Efficiency development of Czech foreign trade in high-technology products and high-value agricultural products

Vývoj výkonnosti českého zahraničního obchodu v oblasti technologicky náročných produktů a zemědělských produktů s vyšší přidanou hodnotou

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Abstract: High efficiency of foreign trade is achieved in export of the commodities that are not only price competitive. The high-technology manufactures usually have the highest value added. The same is true for high-value agricultural products. The article concentrates on the comparison of exports of the Czech economy and other selected transition economies of Central Europe with economies of the European Union members, the United States and Japan using the coefficient of transformation output and the relative specialisation ratio on high-technology intensive commodities and high-value agricultural products. We can conclude that the efficiency gap of Czech economy and of the selected economies of Central Europe increased in the first half of the nineties. The trends of the second half of the nineties are quite different. The gap in efficiency of foreign trade is slowly decreasing and the analysed transition economies overcame the weakest economies of the EU members.

Key words: international trade, foreign trade, competitiveness, high-technology trade, agricultural trade

Abstrakt: Vysoké výkonnosti zahraničního obchodu je dosahováno u komodit, které nejsou konkurenceschopné pouze cenou. Nejvyšších přidaných hodnot se obvykle docílí u komodit vysoce náročných na špičkové technologie. Příspěvek se zaměřuje na komparaci pozice české ekonomiky a dalších vybraných transitivních ekonomik střední Evropy s ekonomikami členských zemí Evropské unie, Spojených států amerických a Japonska za využití koeficientu transformačního výkonu a relativní míry specializace na technologicky náročné produkty a na zemědělské produkty s vyšší přidanou hodnotou. Z pohledu vývoje obou ukazatelů lze konstatovat, že se mezera ve výkonnosti ekonomiky České republiky a dalších sledovaných transitivních ekonomik v první polovině devadesátých let zvýšila. Druhá polovina devadesátých let je obdobím zcela odlišného vývoje, ve kterém dochází k snižování mezery ve výkonnosti zahraničního obchodu sledovaných ekonomik a předstižení ekonomicky nejslabších zemí Evropské unie.

Klíčová slova: mezinárodní obchod, zahraniční obchod, konkurenceschopnost, technologicky náročné produkty, zemědělský obchod

INTRODUCTION

Transition and re-integration of Czech economy into the world and European market leads to a significant increase of the openness of economies. The rapidly increasing openness emphasizes the share of foreign trade in the GDP creation. The higher share in GDP creation export takes, the more is the effectiveness of the GDP creation influenced by the effectiveness of exports. At the end of the year 2002, the openness of Czech economy reached approximately 60% measured by the share of total exports in GDP.

Efficiency of foreign trade depends highly on the competitiveness of export commodities. Commodity competitiveness based exclusively on price can be easily mana-

ged by a massive depreciation of national currency. This type of competitiveness is not sustainable in the long run because the improved results of trade balance immediately induce forces operating towards the appreciation of national currency. So the price based competitiveness diminishes and finally fully disappears. Most of economies in transition used this way at the beginning of their transformation process. Non-price competition inhering in better qualitative attributes of the goods empowers to export the goods at higher market prices in comparison with input what simultaneously leads to a higher productivity (efficiency) of production factors. A higher productivity allows the economy to pay higher incomes for the factor use and so it allows to increase the total welfare of their owners.

The competitiveness of these economies is mainly analyzed and compared by international organizations and other institutions. The spectrum of methods and statistics used is also really wide. Most approaches to competitiveness analyze the economy as one indivisible element and very often the results are formed only on preconditions of the competitiveness success. They pay little or almost no attention to the real demonstration of the economy competitiveness in the world market. Competitiveness evaluation usually proceeds on the basis of quantifiable, easily calculable and comparable indicators, seldom amended with "soft data" of experts estimations or questionnaires. Such methods usually create the list of economies according to their competitiveness based upon the selected indicator, but not differentiating the influence of the economy components (Kadeřábková 2003; OECD 1994, 2001, 2002).

