position when XRCA is greater than 1 and RTA is greater than zero. (−) indicates lack of competitiveness or uncompetitive position when MRCA is greater than 1 and RTA is smaller than zero. (+−) indicates when no clear statement regarding competitiveness can be derived. Results of RTA are in more detail presented in Appendix in Eiteljörge and Hartmann (1999), pp. 222-224. Source: Eiteljörge and Hartmann (1999), p. 201.

all over the CEE countries experienced considerable decline. The shrinking of the livestock sector is an indication that the pre-transition structures were neither viable nor long-term sustainable and hence they were largely not internationally competitive. This is revealed by most presented studies on competitiveness of the livestock sectors in CEE countries.

The new emerging livestock sector in CEE countries is now smaller by its size, but it is likely becoming more competitive and long-term sustainable. The overview of the results on international competitiveness generally indicates that as the livestock sector in CEE countries so far was structured and organized livestock sector is only partly internationally competitive. It is clearly indicated that the livestock sector in CEE countries in most cases is found as uncompetitive or results are mixed, and only in few cases is found that a certain product or a certain part in the vertical chain is found internationally competitive. Some products are ranked differently by studies such as pork and poultry depending on what kind of production technology were considered. For example, large-scale pork and poultry production

is reported as economically efficient, but less environmentally friendly. On the contrary, medium-sized household pork production is reported as economically less efficient, but environmentally friendlier. There are identified several sensitivity of the international competitiveness results to macroeconomic, technological and policy variables. A further macro-economic adjustments, including adjustments in input and output prices, changes in shadow factor prices, and changes in technology used are likely to influence patterns in development of competitiveness.

Trade liberalisation and EU integration will induce new competitive pressures, but will also provide several new opportunities for new investments and technologies, quality and efficiency improvements. This is a challenge for the livestock sector in CEE countries to find new approaches and methods in setting up sustainable livestock sector able to survive in an open international environment improving quality and trade competitiveness, market shares and cost structures at international conditions producing value-added at lower costs than are costs of import substitution or earnings with exporting it.

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