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Competitiveness and comparative advantages in agriculture (livestock approach)

Abstract. This study compares the effect of Common Agricultural Policy implementation on comparative advantages of livestock production in four selected countries, namely Czech Republic, Hungary, Poland and Slovakia (V4). The comparative advantage of Czech Republic's bovine production as well as Slovakian poultry production has improved. On the contrary, sheep production in Poland and Slovakia has lost its previous positive RSCA value, similarly to swine production in Czech Republic and horse production in Hungary. Furthermore, a detailed analysis of bovine production in V4 countries revealed that the formerly successful quality competition was replaced gradually by price competition during the examined period (1999-2010).

Key words: revealed symmetric comparative advantage, livestock, bovine, unit value method.

Introduction

The theory of comparative advantages by David Ricardo [1821] explains how the international trade could contribute to a greater welfare through a proper production factor allocation within and among nations. Parallel to removing trade barriers, especially within international integrations such as the European Union (EU), more and more emphasis is attached to the adequate production factor allocation in order to create competitive and sustainable economies for the future.

The aim of this study is to examine how the EU accession, more precisely the implementation of Common Agricultural Policy, has affected the comparative advantages of livestock production in the four selected economies, namely Czech Republic, Hungary, Poland and Slovakia. Besides, the competitiveness of bovine production was examined in detail.

Firstly, data sources are described which is followed by an introduction of applied methodology. Secondly, the results of examination are presented. Finally, the last part contains the main conclusions.

Data and methodology

Although there are several open online databases that contain adequate information about the external trade (e.g. World Bank's database, UN Comtrade, OECD STAN), the Eurostat database was used to gather the required information. The selected database,

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similarly to other databases, provides data in conformity with different statistical classification systems. In this study the Standard International Trade Classification (SITC) was employed.

Since the focus of this study is on live animals (especially on bovine animals), only the related information was gathered for a period from 1999 until 2010 (five-digit SITC level).

Three main methods were applied. First is the classical Reveal Comparative Advantage (RCA) by Bela Balassa [1965]. Although the method has been criticized a lot [Vollrath 1991; Laursen 1998; Fertő & Hubbard 2001; Jámbor 2009], its many applications can be found in the literature.

$$RCA_{ij} = \frac{EX_{ij}}{EX_{nj}} / \frac{EX_{it}}{EX_{nt}}$$

where:
EX – export
i – country index
j – commodity index
n – EU-27 countries
t – all commodities.

If the value of RCA index takes a greater value than 1, the country has revealed comparative advantage in that product and vice versa. Since the index is not symmetric, Hinloopen and van Marrewijk [2001] have developed a classification system in order to provide an adequate interpretation of the results. However, the second applied method eliminates asymmetry so there is no need for that classification in this case.

The second applied method is related to RCA. Laursen [1998] has provided a correction to RCA which makes RCA index symmetric. This way the results could be interpreted simply. It is called Revealed Symmetric Comparative Advantage (RSCA).

$$RSCA = (RCA - 1)/(RCA + 1)$$

The value of RSCA ranges from -1 to 1. The interpretation of the results is the following: if the value of RSCA is positive, the country has revealed comparative advantage in that product, the higher the value of RSCA the greater is the advantage, and vice versa.

Finally, the third method was presented by Gehlhar and Pick [2002] and called Unit Value Difference (UVD).

$$UV_{ij}^{EX} = EX_{ij} / Q_{ij}^{EX}$$
$$UV_{ij}^{IM} = IM_{ij} / Q_{ij}^{IM}$$
$$UVD_{ij} = UV_{ij}^{EX} - UV_{ij}^{IM}$$

where:
UV – unit value
IM – imports.
The other symbols mean the same as in the first equation.

A positive UVD means that the export unit value exceeds the import unit value. According to the result of UVD and the effect of the product on Trade Balance (TB) the following classification could be made:

1st category: UVD < 0 and TB > 0	success in price competition
2nd category: UVD > 0 and TB < 0	fail in price competition
3rd category: UVD > 0 and TB > 0	success in quality competition
4th category: UVD < 0 and TB < 0	fail in quality competition.

