

EMPIRICAL METHODS IN INTERNATIONAL TRADE USING FOR EVALUATION IN LIVE-STOCK INDUSTRY, CASE OF SPECIFIC CHOSEN COMMODITY

^aMICHAL BEŇO

Vysoká škola manažmentu/City University of Seattle, Panónska cesta 17, 851 04 Bratislava, Slovakia
email: ^am.beno@tyrolia.com

Abstract: World trade in livestock products is concentrated globally. V4 integration into the World and EU economy is one of the most important developments affecting the structure and evolution of the global system of the 21st century. These countries have grown, driven primarily by the expansion of modern, industrial and export-oriented sector. This case explores what V4 competitiveness of specific commodity means by using four different measures by using the modification of Balassa's and Vollrath's indices: relative export share, relative import share, relative export advantage and relative import advantage. Each measure has a special meaning and use and the concept and measurement of international competitiveness of nations is a useful tool. This analysis shows that V4 countries overall had a strong comparative advantage and competitiveness in selected industry, taking into account six commodities worldwide, in the period from 2004 to 2013.

Keywords: competitiveness, international trade balance, live-stock industry, comparative advantage.

1 Introduction

World export has an increasing tendency and becomes more important. The live-stock export industry is a valuable state's industry and supports the live hood of many people. With the development of improved communications of all kinds, recent decades have seen rapid growth of international trade.

The expansion of agricultural products has allowed a greater diversity through the world. The trade in live-stock products was largely limited to cross the borders by many exceptions, regulations which were abolished by free trade areas, an example for the first type of this block is the North American Free Trade Agreement (NAFTA) formed in 1994 (NAFTA, 2008). In recent years many of regional integration agreements has rapidly increased, and more than 164 agreements have been notified to GATT/WTO (WTO, 2017). The developments, e.g. refrigerated transportation since 1800s century in U.S. (Briley, 2004), sea- and airfreight, new technologies like mechanization, electrification, internet, automation and data exchange in manufacturing technologies led to the creation of new major trading routes.

The aim of this paper is the measurement and comparison of trade balance through the competitiveness and international comparative advantage of V4 countries in the six chosen commodities of live animals, using statistical data from the Food and Agriculture Organisation of the United Nations (FAO) and International Trade Centre from 2004 to 2013.

Many of live farm animals around the world are transported thousands of kilometres for slaughter, or to places where they will be fattened for slaughter. This trade is a global phenomenon. In North and South America, Australia and Europe, animals often have to endure journeys across vast distances before long sea voyages to reach their final destinations.

According to the data provided by Trading Economics exports of Live Animals in the U.S. averaged USD 64.21 million from 1996 until 2016, reaching an all-time high of USD 265 million in October 2000, and a record low of USD 18 million in April 2004, because of the spread of BSE illness (also called "mad cow disease") in 2003 (TRADING, 2017a). Canada averaged CAD 137.43 million from 1988 until 2016, reaching an all-time high of CAD 294 million in November 2014 and a record low of CAD 35.50 million in April 1988 (TRADING, 2017b). Mexico averaged USD 39 993.17 thousand from 1993 until 2016, reaching an all-time high of USD 121 740 thousand in December 2014, and a record low of USD 1 114 thousand in September 1996 (TRADING, 2017c).

On the basis of the data available from Australian Livestock Exporters' Council (ALEC) in the period 2014-15 Australia exported 1.38 million cattle valued at Australian \$1.35 billion FOB, 2.18 million sheep valued at Australian \$244 million FOB, 90 950 goats valued at Australian \$9.6 million FOB (Online, 2017). Trading data in Australia averaged AUD 1 546.48 million from 1988 until 2016, reaching an all-time high of AUD 3 299 million in May 2015, and a record low of AUD 543 million in January 1989 (TRADING, 2017d).

All V4 countries are since 2004 members of the European Union, which caused several changes in this Live-stock industry. In 2015 Spain, Germany, France United Kingdom and Italy held the largest populations of livestock in the EU-28 (Extra-EU, 2015). Further comparison shows big differences in the V4 countries (Agricultural production-animals, 2017) as follow in the Czech Republic, bovines (1.33 million heads), pigs (1.55 million heads); in Hungary, bovines (0.77 million heads), pigs (2.94 million heads), sheep (1.24 million heads); in Poland, bovines (5.59 million heads), pigs (10.99 million heads); and in Slovakia, bovines (0.47 million heads), pigs (0.64 million heads) (Agriculture, forestry and fishery statistics, 2015).

Until 2011, EU-28 exports of animal products in terms of monetary value were lower than EU-28 imports. In 2011, animal products recorded a EUR 215 million trade surplus which grew over the next two years to EUR 2 862 million in 2013. From 2002 to 2013 animal products exports more than doubled, growing by 109 %. On the other hand, imports increased by 38 % during the same period (Extra-EU trade in agricultural goods, 2015).

Evidently, the livestock export trade is vital for providing options to producers for competition for their livestock. This is an important contributor to agricultural export earnings and to the economics of the State. It is a necessary component of the State's agricultural sector and contributes annual earnings to the economy offering jobs and significant employment opportunities.

2 Methodology

The classic theory of comparative advantage generally understood that trade generates gains for both exporting and importing countries. Various methods of quantification of revealed comparative advantages provide the basis for analysis. The first to have published this index was Balassa in 1965, as follows:

$$B = (x_{ij} / x_{it}) / (x_{nj} / x_{nt})$$

where x means export, i indicates a given country, j is a given product, t represents a group of products and n a group of countries (Balassa, 1965). The concept of revealed comparative advantage pertains to the relative trade performance of individual countries in particular commodities (Ballasa 1965, 1977, 1986). The Balassa Index is criticised because it is seen to neglect the different effects of agricultural policies and asymmetric values (Jambor, 2013).

