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## SENSITIVITY OF SELECTED COUNTRIES TO CHANGES IN THE SUGAR BEET MARKET IN THE CONTEXT OF THE REFORM OF THE EUROPEAN UNION SUGAR REGIME IN 2006

## WRAŻLIWOŚĆ WYBRANYCH KRAJÓW UNII EUROPEJSKIEJ NA ZMIANY ZACHODZĄCE NA RYNKU BURAKÓW CUKROWYCH W RAMACH REFORMY SYSTEMU W 2006 ROKU

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**Streszczenie.** W artykule przedstawiono analizę wpływu reform na cukrownictwo i produkcję buraków cukrowych w ramach poszczególnych państw członkowskich UE. Dokonano analizy podstawowych tendencji przemysłu cukrowniczego w poszczególnych krajach UE. Skupiono się również na wrażliwości przemysłu cukrowego, każdego z krajów, na zmiany kwot produkcji, ceny referencyjne cukru i minimalne ceny buraków cukrowych. Uzyskane wyniki wskazują, że reforma przyniosła wiele zmian, które nie były równe dla wszystkich zainteresowanych krajów. Ogólnie rzecz biorąc, w odniesieniu do UE, można stwierdzić, że produkcja buraków cukrowych zmniejszyła się o ponad 20%. Ponadto, zaobserwowano zmniejszenie produkcji cukru o około 25%. Ten spadek produkcji wpłynął na liczbę plantatorów buraków, która zmniejszyła się o około 49%. Ograniczenie możliwości przetwarzania (zamknięto około 40% wszystkich cukrowni działających w 2006 roku), doprowadziło do zmniejszenia zatrudnionych w sektorze o ponad 45%. Wyniki pokazują, że na rynku buraka cukrowego w UE pojawiły grupy krajów, które zostało wzmocnione kosztem innych krajów.

**Key words:** development, quotas, reform, sugar, sugar beet.

**Słowa kluczowe:** buraki cukrowe, cukier, kontyngenty, reformy, rozwój.

### INTRODUCTION

Production of sugar beet and sugar in the EU is built on the foundations of Common Market Organisation, CMO. The level of EU sugar CMO has a direct impact on global sugar market (Gotor, Tsigas 2011). In 2006, the CMO was significantly reformed. The implemented reform led to a reduction in production quotas for sugar by about 6 million tons (i.e. 30% of the volume before the reform, which was about 17 million tons). The remaining value of sugar quotas in the EU 27 was reduced to approximately 13.3 million tons after the implementation of basic principles of the “reform”. In addition to reducing the physical volume of production quotas, the reduction of sugar reference prices by about 36% (i.e. from 631.9 EUR/ton in 2006/2007 to 404.4 EUR/ton in 2009/10) was a key element of the reform (MZe ČR 2011; CEFS 2011). Another significant feature of the reform was also the removal of intervention mechanisms. This removal guaranteed minimum prices of sugar in the pre-reform period. Table 1 provides an overview of the approved reform measures.

Table 1. Impact of the measures taken on the reference prices and production quota of sugar

Countries	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011
Reference prices of white sugar (in EUR/ton)	631.9	631.9	541	404.4	404.4
Minimum prices of sugar beet (in EUR/ton)	32.86	29.8	27.83	26.29	26.3
Production quotas in particular periods mentioned above (in tons)					
Austria	387 326	405 812	351 027	351 027	351 027
Belgium	701 595	862 077	676 235	676 235	676 235
Denmark	353 216	420 746	372 383	372 383	372 383
Finland	129 156	90 000	80 999	80 999	80 999
France + dom.	3 184 157	4 120 687	3 437 032	3 437 032	3 437 031
Germany	2 859 942	3 655 456	2 898 256	2 898 256	2 898 256
Greece	280 233	158 702	158 702	158 702	158 702
Ireland	199 260	0	0	0	0
Italy	1 557 443	753 846	508 379	508 379	508 379
Netherlands	864 560	876 560	804 888	804 888	804 888
Portugal	61 714	15 000	0	0	0
Spain	896 567	887 164	630 586	498 480	498 480
Sweden	325 728	325 700	293 186	293 186	293 186
Great Britain	1 005 863	1 221 474	1 056 474	1 056 474	1 056 474
EU15	12 388 775	13 803 950	11 278 099	11 145 993	11 145 993
Czech Republic	411 332	367 938	372 459	372 459	372 459
Hungary	363 966	298 591	105 420	105 420	105 420
Latvia	60 759	0	0	0	0
Lithuania	94 161	103 010	90 252	90 252	90 252
Poland	1 498 046	1 772 477	1 405 608	1 405 608	1 405 608
Slovakia	183 225	140 031	112 319	112 319	112 319
Slovenia	46 849	0	0	0	0
Bulgaria		4 752	0	0	0
Romania	X	109 164	104 689	104 689	104 689
EU12	2 658 338	2 795 963	2 190 747	2 190 747	2 190 747
EU25	15 047 113	16 485 997	13 364 157	13 232 051	13 232 051
EU27	15 047 113	16 599 913	13 468 846	13 336 740	13 336 740