Disadvantage of UVD is that only two countries with two-way trade could be compared by this method. In order to loosen this assumption, the original UVD was modified as shown below:

$$MUVD = \frac{\sum(UV_{ij}^{EX} * Q_{ij}^{EX})}{\sum Q_{nj}^{EX}} - \frac{\sum(UV_{ij}^{IM} * Q_{ij}^{IM})}{\sum Q_{nj}^{IM}}$$

However, it should be noted that the interpretation is slightly different from that for the original UVD due to the greater number of trade partners. The Modified Unit Value Difference (MUVD) reflects the gap between average export unit value and average import unit value of one selected commodity among several countries (EU-27 in this case). The symbols in this equation are the same as in the previous equations.

Discussion

The SITC system distinguishes several categories within live animals (Table 1). All of them were examined with respect to the RCA and RSCA indices for the four selected countries, namely Czech Republic, Hungary, Poland and Slovakia (V4 countries).

Table 1. List of examined commodities

SITC code	Description
00111	Bovine animals, live – pure-bred breeding
00119	Bovine animals, live – other than pure-bred breeding
00121	Sheep, live
00122	Goat, live
00131	Swine, live – pure-bred breeding
00139	Swine, live – other than pure-bred breeding
00141	Poultry (weighting not more than 185g)
00149	Poultry (weighting more than 185g)
00151	Horses
00152	Asses, mules and hinnies
00190	Live animals, n.e.s.

Source: EUROSTAT.

The RSCA is based on the RCA, thus they resulted in the same outcome but in different scale (see the methodology). The following table (Table 2) contains the

comparative advantages and their changes in the V4 countries within the EU-27 in 1999-2010.

Table 2. Revealed Symmetric Comparative Advantages of V4 countries within the EU-27 (1999-2010)

SITC Description	Czech Rep.	Hungary	Poland	Slovakia
Bovine animals, live – pure-bred breeding	↗	↕	−	−
Bovine animals, live – other than pure-bred breeding	↗	−	+	−
Sheep, live	−	+	↘	↘
Goat, live	−	+	−	−
Swine, live – pure-bred breeding	↘	↕	−	−
Swine, live – other than pure-bred breeding	−	−	−	↕
Poultry (weighting not more than 185g)	+	+	−	+
Poultry (weighting more than 185g)	+	−	−	↗
Horses	−	↘	+	−
Asses, mules and hinnies	−	−	−	−
Live animals, n.e.s.	↘	−	↘	+

+: comparative advantage over the period
↕: comparative advantage varies over the period
↘: comparative advantage only before 2004
−: comparative disadvantage over the period
↗: comparative advantage after 2004

Source: authors' own calculation.

The EU accession and the implementation of Common Agricultural Policy (CAP) in the V4 countries has resulted in an establishment of internal market in which the producers have the same trade conditions that is not affected by different tariff and subsidy systems (except for existing derogations). It means that the differences in comparative advantages were caused mainly by the prices of production factors after 2004. Therefore, the focus is on the changes that were realized after 2004.

Although Table 2 shows the comparative advantages in the trade in selected animal commodities among the EU-27 countries, final conclusions based on it could not be made. The main reasons of it are the high transportation costs of livestock and the differences in consumer habits. Furthermore, Table 2 does not show how significant the advantage or disadvantage was in different years.

The high transportation cost of livestock means that comparative advantages should be considered only for the neighbouring countries extended for the main not-neighbouring partners in the trade in livestock.

The different consumer habits are also a very important factor. For instance Hungary has a comparative advantage in live goats. It is because the Hungarian population consumes goat based dairy products although the consumption of goat meat is not widespread.

Finally, the comparative advantage of livestock production varied during the examined period. Figure 1 shows how the bovine (other than pure-bred breeding) comparative advantages have changed.