Vollrath (1991) offered three alternative specifications of revealed comparative advantage, following analyses of international competitiveness in agriculture. The first of these measures is the relative trade advantage (RTA), which accounts for imports as well as exports. It is calculated as the difference between relative export advantage (RXA), which equates to the Balassa Index, and its counterpart, relative import advantage (RMA).

$$RTA = RXA - RMA$$

where RXA and RMA refer to relative export advantage and relative import advantage (Scott and Vollrath, 1992).

One way of judging competitiveness is to ask what the trade record reveals about the country's performance. How well does a country export one item, compared with all other goods? We can first work out the formula for Relative Export (RES) and Import Share (RIS), an intermediate step towards Relative Export (REA) and Import Advantage (RIA). The value of the method becomes more apparent when we compare RES or RIS between various commodities.

In order to identify whether the V4 countries are more competitive, we determined specific live-stock commodity as cattle, chickens, horses, pigs, sheep and turkeys and used the modified indexes because it was decided as the best procedure for this investigation.

In the first step, we defined the Relative Export Share as follows:

RES of the V4 country of live animals =

$$\frac{\text{V4 country exports of live animals}}{\frac{\text{World exports of live animals}}{\frac{\text{total exports of V4 country}}{\text{World total exports}}}} \quad (1)$$

RES of the V4 country of commodity =

$$\frac{\text{V4 country exports of commodity}}{\frac{\text{World exports of commodity}}{\frac{\text{total exports of V4 country}}{\text{World total exports}}}} \quad (2)$$

During the second phase, we determined the Relative Import Share as follows:

RIS of the V4 country of live animals =

$$\frac{\text{V4 country imports of live animals}}{\frac{\text{World imports of live animals}}{\frac{\text{total imports of V4 country}}{\text{World total imports}}}} \quad (3)$$

RIS of the V4 country of commodity =

$$\frac{\text{V4 country imports of commodity}}{\frac{\text{World imports of commodity}}{\frac{\text{total imports of V4 country}}{\text{World total imports}}}} \quad (4)$$

With the completion of these steps, we are now ready to proceed with the Relative Export Advantage which is based on intermediate comparison of market shares of world trade, which we defined in this way:

REA of V4 country of live animals =

$$\frac{\text{V4 country export share of live animals}}{\frac{\text{total exports of V4 country excluding live animals}}{\frac{\text{World export share of live animals}}{\text{World total export excluding live animals}}}} \quad (5)$$

REA of V4 country of commodity =

$$\frac{\text{V4 country export share of commodities}}{\frac{\text{total exports of V4 excluding commodities}}{\frac{\text{World export share of commodities}}{\text{World total export excluding commodities}}}} \quad (6)$$

Relative export advantage makes clear distinctions between a specific commodity and all other commodities, and between a specific country and the rest of the world. The raw indices are converted to natural logarithms.

The last step described the Relative Import Advantage as follows:

RIA of V4 country of live animals =

$$\frac{\text{V4 country imports share of live animals}}{\frac{\text{total imports of V4 excluding live animals}}{\frac{\text{World imports share of live animals}}{\text{World total imports excluding live animals}}}} \quad (7)$$

RIA of V4 country of commodity =

$$\frac{\text{V4 country imports share of commodity}}{\frac{\text{total imports of V4 excluding commodity}}{\frac{\text{World imports share of commodity}}{\text{World total imports excluding commodity}}}} \quad (8)$$

where the raw indices are converted to natural logarithms.

To summarise how well a country's economic sector, such as live animals and the commodities, competes with other economic activities in the international market, both exports and

imports by the country in question are accounted for. We defined the Revealed Competitiveness as follows:

$$RC = REA - RIA$$

where REA refers to the Relative Export Advantage and RIA to the Relative Import Advantage. To arrive at a final index number for Revealed Competitiveness, we subtract the Relative Import Advantage of the sector from its Relative Export Advantage. As in the Relative Export Advantage index, we use natural logarithms to ease comparisons. This adjustment is made because countries have two-way trade in their economic systems.

3 Results

3.1 Relative Export Share of Live Animals and Six Chosen Commodities

The records reveal that from 2004 to 2013, the relative export share of live animals from the Czech Republic was 1.64 times better than the average of all its exports, compared with the world. Hungary's relative export share of live animals was 2.74 times better than the average of all its exports, compared with the world. Poland's results reveal that the relative export share of live animals from the country was 2.09 times better than the average of all its exports, compared to the world. The last country, Slovakia, in that period showed that its relative export share of live animals was 1.93 times better than the average of all its exports, compared with the world.

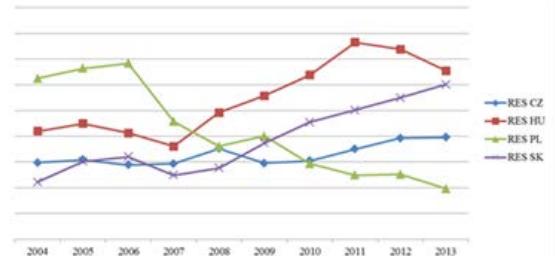
If we examine the single country results over the periods, we can confirm that Poland had a better advantage of the V4 share of exports from 2004 to 2007 and Hungary had the advantage from 2008 to 2013, demonstrated in Table 1 and Figure 1, Slovakia is the only country with the possibility of expanding its share of exports, as can be seen from 2008 by the increase.