Source: Ministry of Agriculture CR, European Commission, own data processing, 2012.

As a compensation for losses caused by the above-mentioned reform, a series of measures were accepted to offset the loss of the sugar beet growers. Furthermore, a so-called restructuring fund was established, the budget is funded by sugar producers in order to encourage less competitive sugar producers not to leave the market and close or reduce their own uncompetitive production capacities.

The reform itself, which was adopted in 2006, does not represent the “bomb” that fell from the sky reducing the sugar industry in the EU. The EU sugar industry had been changing over time in the period before the introduction of the above-mentioned reform (Svatoš, 2008). These changes were associated with the previously adopted reforms of the Common Agricultural Policy, Common Trade Policy, with its commitments to the WTO (reduction of subsidies provided within the Amber Box, reduction of export subsidies, etc.), with the EU enlargement process and last but not least, with various changes that were related to the EU’s commitments which were adopted in relation to developing countries (Čermák 2009). In addition, the sugar industry was greatly influenced by the adopted concept of sustainable agriculture and rural development, which was applied under the Common Agricultural Policy

of the EU (Ribera et al. 2011). In relation to sugar production, in recent years the concept of alternative fuels which is significantly promoted by the European Commission (or more precisely by the the whole EU) has played a role as well. The sugar industry was touched by this phenomenon especially in terms of the fact that some sugar beet are not processed into sugar but into bio ethanol (Reinbergr 2011) – this reality is then connected with the fact that a number of sugar factories across Europe have expanded their production capacities by including the production of bio fuels as well.

From the Table above it can be seen that the European sugar industry has not only reshaped under the pressure of adopted reform. A number of long-term factors, which need to be taken into consideration influence, this reform. In this respect, the paper deals with the sensitivity of individual EU countries or more precisely their sugar industry. These changes are not only in the context of the reform of 2006 but also in a longer context – from 2000 to present.

However, it is the reform of 2006 which represents one of the most important internally implemented interventions that changed the form of the sugar market in the EU27 countries over a relatively short time. In the past few years, a number of sugar factories closed as a result of the reform process and the subsequent restructuring, which was driven mainly by the need to increase the efficiency of the sugar industry in the EU (Strnadlová 2009). From a virtual perspective, the reform affected each EU country and the region. Of course, production capacities were affected directly but also logically individual consumers in EU countries were indirectly affected, because the reform was reflected in sugar prices in the EU. Currently, sugar beet is produced in 18 EU countries, which means that five EU countries (in the pre-reform period sugar was produced in 23 EU countries) have closed their production capacities. However, it should be noted that in countries such as Ireland, Portugal, Latvia and Slovenia the reduction or elimination of their own production capacities was a marginal issue. In this regard, it is appropriate to focus mainly on the issue of how the reform affected the most important players on the sugar market in the EU27 countries because this market is highly concentrated in terms of distribution of its own production capacities. The seven countries with highest production control more than 70% of the sugar beet production in the EU market. Germany, France and Poland whose combined share of the cumulative production of sugar beet in the EU countries exceeds 60% dominate the market.