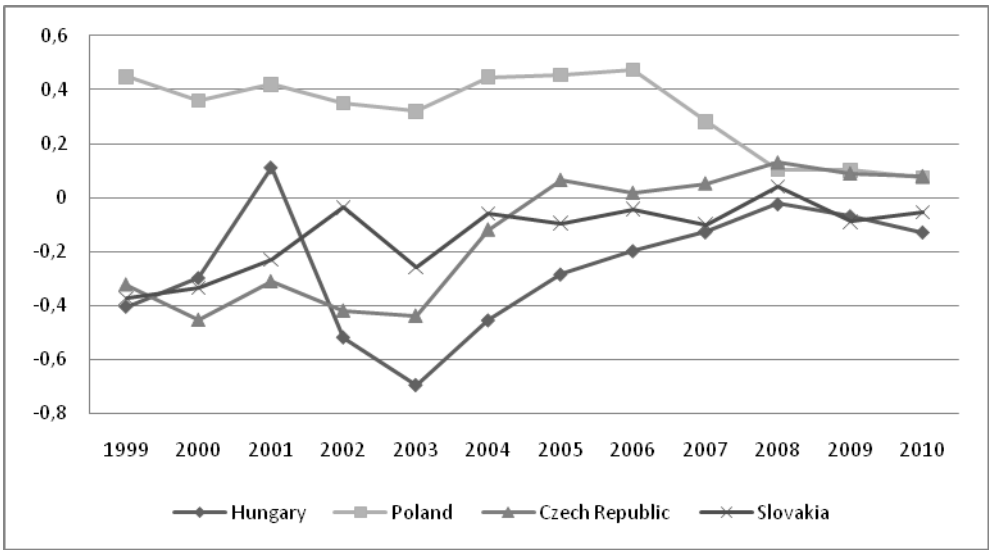

Fig. 1. RSCA in bovine (code 00119) trade for the V4 countries within the EU-27 (1999-2010)

Source: authors' own calculation.

According to the numbers in Figure 1, the comparative advantages in bovine trade were much different before 2008. Afterwards, the RSCA values were converging. The situation of other animal commodities is different (see Appendix 1).

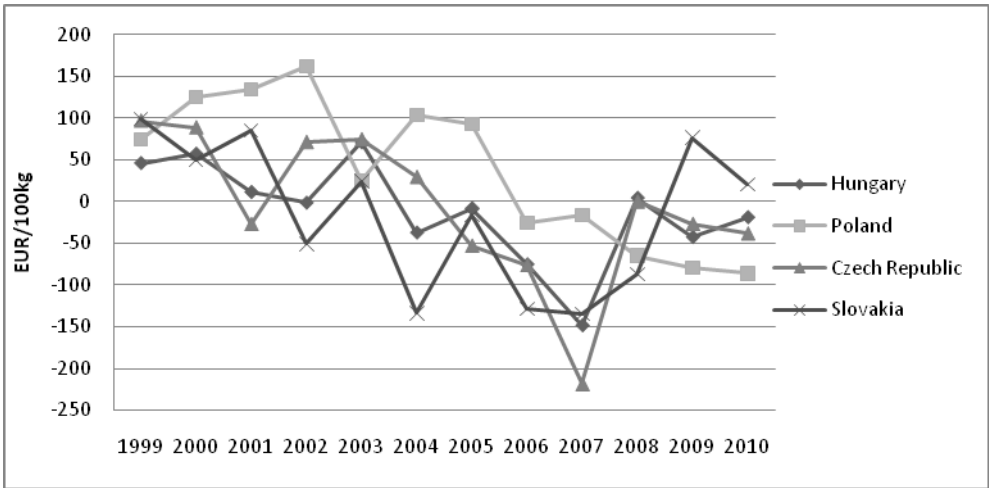

Fig. 2. MUVD in trade in bovine animals (code 00119) for the V4 countries within the EU-27 (1999-2010)

Source: authors' own calculation.

Furthermore, Figure 1 underpins that the intensity of comparative advantage and disadvantage is not a negligible factor. For instance Hungary has a comparative disadvantage in bovine production but this disadvantage has decreased significantly during

the years. On the contrary, Poland has a decreasing trend in RSCA value after 2006, but it still remains positive.

Since the RCA and the RSCA approach did not provide enough information about the competitiveness of the selected countries, MUVDs were calculated for the trade in bovine animals. Figure 2 shows the results.

MUVD shows the gap between the average export price/unit and the average import price/unit. As it could be seen in Figure 2, MUVD values for the V4 countries showed a negative trend from 1999 until 2007 which means that they tended to import increasingly expensive animals than those exported in this period. After 2007 Hungary, Czech Republic and Slovakia has managed to reverse this trend and the price gap between exports and imports of bovine animals has approached zero again.