TABLE 1: Relative Export Share of Live Animals, 2004-2013

	2004	2005	2006	2007	2008
CZ	1.49	1.54	1.44	1.47	1.76
HU	2.10	2.25	2.06	1.81	2.46
PL	3.13	3.32	3.42	2.29	1.81
SK	1.11	1.51	1.60	1.24	1.38
	2009	2010	2011	2012	2013
CZ	1.48	1.52	1.75	1.97	1.98
HU	2.79	3.19	3.83	3.69	3.27
PL	2.01	1.47	1.24	1.26	0.98
SK	1.87	2.27	2.51	2.75	3.01

Source: author's own calculation based on (FAOSTAT, 2015), (International Trade in Goods - Exports 2001-2016, 2015).

FIGURE 1: Relative Export Share of Live Animals, 2004-2013



Source: author's own calculation based on (FAOSTAT, 2015), (International Trade in Goods - Exports 2001-2016, 2015).

The value of the method becomes more apparent when we compare relative export shares among various commodities in our case: cattle, chickens, horses, pigs, sheep and turkeys as indicated in Figure 2.

We see the highest marked share value of the commodity in the period from 2004 to 2013. The first commodity is cattle, where we see the best share in Poland from 2004 to 2007; the next best

share belongs to Hungary from 2008 to 2013. For the second commodity, chickens, we realise three different countries in different periods: in 2004 and 2007, it was the Czech Republic, from 2005 to 2006 and 2011 and 2012, Slovakia, and the third country, Hungary, from 2008-2010 and in 2013. For the next commodity, horses, we easily recognise the best export share of Poland. Pigs have the best share in Hungary from 2004 to 2010, and Slovakia from 2011 to 2013. For the sheep commodity, it is plainly Hungary. For the last commodity, turkeys, the best share is in Slovakia from 2004 to 2005, the Czech Republic from 2006 to 2008 and in 2011, with Poland having the best share from 2009 to 2010 and from 2012 to 2013.

FIGURE 2: Relative Export Share of Six Commodities, 2004-2013

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Czech Republic	Cattle	7.56	10.24	9.98	8.20	8.76	7.46	7.30	7.75	9.63
	Chickens	4.10	3.22	3.65	4.22	4.72	3.93	3.74	3.84	3.24
	Horses	0.05	0.09	0.07	0.04	0.04	0.02	0.02	0.02	0.02
	Pigs	1.84	1.35	0.99	0.85	0.88	0.45	0.89	1.11	1.30
	Sheep	0.03	0.02	0.05	0.02	0.02	0.01	0.02	0.02	0.02
	Turkeys	4.17	5.21	7.83	8.35	10.59	4.84	5.59	6.44	8.29
Hungary	Cattle	6.09	8.18	9.06	8.48	9.24	10.22	14.29	18.69	14.65
	Chickens	1.89	3.25	3.75	3.44	4.76	4.45	3.99	3.99	4.91
	Horses	0.57	0.35	0.49	0.38	0.36	0.29	0.37	0.27	0.07
	Pigs	5.53	5.58	5.45	3.04	2.11	3.29	5.20	2.82	3.08
	Sheep	11.10	10.40	9.09	6.90	7.01	6.38	6.20	6.50	6.62
	Turkeys	0.36	0.82	0.67	0.36	0.53	2.49	0.65	1.71	1.29
Poland	Cattle	23.77	25.76	25.34	13.98	8.81	9.32	6.82	5.68	5.41
	Chickens	1.27	1.71	1.88	1.49	1.21	1.37	1.08	1.05	1.34
	Horses	3.10	2.53	2.20	1.78	1.56	1.55	1.46	1.46	1.31
	Pigs	1.00	1.69	3.57	2.31	1.87	1.87	1.26	0.65	0.71
	Sheep	0.72	0.86	0.70	0.63	0.51	0.43	0.35	0.35	0.29
	Turkeys	3.21	2.78	2.85	1.81	3.34	5.67	5.88	5.98	9.28
Slovakia	Cattle	9.10	8.16	9.02	5.62	6.60	8.09	9.02	8.68	8.25
	Chickens	1.38	5.76	4.23	2.43	3.39	4.24	3.94	4.52	5.28
	Horses	0.03	0.03	0.14	0.06	0.23	0.32	0.02	0.01	0.01
	Pigs	0.05	0.80	1.80	2.21	1.01	1.45	3.44	4.86	4.79
	Sheep	0.69	0.47	0.52	0.27	0.33	0.30	0.24	0.29	0.34
	Turkeys	5.81	5.72	5.49	0.30	3.87	2.55	2.31	1.75	1.73

Source: author's own calculation based on (FAOSTAT, 2015), (International Trade in Goods - Exports 2001-2016, 2015).

3.2 Relative Import Share of Live Animals and Six Chosen Commodities

The records show that, in the chosen period, the Czech Republic imported more live animals of all its imports than the rest of the V4 countries, compared with the world. The Czech Republic had 1.64 times more than the average, Hungary 1.42 and Poland 1.47 times more imported live animals. Only the Slovak Republic imported less than 1.10 times.

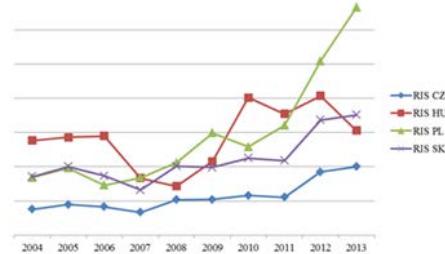
If we examine single country results over the periods, we confirm that Poland had the advantage of the V4 import share from 2007 to 2009 and from 2012 to 2013, and Hungary from 2004 to 2006 and from 2010 to 2011, as shown in Table 2 and Figure 3.