The effects of the adopted reform process can be observed in the period 2006–2011. This reform process was much more radical in its scope than the reforms adopted previously. In the period 2000–2005, 68 factories were closed in the EU (11 per year on average), in 2006–2008, an additional 83 factories were closed (28 per year on average). From the facts above it can be concluded that the production capacity in EU countries has decreased by 60% in the last 10 years. However, in many cases this decline was offset by longer production campaigns and also by the fact that generally only modern plants remained on the market from which many of them were not used on 100% of their planned

production capacity in the pre-reform period. In this respect, it is important to remember the fact that the average production capacity of many sugar factories increased, especially in Western European countries (EU15) which represent about 85% of the production of sugar beet in the EU. The reform allowed the breakthrough of particularly large and modern operations in these countries at the expense of many smaller operations. In connection with the decline in sugar and sugar beet production together with the reduction of processing and manufacturing capacity, there was a significant reduction in the number of workers in the sugar industry. This number decreased by approximately 45% in the years 2006–2011. Currently, just under 30,000 people are working in the sugar industry. Nevertheless, in this respect, it is also important to point out that subsequent customer supply chains are connected to many other entities that employ tens or hundreds of thousands of other people (the CEFS projections indicated that the sugar industry in the EU provides livelihood directly or indirectly to more than one million people). In this respect, it is good to point out that the reform of sugar production significantly affected beet growers, who in the observed period, reduced the harvest area from approximately 2.2 million hectares to less than 1.5 million hectares which had implications in reducing number of small growers. During the observed period, the number of sugar beet producers was reduced from more than 300 thousand to about 155 thousand, which is subsequently connected to the development of employment in sectors related to the cultivation of sugar beet.

The result of the reforms and changes in the European sugar industry mentioned above is the fact the current market is controlled by about 56 companies, which possess about 106 sugar factories. Reforms and changes that occurred in both the internal and external economic environment of EU countries had both direct and indirect impact on the sugar sector of the EU countries. In recent years, they led to a significant reduction of the sugar industry, they eliminated some (but far from all) weak elements of the European sugar industry which led to the empowerment of those entities that have a competitive advantage in the production and processing of sugar beet. However, it should also be mentioned that the reform, which hit a number of European countries to various degrees, is criticised for its imbalance. Critics of the reform argue that it was “tailored” in order to provide benefits to certain countries or groups (Renwick 2007). The critics further suggest that the effect of the adopted reforms varies considerably from country to country and while the impact of the reform was fatal for some EU countries, other countries were affected by the reform only marginally.

## **AIM AND METHODOLOGY**

The aim of this paper is to quantify the differences in the basic development trends of the sugar industry for individual EU countries so as to identify the degree of impact these changes have brought about in connection with the application of the reform related to the

allocation of production quotas for sugar in individual EU countries. In this regard, the paper analyses development of the growth rate of sugar production, sugar beet production, sugar beet growing areas, number of sugar beet producers, number of employees in the sugar industry, number of active sugar factories and length of the production campaign. The average sugar content and yields, per acre of the sugar beet, as well as sugar are taken into account. Beside the development trend, the paper also focuses on the sensitivity of the parameters related to the production of sugar (sugar beet and sugar production, etc.) to development of quotas for sugar production. Furthermore, the sensitivity of sugar and sugar beet production in individual EU countries to change the sugar reference prices and minimum sugar beet prices are also analysed.

In terms of content, the paper analyses development of the European sugar production in the period of 2006–2011. The subject of the analysis is the development of selected characteristics of sugar production in individual countries of the European Union. This paper analyses the sensitivity of selected variables related to the existence of the sugar industry in particular in countries suffering changes brought by the reform in 2006. In this respect, emphasis is put on annual changes observed in the case of individual characteristics, which are then interpreted by geometric average for the entire period. Furthermore, the sensitivity of indicators is analysed related to the sugar industry and to the changes of selected parameters affecting the sugar industry in individual EU countries. Sensitivity of individual countries is demonstrated by elementary point elasticity (Tvrdoň 2000) expressing the percentage change of monitored parameters if the instrument of the EU sugar policy changes by one percent.