The competitiveness in the field of foreign trade is often not at all or only marginally considered, despite the fact that the results of foreign trade can be held as the issue of the world market competitiveness. The indicators based on international trade results are widely accessible and can be also easily quantified and calculated for most of developed and developing countries. They are conjunctively comparable in time, territory or commodity (Plchová 1995: 41). The often monitored indicators comprise of export and import price indices, terms of trade, real effective exchange rate, transformation effect, etc. (Plchová 1995: 44). Otherwise, the relative indicators that diminish the influence of changes of price in volumes of international trade are used. The most often published indexes are RCA (Revealed Comparative Advantage), contribution to trade balance (Kadeřábková 2003: 231), relative specialisation ratio (Plchová 1996: 71).

MATERIAL AND METHODS

The article concentrates on the development of Czech foreign trade competitiveness, next on the comparison of Czech foreign trade competitiveness to other economies' results using two indicators – transformation effect and relative specialization ratio. The values of both indicators were calculated for the years 1990, 1995 and 2000, consequentially the average yearly changes during the analyzed period were evaluated. The results were compared in set of the economies comprising of the members states of the European Union, the EU associated states of Central Europe (Hungary, Poland, Slovakia, Slovenia) and the USA and Japan as two other main economic centers of the world economy. The set of countries composed this way enables us to study the foreign trade effectiveness convergence or divergence of the selected economies.

The necessary calculations were proceeded in MS Excel. The source data are taken from the electronic version of the UNCTAD Science & Technology for Development Network and the UNCTAD Handbook of Statistics. The COMTRADE database allows the complementarity of the figures for some years.

TRANSFORMATION EFFECT

The purpose of the transformation effect indicator is quantification of the added value to primary commodities in national economy, to express the difference between the value of external inputs and the value of the output of economy. The external inputs are represented by raw material imports, the external outputs by export of the manufactured commodities. The size of the economies must be taken into account, so the indicators are usually recalculated relatively to the GDP or population.

According to the methodology of the OECD (OECD, 1997), the external inputs comprise of commodity section 2-raw materials, inedible, except fuels, commodity section 3-mineral fuels, lubricants and related materials SITC, rev. 3 and the division 68-non-ferrous metals SITC, rev. 3. The external outputs correspond to exports of the commodity sections 5 to 8 SITC, rev. 3, except the division 68-non-ferrous metals SITC, rev. 3. The values of transformation effect recalculated per capita are presented in Table 1. The table contains also the absolute index 1990–2000 and the average annual change in per cent.

The values of transformation effect per capita are very variable across the examined set of economies[1]. The highest is the transformation effect of Ireland – more than 16 400 USD. Ireland's transformation effect increased also very quickly what is uncommon for economies with the transformation effect at the similar absolute level. Ireland quadruplicated its transformation effect during the last decade and overcame Belgium-Luxembourg, the best economy regarding foreign trade effectiveness in the long run measured by this indicator.

The higher dynamic, but at a quite different level, is demonstrated by Hungary that increased its transformation effect more than five times. Also the transformation effects per capita of the other Central Europe transition economies have acceptably improved except Slovenia where it only stagnated. The basic indexes for all countries are not fully comparable because some of them have different basic years. From the average year changes in percent that are comparable, more than double growth rate of the Central European transition economies in comparison to the EU members, the USA and Japan is obvious. Some European countries decreased their transformation effect in the last five years (Germany, Italy, Portugal) but only Greece declined during the whole analysed period.

We can conclude that from the point of view of transformation effect, the Central European economies in transition converge to the EU members. The transformation

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[1] Evaluating the result of foreign trade, we have to keep in mind the volume character of the source data. The whole change includes the change in quantity and price as well. The increase of the transformation effect is supported by faster growth of the manufactured goods prices than the prices of primary commodities in international trade in the long run.