TABLE 2: Relative Import Share of Live Animals, 2004-2013

	2004	2005	2006	2007	2008
CZ	0.38	0.45	0.41	0.33	0.52
HU	1.38	1.43	1.45	0.83	0.71
PL	0.84	0.98	0.73	0.84	1.06
SK	0.85	1.00	0.86	0.66	1.01
	2009	2010	2011	2012	2013
CZ	0.52	0.58	0.55	0.92	1.00
HU	1.08	2.01	1.77	2.04	1.53
PL	1.49	1.29	1.60	2.54	3.32
SK	0.99	1.13	1.09	1.68	1.76

Source: author's own calculation based on (FAOSTAT, 2015), (International trade in goods - imports 2001-2016, 2015).

FIGURE 3: Relative Import Share of Live Animals, 2004-2013



Source: author's own calculation based on (FAOSTAT, 2015), (International trade in goods - imports 2001-2016, 2015).

The value of the method becomes more apparent when we compare relative import shares between various commodities as highlighted in Figure 4. We see the highest bold marked share value of the commodity in the period from 2004 to 2013. The first commodity is cattle, where we see the highest import share in Poland from 2004 to 2007; after that the next highest import share belongs Slovakia from 2008 to 2009 and Hungary from 2010 to 2013. For the second commodity, chickens, we easily realise the highest import share for Slovakia, except in 2004, which refers to Poland. For the next commodity, horses, we easily recognise the highest import share for Poland, except in 2009 for the Czech Republic and, in 2011, for the Slovak Republic. The highest pig share goes to Hungary from 2004 to 2007 and in 2010, and Poland from 2008 to 2009 and 2011 to 2013. For the sheep commodity, Hungary is plainly shown as the best. The last commodity, turkeys, shows us that Poland had the highest import share for the whole period.

FIGURE 4: Relative Import Share of Six Commodities, 2004-2013

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Czech Republic	Cattle	0.48	0.42	0.25	0.41	0.38	0.28	0.16	0.13	0.18
	Chickens	1.28	2.49	2.22	1.32	1.49	1.73	1.59	1.46	1.67
	Horses	0.14	0.11	0.10	0.09	0.10	0.10	0.02	0.04	0.03
	Pigs	0.09	0.46	0.58	0.62	1.29	1.85	1.84	1.75	2.39
	Sheep	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Turkeys	3.11	2.85	2.14	1.00	2.07	1.10	1.35	1.05	1.16
Hungary	Cattle	0.67	1.05	0.79	0.72	0.23	0.29	4.37	6.74	7.65
	Chickens	1.20	1.28	0.41	0.35	0.74	0.41	1.44	1.69	2.71
	Horses	0.02	0.02	0.03	0.00	0.00	0.00	0.01	0.01	0.00
	Pigs	5.32	5.53	5.33	3.16	2.30	3.83	5.99	3.24	3.45
	Sheep	1.13	0.78	2.91	0.59	0.70	0.59	0.52	0.55	0.48
	Turkeys	1.69	1.64	1.81	1.83	2.64	4.00	3.65	3.64	6.11
Poland	Cattle	2.17	2.47	1.70	1.44	0.78	0.55	0.94	1.00	1.56
	Chickens	2.00	2.22	2.45	2.15	1.76	2.03	2.47	2.53	2.70
	Horses	0.26	0.12	0.12	0.20	0.18	0.04	0.09	0.09	0.21
	Pigs	1.07	1.66	0.79	0.90	2.47	4.41	3.63	4.70	8.63
	Sheep	0.61	0.70	0.58	0.55	0.43	0.43	0.34	0.32	0.28
	Turkeys	10.72	13.98	15.21	16.28	13.38	10.41	9.46	11.81	10.38
Slovakia	Cattle	0.04	0.02	0.33	0.37	0.88	0.62	1.89	1.32	1.79
	Chickens	1.26	5.14	3.95	2.25	3.22	4.42	4.01	4.72	5.58
	Horses	0.01	0.02	0.06	0.08	0.16	0.05	0.08	0.16	0.12
	Pigs	1.22	2.79	2.55	1.69	2.00	2.03	2.62	2.43	4.78
	Sheep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
	Turkeys	1.12	1.47	1.00	0.28	1.65	0.77	1.15	0.96	0.95

Source: author's own calculation based on (FAOSTAT, 2015), (International trade in goods - imports 2001-2016, 2015).

3.3 Relative Export and Import Advantage of Live Animals and Six Chosen Commodities

By examining Tables 3 and 4, Figure 5 and 6, the same results as for the RES and RIS data, which were previously examined, can be confirmed. However, the difference in this calculation is that the raw indices are converted to natural logarithms as we implement the principle of export and import advantage mentioned in the methodology. A positive value of REA and RIA is interpreted as an indication of a country's export or import advantage versus the rival – the world.

TABLE 3: Relative Export Advantage of Live Animals, 2004-2013

	2004	2005	2006	2007	2008
CZ	0.58	0.61	0.52	0.52	0.69
HU	0.74	0.81	0.72	0.59	0.90
PL	1.14	1.20	1.23	0.83	0.59
SK	0.11	0.41	0.47	0.22	0.32

	2009	2010	2011	2012	2013
CZ	0.55	0.56	0.69	0.82	0.83
HU	1.03	1.16	1.35	1.31	1.19
PL	0.70	0.38	0.22	0.23	-0.02
SK	0.63	0.82	0.92	1.01	1.10

Source: author's own calculation based on (FAOSTAT, 2015), (International Trade in Goods - Exports 2001-2016, 2015).