Results obtained from the above analysis enable a comparison of the differences that exist between individual EU countries in terms of the impact of changes associated with the reform of the sugar industry. In this respect, it is also worth noting that the paper divides EU countries into several groups: EU27 (all EU Member States), EU25 (all EU Member States except Bulgaria and Romania), EU15 (EU Member States, which accessed the EU in 1951–1995) and EU12 (EU Member States, which accessed the EU in 2004 and 2007).

## **ANALYSIS AND DISCUSSION**

The analysis of the sugar industry in each country of the EU27 provides the following findings. The reform as a whole affects more vigorously the new member states. While in the old member states, the sugar production was fully stopped only in the cases of Ireland and Portugal. In the new member states, sugar beet production was eliminated in the case of Bulgaria, Latvia and Slovenia.

Table 2. Average annual change of the characteristic related to the development of the sugar industry in individual EU countries between 2006–2011 (average chain index expressed as geometric average)

Countries	Number of factories	Average length of campaign	Harvesting area of sugar beet [ha]	Yield of sugar beet per ha	Sugar beet production	Sugar production	Average yield of sugar per ha	Sugar content	Daily capacity of processed sugar beet	Number of sugar beet producers	Employment
Austria	0.922	1.087	1.003	0.974	0.977	0.981	0.978	1.002	0.898	0.966	0.952
Belgium	0.903	1.039	0.928	1.020	0.947	0.942	1.016	0.998	0.911	0.895	0.959
Denmark	0.922	1.047	0.964	1.012	0.976	0.953	0.989	0.990	0.932	0.809	0.953
Finland	0.871	0.974	0.860	0.976	0.839	0.851	0.990	0.999	0.862	0.844	0.881
France	0.964	1.042	1.000	1.014	1.014	1.006	1.005	0.992	0.973	0.975	0.960
Germany	0.956	1.078	0.962	1.015	0.976	0.968	1.007	0.992	0.906	0.930	0.931
Greece	1.000	0.900	0.795	0.970	0.772	0.757	0.952	0.989	0.858	0.767	0.885
Ireland	Closed										
Italy	0.732	0.958	0.755	1.004	0.758	0.790	1.045	1.000	0.791	0.750	0.757
Netherland	0.922	1.039	0.949	1.025	0.973	0.977	1.030	1.000	0.937	0.907	0.895
Portugal	Closed										
Spain	0.854	1.047	0.847	1.023	0.866	0.866	1.022	1.006	0.828	0.851	0.887
Sweden	0.871	1.041	0.949	1.014	0.963	0.951	1.002	0.985	0.924	0.909	0.926
Great Britain	0.922	1.008	0.942	1.031	0.971	0.942	1.000	0.996	0.963	0.908	0.994
EU15	0.909	1.033	0.933	1.019	0.951	0.949	1.017	1.000	0.920	0.886	0.915
Czech Republic	0.914	1.016	0.981	0.987	0.968	0.950	0.968	0.977	0.953	0.959	0.910
Hungary	0.725	1.054	0.749	1.010	0.756	0.742	0.991	0.989	0.718	0.719	0.712
Latvia	Closed										
Lithuania	0.922	1.046	0.907	1.103	1.000	0.952	1.050	0.975	0.956	0.760	0.772
Poland	0.852	1.027	0.932	1.051	0.979	0.935	1.003	0.972	0.953	0.879	0.805
Slovakia	0.871	1.004	0.878	1.008	0.885	0.881	1.003	0.988	0.882	0.865	0.795
Slovenia	Closed										
EU25	0.891	1.031	0.928	1.022	0.949	0.942	1.015	0.997	0.920	0.883	0.882
Bulgaria	Closed										
Romania	N/A	N/A	1.039	1.071	1.112	N/A	N/A	1.025	N/A	0.602	N/A
EU12	0.861	1.018	0.916	0.974	0.944	0.915	0.952	0.934	0.895	0.845	0.837
EU27	0.897	1.031	0.929	1.022	0.949	0.943	1.015	0.997	0.921	0.874	0.889

Source: CEFS, 2012, own processing.