Table 1. The development of transformation effect in years 1990–2000 (USD per capita)

Economy	1990	1995	2000	Index 1990 = 100	Average annual change (%)
Austria	3 752.3	4 864.4	5 069.0	1.351	3.05
Belgium-Luxembourg	6 849.9	10 280.2	11 183.6	1.633	5.02
Denmark	3 241.9	4 886.1	5 084.5	1.568	4.60
Finland	3 352.6	5 542.0	6 143.9	1.833	6.24
France	2 135.8	3 152.8	3 360.4	1.573	4.64
Germany	3 871.0	4 823.9	4 748.6	1.227	2.06
Greece	142.4	199.1	139.1	0.977	−0.23
Ireland	3 945.3	8 030.1	16 397.7	4.156	15.31
Italy	1 945.4	2 967.2	2 951.6	1.517	4.26
Netherlands	3 720.4	5 770.2	6 063.1	1.630	5.01
Portugal	890.5	1 488.2	1 459.9	1.639	5.07
Spain	638.3	1 321.5	1 539.6	2.412	9.20
Sweden	4 472.0	6 067.9	6 392.6	1.429	3.64
United Kingdom	2 008.1	2 918.4	3 319.5	1.653	5.15
Japan	1 438.8	2 588.8	2 655.2	1.845	6.32
USA	669.6	1 181.6	1 413.8	2.111	7.76
Czech republic*	790.0	1 353.2	2 021.5	2.559	14.37
Hungary	406.4	544.6	2 139.9	5.265	18.07
Poland	127.8	303.1	457.5	3.579	13.60
Slovakia*	450.0	946.8	1 294.0	2.875	11.14
Slovenia**	–	3 002.2	3 023.2	1.007	0.14

* data correspond to period 1993–2000, ** data correspond to period 1995–2000

Source: UNCTAD Handbook of Statistics, COMTRADE database

effect of the best of them – Hungary and the Czech Republic – overcame the effect of the weakest EU members – Greece, Spain and Portugal. To reach the group of the similarly effective countries – France, Italy, United Kingdom – they would have to increase their transformation effect at least by one half.

RELATIVE SPECIALIZATION IN HIGH-TECHNOLOGY PRODUCTS

The relative specialization ratio measures the export concentration of economy on the analysed commodity in relation to exports of all manufactured goods. While the foreign trade concentrates on the commodities of which the quality and not the price is crucial, the economy can sell the goods at higher prices and so obtain a higher nominal effectiveness. These commodities possess a very high added value at the same time. High technology commodities are the extreme of commodities of this type.

According to the methodology and statistics of OECD (OECD 1997) the set of high technology commodities comprises of 18 commodity groups at 3 digit aggregation level SITC, rev. 3. The complete list of the defined high technology group is in Annex 1. The export concentration was measured in the years 1990–2000 using the indicator formula:

$$K = \frac{X_{ki} \Big/ \sum_i X_{ki}}{X'_i \Big/ \sum_i X'_i}$$

where X_{ki} – value of export of commodity k from country i
X'_i – value of export of manufactured commodities from country i

The relative specialization ratio is the share of the analyzed commodity country export in the world export of

this commodity divided by the share of the country in the world exports of manufactured goods. The values higher than 1 correspond to a greater concentration, the values below to an under-average concentration. The values of the indicator were recalculated to averages for all high technology commodities to obtain the average concentration of high technology export. This step should minimize the influence of the significant FDI in the particular industry branch that in case of small economies can totally change the foreign trade pattern.

The average values of the indicator for the set of countries are shown in Table 2. The table also contains the average yearly changes in percent for 1990–2000, in case of Germany, the Czech Republic, Slovakia and Slovenia for the years 1995–2000. The over-proportional concentration on high technology goods (in the table printed in bold) panned out only seven economies. During the last five years, Ireland and Sweden left this group of countries, on the other hand, Finland came in.