Green marked fields indicate comparative advantage of V4 country in the commodity category versus the world.

FIGURE 5: Relative Export Advantage of Six Commodities, 2004-2013

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Czech Republic	Cattle	0.53	0.79	0.65	0.58	0.80	0.75	0.77	0.77	0.95	0.96
	Chickens	1.41	1.17	1.30	1.44	1.55	1.37	1.32	1.35	1.18	1.22
	Horses	-3.04	-2.46	-2.66	-3.30	-3.11	-3.94	-3.82	-3.73	-3.28	-4.06
	Pigs	0.61	0.30	-0.01	-0.16	-0.13	-0.80	-0.12	0.11	0.17	0.26
	Sheep	-3.40	-3.83	-2.93	-3.98	-4.11	-4.11	-4.45	-3.90	-3.82	-3.75
	Turkeys	1.43	1.65	2.06	2.12	2.36	1.58	1.72	1.86	2.11	2.09
Hungary	Cattle	0.31	0.57	0.53	0.61	0.85	1.07	1.32	1.66	1.37	0.98
	Chickens	0.64	1.18	1.24	1.56	1.49	1.38	1.09	1.30	1.59	1.59
	Horses	-0.56	-1.06	-0.71	-0.97	-1.03	-1.22	-0.99	-1.31	-2.67	-2.51
	Pigs	1.71	1.72	1.70	1.11	0.75	1.19	1.65	1.04	1.13	0.99
	Sheep	2.41	2.34	2.21	1.93	1.95	1.85	1.83	1.87	1.89	1.66
	Turkeys	-1.01	-0.20	-0.40	-1.02	-0.63	0.91	-0.43	0.53	0.25	-0.33
Poland	Cattle	1.68	1.71	1.56	1.11	0.81	0.97	0.58	0.46	0.37	-0.07
	Chickens	0.24	0.54	0.63	0.40	0.19	0.31	0.07	0.05	0.29	0.38
	Horses	1.13	0.93	0.79	0.58	0.44	0.44	0.38	0.38	0.27	-0.01
	Pigs	0.00	0.52	1.27	0.84	0.63	0.62	0.23	-0.42	-0.34	-0.70
	Sheep	-0.33	-0.15	-0.36	-0.47	-0.67	-0.84	-1.04	-1.04	-1.23	-1.42
	Turkeys	1.17	1.02	1.05	0.59	1.21	1.74	1.77	1.79	2.23	2.40
Slovakia	Cattle	0.71	0.56	0.52	0.20	0.52	0.83	0.86	0.65	0.80	0.70
	Chickens	0.32	1.75	1.44	0.89	1.22	1.45	1.37	1.51	1.66	1.47
	Horses	-3.38	-3.50	-1.97	-2.74	-1.47	-1.13	-3.75	-4.27	-3.76	-4.70
	Pigs	-2.93	-0.22	0.59	0.79	0.01	0.37	1.23	1.58	1.57	1.88
	Sheep	-0.37	-0.76	-0.66	-1.33	-1.10	-1.21	-1.43	-1.24	-1.08	-1.30
	Turkeys	1.76	1.74	1.70	-1.19	1.35	0.94	0.84	0.56	0.55	1.37

Source: author's own calculation based on (FAOSTAT, 2015), (International trade in goods - exports 2001-2016, 2015).

TABLE 4: Relative Import Advantage of Live Animals, 2004-2013

	2004	2005	2006	2007	2008
CZ	-0.98	-0.80	-0.88	-1.10	-0.66
HU	0.32	0.36	0.37	-0.18	-0.34
PL	-0.17	-0.02	-0.32	-0.18	0.06
SK	-0.16	0.00	-0.15	-0.42	0.01
	2009	2010	2011	2012	2013
CZ	-0.65	-0.55	-0.59	-0.08	0.00
HU	0.08	0.70	0.57	0.71	0.42
PL	0.40	0.25	0.47	0.94	1.20
SK	-0.01	0.12	0.08	0.52	0.56

Source: author's own calculation based on (FAOSTAT, 2015), (International trade in goods - imports 2001-2016, 2015).