However, in order to get assessable results, the traded quantities should be also examined.

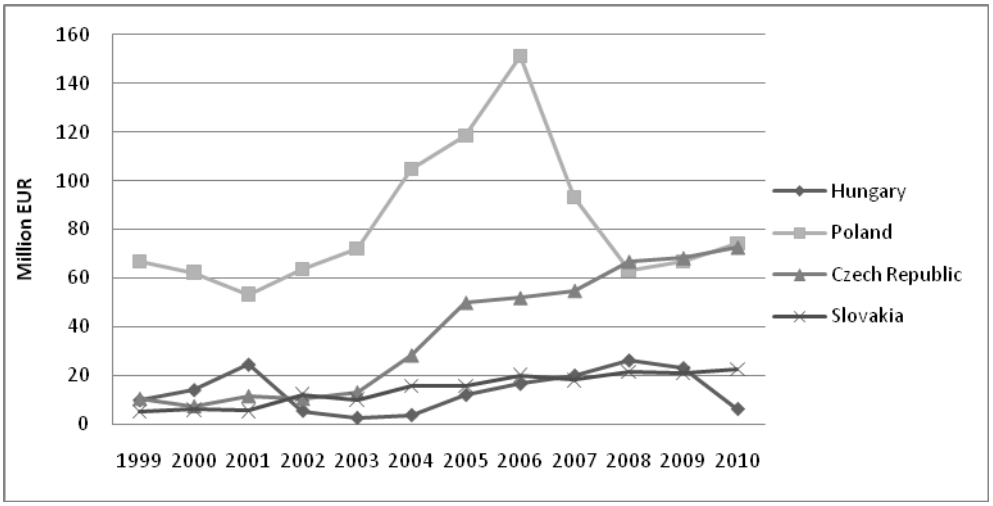

Fig. 3. Trade balance of the V4 countries in trade in bovine animals (code 00119) with the EU-27 countries (1999-2010)

Source: authors' own calculation.

As it is shown in Figure 3, trade balances of the V4 countries were positive during the examined period. The greatest positive trade balance is observable in Poland between 2003 and 2008. This peak was caused by increasing prices of bovine animals in that period. As for the Czech Republic, the rising trend of trade in bovine animals balance was caused by both the increasing export price and the increasing quantity.

According to the categorization provided by Gehlhar and Pick [2002], it helps to classify the competitiveness of bovine production. It could be said that the formerly successful quality competition has turned into a successful price competition in V4 countries during the examined period.

Conclusion

According to the findings of the discussion above, RCA and RSCA are suitable methods to measure livestock production differences among countries. However, because of the high transportation costs of livestock, the countries that are involved in the examination should be selected carefully in order to get adequate results. In this case the EU-27 countries were selected as a trading partner of the V4 countries.

The effect of EU accession on comparative advantages of livestock production is mixed. The comparative advantage of Czech Republic's bovine production as well as Slovakian poultry production has improved. Contrary, sheep production of Poland and Slovakia has lost its previous positive RSCA value similarly to swine production of Czech Republic and horse production of Hungary.

The intensity of comparative advantage/disadvantage is also important factor. But, in order to get a clear view of the position of this commodity it was important to examine how it was changing over times. In this way, the policy effects could be analysed such as the CAP implementation in livestock farming. By 2008, the differences between bovine RSCA values for the V4 countries have decreased significantly and they stayed around zero in 2009 and 2010.

Finally, the (M)UVD analysis of bovine trade has demonstrated that the unit value difference between export and import has decreased in time and now the average export price/unit is lower than the average import price/unit in most cases. Extending the analysis on trade balances revealed that the former quality competition was followed by price competition in each of the countries.