From the dynamic point of view, Greece reaches the best results, but again at a very low absolute level. From the economies at a significantly higher absolute concentration, there slowly descend France, the USA and more quickly the above-mentioned Ireland. The fall of the shares of these economies are probably caused by a substantive growth dynamic of other economies, primarily of the Asia and Pacific economies and the economies in transition. For the development of economies in transition, a substantial decline in the first half of the nineties that is followed by a quick advance in the second half is characteristic. Although the growth still does not beat the declines, the dynamics is very high. In case of the Czech Republic, Hungary and Slovenia, an over-proportional concentration on high technology exports can soon appear.

Table 2 encompasses also the lists of 3-digit commodity groups where each country reaches the highest concentration (only the top five). Only the world over-proportional commodity groups are taken into account.

Table 2. Development of relative specialization ratio for high-technology products in years 1990–2000

Country	1990	1995	2000	Average annual change (%)	The most important commodities in 2000					Above value 1 in 2000
Austria	0.826	0.632	0.672	–1.99	718–1.725	716–1.400	541–1.363	771–1.290		4
Belgium-Luxembourg	0.387	0.427	0.671	5.73	718–4.209	541–1.967				2
Denmark	0.989	**1.020**	**1.136**	1.40	541–3.680	716–3.524	871–2.321	774–1.524	771–1.381	8
Finland	0.616	0.872	1.104	6.02	764–5.356	718–4.271	716–3.178	774–2.324	771–2.103	6
France	**1.111**	**1.171**	**1.066**	–0.41	524–3.766	792–2.763	541–1.742	718–1.240	764–1.029	5
Germany*	–	0.898	0.834	–1.47	774–1.560	718–1.325	874–1.321	874–1.321	792–1.318	7
Greece	0.126	0.197	0.344	10.56	541–1.846	764–1.225				2
Ireland	**1.126**	**1.074**	0.880	–2.43	759–3.626	752–3.475	541–3.097	764–1.035		4
Italy	0.468	0.463	0.513	0.93	712–1.656	541–1.239	716–1.000			3
The Netherlands	**1.122**	**1.174**	**1.424**	2.43	774–3.060	762–2.839	751–2.706	524–2.042	759–1.634	7
Portugal	0.335	0.287	0.344	0.30	771–1.493	761–1.149				2
Spain	0.481	0.498	0.526	0.89	718–1.841	761–1.706				2
Sweden	0.873	**1.001**	0.978	1.16	764–3.801	541–2.459	718–2.402	712–1.679	774–1.057	7
United Kingdom	**1.112**	**1.185**	**1.191**	0.69	524–2.851	541–1.964	792–1.766	751–1.745	874–1.689	6
Japan	**1.389**	**1.337**	**1.371**	–0.12	881–3.413	712–2.745	751–2.700	571–2.650	778–2.033	11
USA	**1.345**	**1.343**	**1.218**	–0.98	792–2.776	774–2.298	874–2.217	524–1.876	871–1.484	8
Czech Republic*	–	0.655	0.971	8.20	712–5.606	716–2.483	778–2.217	761–1.411	524–1.213	6
Hungary	**1.051**	0.627	0.807	–2.32	761–2.827	752–2.287	778–1.918	759–1.826	764–1.266	6
Poland	**1.187**	0.495	0.619	–5.74	761–4.000	712–2.553	771–1.014			3
Slovakia*	–	0.332	0.425	5.06	716–1.680	718–1.498	771–1.144	761–1.082		4
Slovenia*	–	0.617	0.768	4.47	716–3.477	712–2.297	541–2.092	778–1.436	718–1.169	5

* data correspond to period 1995–2000

Source: UNCTAD Handbook of Statistics, UNCTAD Science&Technology for Development Network, COMTRADE database

The table gives the needed data for comparison of the structure of high technology exports. The first pole of the spectrum includes the economies that are over average in most of high technology commodities like Japan, the USA and Denmark. The second pole is occupied by countries like Greece, Spain, Italy with only a limited number of high technology exports. Their export advantage is only slightly over the average, as well.