FIGURE 6: Relative Import Advantage of Six Commodities, 2004-2013

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Czech Republic	Cattle	-2.05	-2.25	-2.95	-2.28	-2.27	-2.54	-3.27	-3.40	-3.09	-3.27
	Chickens	0.24	0.91	0.80	0.28	0.40	0.55	0.47	0.38	0.51	0.52
	Horses	-1.98	-2.20	-2.30	-2.37	-2.27	-2.31	-3.96	-3.32	-3.57	-4.24
	Pigs	-2.39	-0.78	-0.57	-0.48	0.26	0.62	0.62	0.56	0.87	0.47
	Sheep	-5.10	0.00	0.00	-6.06	-9.20	-7.55	-6.89	-7.24	0.00	-6.54
	Turkeys	1.13	1.05	1.00	0.00	0.70	0.39	1.29	0.05	0.15	0.33
Hungary	Cattle	-1.72	-1.33	-1.81	-1.71	-2.80	-2.53	0.68	0.57	0.64	0.16
	Chickens	0.18	0.25	-0.90	-1.04	-0.29	-0.89	0.34	0.52	1.00	0.65
	Horses	-4.06	-3.83	-3.64	0.00	0.00	-5.81	-5.07	-4.36	-5.98	-4.43
	Pigs	1.67	1.71	1.67	1.15	0.83	1.34	1.79	1.18	1.24	1.12
	Sheep	0.12	0.00	0.00	-0.52	-0.36	-0.53	-0.65	-0.59	0.00	-0.87
	Turkeys	0.52	0.50	0.59	0.60	0.97	1.39	1.29	1.29	1.81	1.53
Poland	Cattle	-0.55	-0.48	-1.05	-1.02	-1.56	-1.88	-1.48	-1.34	-0.95	-0.51
	Chickens	0.69	0.80	0.90	0.76	0.56	0.71	0.91	0.93	0.99	1.13
	Horses	-1.35	-2.10	-2.11	-1.60	-1.71	-3.12	-2.41	-2.41	1.56	-1.37
	Pigs	0.04	0.51	-0.24	-0.11	0.90	1.49	1.29	1.55	2.16	2.41
	Sheep	-0.49	0.00	0.00	-0.59	-0.85	-0.85	-1.09	-1.13	0.00	-1.41
	Turkeys	2.37	2.64	2.72	2.79	2.59	2.34	2.25	2.47	2.34	2.48
Slovakia	Cattle	-4.50	-5.23	-2.67	-2.37	-1.44	-1.75	-0.78	-1.06	-0.81	-0.78
	Chickens	0.23	1.64	1.37	0.81	1.18	1.49	1.38	1.55	1.72	1.54
	Horses	-5.24	-3.76	-2.86	-2.50	-1.84	-3.03	-2.57	-1.86	-2.16	-4.13
	Pigs	0.20	1.03	0.94	0.52	0.69	0.71	0.96	0.89	1.57	1.69
	Sheep	-5.36	0.00	0.00	-8.43	-7.43	0.00	-7.24	-8.07	0.00	-7.48
	Turkeys	0.11	0.39	0.47	-1.26	0.50	-0.26	0.14	-0.04	-0.42	-0.05

Source: author's own calculation based on (FAOSTAT, 2015), (International trade in goods - imports 2001-2016, 2015).

3.4 Revealed Competitiveness of Live Animals and Six Chosen Commodities

Revealed Competitiveness is a remarkable measure when trying to gauge a country's overall live animals and its commodities. To arrive at a final index number for revealed competitiveness, we subtract the Relative Export Advantage of the sector from its Relative Import Advantage, using natural logarithms to ease comparisons.

In this section, we describe the Revealed Competitiveness of V4 countries of live animals versus the world trade market. We implement the principle of Relative Competitiveness as mentioned already, where a positive value of RC is interpreted as the indication of V4 comparative advantage versus the world.

TABLE 5: Revealed Competitiveness of Live Animals, 2004-2013

	2004	2005	2006	2007	2008
CZ	1.56	1.41	1.40	1.62	1.35
HU	0.42	0.45	0.35	0.77	1.24
PL	1.31	1.22	1.55	1.01	0.53
SK	0.27	0.41	0.62	0.64	0.31
	2009	2010	2011	2012	2013
CZ	1.20	1.11	1.28	0.90	0.83
HU	0.95	0.46	0.78	0.60	0.77
PL	0.30	0.13	-0.25	-0.71	-1.22
SK	0.64	0.70	0.84	0.49	0.54

Source: author's own calculation.

FIGURE 7: Revealed Competitiveness of Live Animals, 2004-2013

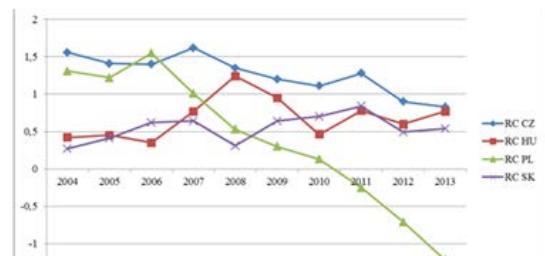


Figure 8 shows a better overview by commodity of the competitiveness of live animals and the advantages on the world market. The first group focused on is Cattle. Slovakia had a big advantage from 2004 and 2005, with a descending trend thereafter. The Czech Republic showed great potential in this commodity from the beginning of 2006 to 2007 and continued to rise from 2010 to 2013. In Hungary, the highest peak is observed from 2008 to 2009, with a downward trend. Poland can be seen as the loser.

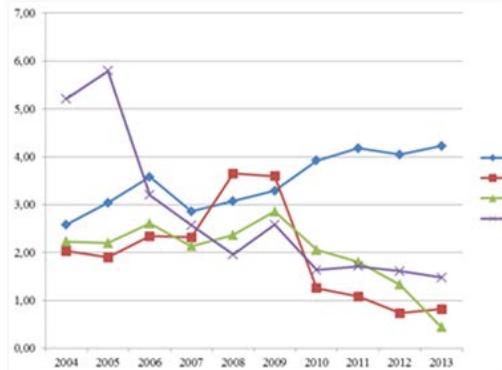
FIGURE 8: Revealed Competitiveness of Six Commodities, 2004-2013