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Appendix 1

RSCA values						
Bovine	1999	2000	2001	2002	2003	2004
HU	-0.4036325	-0.2973663	0.1133188	-0.5178515	-0.6954248	-0.4547931
PL	0.4477893	0.3603727	0.4189935	0.3505222	0.319268	0.447455
CZ	-0.3228913	-0.4544554	-0.3111653	-0.4201602	-0.439001	-0.1184073
SK	-0.3723302	-0.3337515	-0.2313061	-0.036858	-0.2596123	-0.0584623
Sheep						
HU	0.8650782	0.8695191	0.8977369	0.8838202	0.8717567	0.853482
PL	0.4642954	0.3926251	0.3697122	0.2465757	0.2022777	0.089601
CZ	-0.9779271	-0.9591426	-0.983651	-0.9627958	-0.9500427	-0.8948706
SK	0.3589755	0.3541756	0.0630038	0.1787008	0.0035767	-0.0689148
Goat						
HU	0.5150881	0.4976563	0.5168931	0.4506764	0.2094203	0.1719808
PL	-0.0401275	-0.6004307	0.0190769	-0.6255121	-0.802205	-0.9904034
CZ	-0.466416	-0.6623742	-0.7224108	-0.9090634	-0.8390444	n.a.
SK	0.4403352	0.2027115	-0.8998622	-0.4787067	-0.9268377	-0.9827709
Swine (00139)						
HU	-0.1162342	0.3069118	0.4893159	0.2049682	-0.2006798	-0.3926438
PL	n.a.	-0.9588282	-0.9777146	-0.9826939	-0.9894138	-0.8817546
CZ	-0.454684	-0.7160554	-0.6808727	-0.3212976	-0.6438155	-0.0939216
SK	n.a.	n.a.	n.a.	n.a.	n.a.	-0.7034371
Poultry (00149)						
HU	-0.4795833	-0.579368	-0.6544404	-0.7549827	-0.6834906	-0.4972809
PL	-0.9987891	n.a.	-0.9806148	-0.9992452	-0.2996158	-0.9243441
CZ	-0.7303653	-0.5149029	-0.213684	-0.0575445	-0.4667083	0.3155131
SK	-0.9608699	-0.6763352	-0.9208564	-0.9931781	-0.1590842	-0.0592581

Appendix 1 continued

RSCA values						
Bovine	2005	2006	2007	2008	2009	2010
HU	-0.2842354	-0.1973204	-0.1273971	-0.0230713	-0.0676528	-0.1277953
PL	0.4548604	0.4742942	0.2816104	0.1048511	0.1007646	0.0750001
CZ	0.0660532	0.0176719	0.0527768	0.1301985	0.0900041	0.0800408
SK	-0.0947272	-0.0430655	-0.0992913	0.040867	-0.0890977	-0.0532883
Sheep						
HU	0.8602475	0.8569961	0.8287862	0.8253858	0.8120324	0.830041
PL	0.0225979	-0.084899	-0.1030972	-0.2818871	-0.344259	-0.3765668
CZ	-0.9585276	-0.9395225	-0.8820124	-0.8902395	-0.8882858	-0.8977372
SK	-0.1272463	-0.299428	-0.2940772	-0.3126636	-0.5885302	-0.4767154
Goat						
HU	-0.2131043	0.4332818	0.4400618	0.5373195	0.360894	0.776105
PL	-0.9033913	-0.9924378	-0.988477	n.a.	-0.9946106	-0.751053
CZ	n.a.	n.a.	-0.87179	-0.9317456	n.a.	-0.2344121
SK	-0.9058014	-0.9653239	0.1927264	-0.8805232	n.a.	n.a.
Swine (00139)						
HU	-0.3755283	-0.3483561	-0.3321549	0.1169466	-0.1367949	-0.0183565
PL	-0.4718889	0.1968308	0.0707683	-0.4089677	-0.5263985	-0.3775497
CZ	-0.2122004	-0.3741796	-0.333829	-0.4806807	-0.6044577	-0.4713082
SK	-0.4365337	0.0369897	0.0801137	-0.4221692	-0.3859924	-0.3843189
Poultry (00149)						
HU	-0.3584571	-0.5337201	-0.6541841	-0.5403697	-0.508936	-0.5698266
PL	-0.753006	-0.9032717	-0.7456172	-0.5604044	-0.0533753	-0.5956215
CZ	0.1031524	0.2565257	0.3977209	0.4830148	0.3126234	0.1826546
SK	0.5079295	0.1980006	0.0532812	-0.084846	0.0102629	0.1071009