From the economies in transition, the Czech Republic quite unambiguously concentrates on commodity groups 712-steam turbines and other vapor turbines, and parts thereof and 716-rotating electric plant, and parts thereof, next on 778-electrical machinery and apparatus. Also the other economies in transition taken into account have a similar export concentration structure. In their high technology exports, electrical machinery and apparatus for electricity production dominate. The commodities containing electronic parts are not present, except the TV receivers. In Polish and Hungarian export,

TV-receivers dominate, which is just an example of the FDI influence on the foreign trade pattern of small countries.

RELATIVE SPECIALIZATION IN HIGH-VALUE AGRICULTURAL PRODUCTS

The term "high-value agricultural products" refers to certain unprocessed commodities – generally horticultural crops – and to semi-processed and highly processed products, which involve capital – or labour-intensive production in comparison to raw agricultural commodities. High-value agricultural products have a higher unit values than such agricultural commodities as grain or soybeans. In comparison with raw agricultural commodities, export of high-value agricultural products is associated with high levels of employment, gross economic output, personal income, etc.

Table 3. Development of relative specialization ratio for high-value agricultural products in years 1990–2000.

Country	1990	1995	2000	Average annual change (%)	The most important commodities in 2000					Above value 1 in 2000
Austria	**1.472**	**1.484**	**1.821**	2.15	111–14.083	024–2.113	062–1.720	011–1.190	001–1.177	6
Belgium-Luxembourg	**1.108**	**1.010**	0.954	−1.48	111–1.876	062–1.421	54–1.412	057–1.311	012–1.252	7
Denmark	**1.365**	**1.549**	**1.424**	0.42	012–8.411	024–3.535	011–2.829	062–1.111		4
Finland	0.890	0.886	0.962	0.78	024–5.363	062–3.885	112–1.135			3
France	**1.044**	**1.121**	**1.118**	0.68	112–3.025	024–2.199	111–1.994	001–1.989	041–1.776	6
Germany*	–	0.895	0.899	0.09	024–2.438	122–1.842	062–1.386	001–1.016		4
Greece	**1.346**	**1.364**	**1.283**	−0.48	121–7.689	057–2.611	122–1.395	024–1.387	054–1.160	5
Ireland	0.906	0.684	0.835	−0.81	001–2.621	011–2.285	024–1.676	112–1.567		4
Italy	**2.739**	**2.524**	**3.145**	1.39	012–11.821	112–6.162	024–5.061	057–4.250	054–3.792	9
The Netherlands	**1.253**	**1.181**	**1.202**	−0.41	012–3.296	122–2.474	024–2.230	054–2.095	011–1.407	5
Portugal	0.929	0.833	0.750	−2.12	112–4.360	054–1.448	111–1.020			3
Spain	**0.973**	**1.143**	**1.133**	1.53	057–3.112	054–2.858	062–2.590	012–1.520	112–1.255	5
Sweden	0.870	0.604	0.538	−4.70	062–2.323	024–1.150				2
United Kingdom	**1.116**	**1.123**	**1.104**	−0.11	112–4.044	122–2.581	062–2.170	001–1.461	111–1.054	5
Japan	0.446	0.709	0.515	1.45	062–2.119	122–1.982				2
USA	0.943	0.961	0.922	−0.22	122–1.964	041–1.801	121–1.617	011–1.356		4
Czech Republic*	–	0.929	**1.107**	3.56	111–3.142	062–2.891	041–2.117	122–1.816	024–1.233	5
Hungary	0.816	0.862	0.804	−0.14	001–2.657	011–2.492	111–1.147			3
Poland	0.894	**1.020**	0.736	−1.92	001–2.409	062–1.720	054–1.332			3
Slovakia*	–	**1.165**	0.920	−4.61	111–3.010	024–2.241	001–1.561	122–1.376	121–1.046	5
Slovenia*	–	**1.618**	**1.829**	2.48	111–10.135	012–3.137	062–2.606	122–2.339	112–1.402	6

* data correspond to period 1995–2000

Source: UNCTAD Handbook of Statistics, UNCTAD Science&Technology for Development Network, COMTRADE database

Higher unit prices of high-value agricultural products, compared to bulk commodities, imply that modest increases in high-value agricultural products export volume would have a greater economic effect than in case of bulk commodities.