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Czech Republic	Carle	2.58	3.04	3.58	2.86	3.07	3.29	3.92	4.18	4.04	4.23
	Chickens	1.17	0.26	0.50	1.16	1.16	0.82	0.85	0.97	0.66	0.70
	Horses	-1.06	-0.26	-0.35	-0.93	-0.84	-1.63	0.14	-0.41	0.29	0.18
	Pigs	3.00	1.08	0.56	0.32	-0.38	-1.42	-0.74	-0.45	-0.70	-0.21
	Sheep	1.70	-3.83	-2.93	2.08	5.10	3.44	2.45	3.34	-3.82	2.79
	Turkeys	0.29	0.60	1.30	2.13	1.63	1.48	1.42	1.81	1.97	1.76
Hungary	Carle	2.03	1.90	2.38	2.32	3.05	3.66	1.26	1.09	0.73	0.82
	Chickens	0.45	0.93	2.2	2.27	1.85	1.02	0.57	0.30	0.94	
	Horses	3.50	2.77	2.9	-0.97	-1.03	4.58	4.03	3.32	1.92	
	Pigs	0.04	0.01	0.02	-0.04	-0.09	0.15	-0.14	-0.14	-0.11	-0.13
	Sheep	2.28	2.34	2.21	2.45	2.31	2.38	2.47	2.47	1.89	2.53
	Turkeys	-1.53	-0.70	-0.99	-1.63	-1.60	-0.47	-1.72	-0.76	-1.56	-1.87
Poland	Carle	2.23	2.20	2.61	2.13	2.37	2.84	2.05	1.80	1.33	0.44
	Chickens	-0.45	-0.26	-0.26	-0.36	-0.37	-0.59	-0.83	-0.87	-0.70	-0.75
	Horses	2.48	3.03	2.98	2.18	2.15	3.58	2.78	2.78	1.83	1.35
	Pigs	-0.07	0.02	1.51	0.94	-0.28	-0.86	-1.06	-1.97	-2.50	-3.11
	Sheep	0.17	-0.15	-0.36	0.13	0.18	0.01	0.05	0.09	-1.23	-0.01
	Turkeys	-1.23	-1.61	-1.68	-2.20	-1.39	0.61	-0.47	-0.68	-0.11	-0.08
Slovakia	Carle	8.21	8.79	3.20	2.57	1.98	2.58	1.83	1.71	1.61	1.48
	Chickens	0.09	0.12	0.07	0.07	0.05	-0.04	-0.02	-0.04	-0.06	-0.07
	Horses	1.87	0.26	0.89	-0.24	0.37	1.89	1.18	-2.41	-1.60	-0.57
	Pigs	-3.13	-1.25	-0.35	0.27	-0.69	0.33	0.27	0.69	0.00	0.19
	Sheep	5.09	-0.76	-0.66	7.10	6.34	-1.21	5.80	6.82	-1.09	6.19
	Turkeys	1.65	1.36	1.24	0.06	0.85	1.20	0.70	0.60	0.97	1.42

Source: author's own calculation.

See Figure 9 for more detailed results. In the Chicken section, the winner is definitely Hungary, except for the years 2004, 2011 and 2012, where there was stagnation. This was followed by the Czech Republic with the highest peak in 2004, 2011 and 2012. Poland and the Slovak Republic are the losers.

FIGURE 9: Revealed Competitiveness of Cattle, 2004-2013



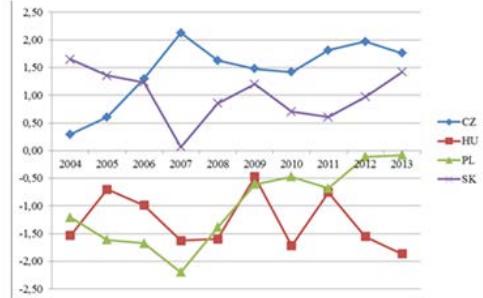
Source: author's own calculation.

The next commodity is Horses, where it can be demonstrated that Hungary in 2004, 2006 and from 2009 to 2013, and Poland in 2005, 2007 and 2008, had better competitiveness than Slovakia and the Czech Republic. Slovakia lost the competing index in this area. In the next commodity, Poland lost its position in 2006 and 2007. From 2008, with a decreasing trend, the same tendency can be shown in the Czech Republic, after the highest index in 2004 and 2005. Slovakia allocated the best potential impulse in this section up to 2010 and until 2013. Hungary remained steady.

The Sheep sector belongs to Slovakia, which is of course very remarkably for this country, with an upward and downward trend, except in 2005 and 2006 which belongs to Hungary, 2009 to the Czech Republic and 2012 again to Hungary. Here we measured the highest index of those six commodities of this V4 country.

The last group is Turkeys, where two sides are revealed: the Czech Republic with a smooth trend from 2006, and Slovakia with the highest peak in 2004 and 2005 on the winning side, with Hungary and Poland on the losing side with a falling trend as shown in Figure 10.

FIGURE 10: Revealed Competitiveness of Turkeys, 2004-2013



Source: author's own calculation.

4 Discussion and Conclusion

We propose further research investigations, with a comparison of the top exporting countries of live animals: U.S., Canada, Mexico, Australia, India, Argentina and Brazil. Research of these countries is very rare, as none of them is an EU member and has raised many questions in need of future examination for validating by a larger sample size. Furthermore, there should be a focus on the V4 country's neighbours. All of these reveal more and less successful performances at the industry-region level. We think that this would improve the understanding of the regional aspect of competitiveness, as a future point of view on the economic development of a region.

It is evident that livestock production is the world's largest user of land, either directly through grazing or indirectly through the consumption of fodder and feed grains. The world food economy is being increasingly driven by the shift of diets towards animal-based products such meat, milk and dairy and as a result, agriculture is being affected, not only through growth of livestock production, but also through linkages to other sectors (Gennari, 2015).

Globally, livestock production currently accounts for some 40 % of the gross value of agricultural production and in industrial countries this share is more than one half. The total demand for animal products in developing countries is expected to more than double by 2030. By contrast, the demand for animal products in the industrial world has been increasing at low rates, and livestock production in this group of countries is expected to grow only slowly over the projection period (Bruinsma, 2003).

We have presented an analysis of the V4 countries' Revealed Comparative Advantage and Competitiveness by using indices of export and import shares and Export and Import Advantage and Revealed Competitiveness for the period 2004 to 2013.

The results need to be interpreted with care; the indices are less satisfactory as cardinal measures, but are useful in identifying whether or not V4 has a comparative advantage or not in live animals (six chosen commodities) versus the world market.