Another advantage of high-value agricultural products exports is the relatively steady growth of high-value agricultural products markets over the few past decades. Even during the world recession of the early 1980s, growth of high-value agricultural products trade did not decrease as severely as trade in raw commodities. International trade in high-value agricultural products holds other benefits as well. Saturation in some domestic markets could make the export more attractive for all producers. Processing industries can adjust production more easily than farmers; exporting processed goods holds fewer risks for entrepreneurs.

Big barriers concern the role of agriculture in international trade. Many developing and middle-income countries seek to expand or to protect their own processing sectors, to generate employment and to achieve a higher level of food security. In fact, developing countries may have stronger incentives to establish their own processing industries than to import high-value agricultural products. This trend is encouraged through import barriers of these countries. Import barriers are especially formidable in the member economies of the EU, which represent a logical market for high-value agricultural products. The EU Common Agricultural Policy imposes tariffs and levies that "severely" restrict many food exports.

In spite of strong regulation of the international agricultural trade, the developed economies are able to "iceberg" the protected markets. The results of the analysed economies are summarised in Table 3. In denominator of the indicator, the shares of the relevant country in agricultural exports defined according the OECD methodology are used (section 0-Food and live animals, section 1-Beverages and tobacco, section 4-Animal and vegetable oils and division 22-Oil-seeds and oleaginous fruits SITC, rev. 3). The figures are more fluctuating in comparison to high-technology commodities because of higher number of "desired" commodity groups relative to the base.

The average relative specialisation ratio in 2000 extends from 0.515 for Japan to 3.145 for Italy. Italy has really a considerable lead over other analysed countries, the second best, Austria, reached the ratio value only 1.821. More than proportional orientation on high-value agricultural products was proved by 10 of 21 considered countries, among them by the economies in transition Slovenia and the Czech Republic. The average annual changes are in +/–1% interval, except for Austria, Spain, Italy and Japan. The development in the group of economies in transition is very heterogeneous. The Czech Republic and Slovenia proved higher increases in orientation to high-value products, the others significant decreases. The pattern for economies in transition is simple: the above proportional exporting economies in tran-

sition strengthened their positions, the ones below average lost still further.

The detailed structure of high-value product orientation of each country is more obvious from the last two columns of Table 3. The Czech high-value agricultural export regarded primarily non-alcoholic beverages, sugar confectionery, wheat and cigarettes. Slovenia, the leader among the Central European countries in transition, has a similar structure plus meat. The total effectiveness of Czech agriculture exports measured by the relative specialisation ratio is comparable with the more developed economies like United Kingdom, the Netherlands and France. The annual dynamics of the last five years promises further improved results in the future.

CONCLUSION

The political changes after 1989 are certainly reflected also in the foreign economic relations. The growing openness of economies in transition and radical changes in the territorial structure of their foreign trade forced these economies into the world market competition with developed countries. These changes lead to significant decline of efficiency of foreign trade of economies in transition while there was a very significant lag in competitiveness in exports. The transition of economies created conditions for a substantial improvement of their international trade position that partly proved in the second half of the nineties when their results started to diminish the gap to developed countries.

The efficiency of foreign trade that is principally conditioned by export competitiveness is still more important in evaluation of the whole economy competitiveness. Just in international trade meet the products of economies here they are in direct competition for customers. Prosperousness in foreign trade is one of scale of prosperousness of the whole economy.

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