The evidence from this study suggests that small countries could also conquer the chosen sector versus the large world market. We have obtained satisfactory results demonstrating that the Czech Republic, Slovakia and Hungary have a very good competitive advantage and competitiveness in cattle, Hungary and the Czech Republic in chickens. Hungary and Poland are specialised in horses, Slovakia and the Czech Republic in pigs. The sheep commodity easily belongs to Slovakia, with Hungary and the Czech Republic partly belonging to this group. The last sector (turkeys) belongs to the Czech Republic and Slovakia.

Increasing population, urbanisation and higher incomes are fuelling the strong demand for animal food products. This will have a major impact on the location and organisation of livestock production. Late or wrong changes can significantly influence animal and human health and the environment. The

future holds both opportunities and serious decisions. For this reason, we see a demand for change in the V4 countries from industry to a return to agriculture and livestock production as it was before the fall of the Iron Curtain in 1989. However, without proactive development policies, safety and security, environmental protection and poverty reduction will not be possible.

Literature:

1. Agriculture, forestry and fishery statistics. 2015. Available at: <http://ec.europa.eu/eurostat/documents/3217494/6639628/KS-FK-14-001-EN-N.pdf/8d6e9dbe-de89-49f5-8182-f340a320c4bd> (Accessed: 20 February 2017).
2. BALASSA, B. 1965. Trade Liberalisation and "Revealed" Comparative Advantage. *The Manchester School* 33, 99–123. doi:10.1111/j.1467-9957.1965.tb00050.x.
3. BALASSA, Bela. 1977 'Revealed' Comparative Advantage Revisited: An Analysis of Relative Export Shares of the Industrial Countries, 1953-1971, *The Manchester School of Economic & Social Studies*, 1977, vol. 45, issue 4, pp. 327-44.
4. BALASSA Bela. 1986. Comparative Advantage in Manufactured Goods: A Reappraisal, *The Review of Economics and Statistics*, Vol. 68, No. 2, pp. 315-319.
5. Bibliography: *Agricultural production – animals*. 2017. Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Agricultural_production_-_animals (Accessed: 20 February 2017).
6. Bibliography: Online, E. *Trade statistics - the Australian livestock export industry*. 2017. Available at: <http://auslivestockexport.com/trade-statistics/> (Accessed: 20 February 2017).
7. BRILEY, G.C. A history of refrigeration. *ASHRAE Journal* 46, 2004. p. 31.
8. BRUINSMA, J.: Food and Agriculture Organization of the United Nations (Eds.), 2003. World agriculture: towards 2015/2030: an FAO perspective. Earthscan Publications, London.
9. *Extra-EU trade in agricultural goods*. 2015. Available at: http://ec.europa.eu/eurostat/statistics-explained/index.php/Extra-EU_trade_in_agricultural_goods (Accessed: 20 February 2017).
10. FAOSTAT. 2015. Available at: <http://faostat3.fao.org/download/T/TA/E> (Accessed: 20 February 2017).
11. GENNARI, P. 2015: FAO Statistical Pocketbook 2015. Available at: <http://www.fao.org/3/a-i4691e.pdf> (Accessed: 20 February 2017).
12. International trade in goods - exports 2001-2016. 2015. Available at: <http://www.intracen.org/itc/market-info-tools/statistics-export-country-product/> (Accessed: 20 February 2017).
13. International trade in goods - imports 2001-2016. 2015. Available at: <http://www.intracen.org/itc/market-info-tools/statistics-import-country-product/> (Accessed: 20 February 2017).
14. JAMBOR, A. 2013: Comparative advantages and Specialisation of the Visegrad countries Agri-Food trade, *Review of Agricultural and Applied Economics*, 16(01), pp. 22–34. doi: 10.15414/raae.2013.16.01.22-34.
15. NAFTA. 2008. North American free trade agreement. Available at: http://www.naftanow.org/about/default_en.asp (Accessed: 20 February 2017).
16. SCOTT, L. and VOLLRATH, T. 1992: Global Competitive Advantages and Overall Bilateral Complementarity in Agriculture. Available at: <http://ageconsearch.umn.edu/bitstream/154792/2/sb850.pdf> (Accessed: 20 February 2017).
17. TRADING (2017b). *Canada exports of (bop) - live animals 1988-2017*. 2017. Available at: <http://www.tradingeconomics.com/canada/exports-of-bop-live-animals> (Accessed: 20 February 2017).
18. TRADING (2017a). *United States exports of live animals 1996-2017*. 2017. Available at: <http://www.tradingeconomics.com/united-states/exports-of-live-animals> (Accessed: 20 February 2017).
19. TRADING (2017c). *Mexico exports of live animals / 1993-2017*. 2017. Available at: <http://www.tradingeconomics.com/mexico/exports-of-live-animals> (Accessed: 20 February 2017).
20. TRADING (2017d). *Australia exports of food & live animals 1988-2017*. 2017. Available at: <http://www.tradingeconomic.com/australia/exports-of-food-live-animals> (Accessed: 20 February 2017).

s.com/australia/exports-of-food-live-animals (Accessed: 20 February 2017).

21. VOLLRATH, T. L. 1991. A Theoretical Evaluation of Alternative Trade Intensity Measures of Revealed Comparative Advantage. In *Weltwirtschaftliches Archiv*, vol. 130, 1991, no. 2, 265–279.

22. What is the WTO? - who we are. 2017. Available at: https://www.wto.org/english/thewto_e/whatis_e/who_we_are_e.htm (Accessed: 20 February 2017).

Primary Paper Section: J

Secondary Paper Section: AH, BB, GA