If the effects of the reform on the particular parameters characterising the development of sugar and sugar beet production in EU15 and EU12 countries are compared, it can be seen that in terms of the development of chain indexes of characteristics associated with the sugar industry, the new member states show a much greater reduction in all characteristics studied (see Table 2).

In the EU12 countries, more refineries were closed in comparison to the EU15 countries. This also concerns the reduction of harvesting areas, sugar beets harvest, sugar production, daily capacity of processed beet, number of employees employed in the sugar industry as well as the number of sugar beet producers. In relation to the EU15 countries, it is clear that the reform mainly affects the countries where the sugar industry was on the edge of the long-term interest. On the other side, in the countries with powerful producers such as France and Germany there was only a minor impact of the reform.

Table 3. Sensitivity of selected variables associated with the development of sugar industry in individual EU countries to the change in available production quota in particular producer active countries [in%] in the period 2006–2011

Countries	Production quotas	Sugar beet harvesting area [ha]	Number of refineries	Sugar beet production	Sugar production	Daily capacity of processed sugar beet	Number of sugar beet producers	Employment	Sensitivity of sugar production to changes of reference prices [%]	Sensitivity of sugar beet production to changes of minimum purchase prices [%]
Austria	0.82	1.12	0.00	0.95	0.73	0.61	1.09	0.78	0.21	0.52
Belgium	0.31	2.72	4.03	2.22	1.80	3.61	4.06	1.36	0.51	1.22
Denmark	0.45	0.52	3.24	0.36	0.02	0.36	6.92	1.12	0.01	0.20
Finland	3.71	3.87	5.35	5.35	3.85	6.06	6.00	4.33	1.08	2.94
France	0.65	0.03	1.50	0.13	0.22	1.09	0.94	1.20	0.06	0.07
Germany	0.11	0.36	1.83	0.71	0.46	3.01	2.26	2.21	0.13	0.39
Greece	4.46	5.39	0.00	5.91	5.84	4.64	6.79	4.08	1.64	3.24
Ireland	x	X	x	x	X	x	x	x	X	x
Italy	8.22	3.14	3.24	2.49	1.40	2.77	4.56	2.55	0.39	1.37
Netherlands	0.60	1.38	3.24	0.48	0.01	2.52	3.55	3.60	0.00	0.26
Portugal	x	x	x	x	X	x	x	x	X	x
Spain	4.59	6.43	3.73	5.53	5.18	8.13	4.92	3.09	1.46	3.03
Sweden	0.87	1.35	0.00	1.21	0.05	0.22	3.11	2.06	0.02	0.66
Great Britain	0.42	1.36	3.24	0.35	1.25	1.29	3.69	0.03	0.35	0.19
EU15	0.88	1.18	2.42	0.56	0.50	2.32	3.06	2.01	0.14	0.31
Czech Republic	0.82	0.29	2.87	0.21	0.70	2.37	1.41	3.33	0.20	0.12
Hungary	8.96	8.78	11.15	7.58	8.41	10.72	11.39	11.63	2.37	4.16
Latvia	x	x	x	x	X	x	x	x	X	x
Lithuania	0.35	2.48	3.24	1.50	0.56	3.26	9.51	8.41	0.16	0.82
Poland	0.53	1.71	4.28	0.69	1.26	1.75	4.04	6.07	0.36	0.38
Slovakia	3.88	3.87	3.24	2.58	3.09	3.77	4.98	6.25	0.87	1.42
Slovenia	x	x	x	x	X	x	x	x	X	x
EU25	1.06	2.25	3.19	0.76	0.78	2.48	3.37	3.32	0.22	0.42
Bulgaria	x	x	x	x	X	x	x	x	X	x
Romania	0.35	0.27	1.83	3.27	N/A	N/A	0.51	3.16	N/A	1.79
EU12	1.00	2.25	2.95	0.76	0.77	2.48	3.73	3.05	0.22	0.42
EU27	1.59	2.46	3.95	1.64	2.07	3.01	5.28	5.12	0.58	0.90

Source: CEFS, 2012, own processing.

Table 3 contains brief information on the sensitivity of individual characteristics, related to the sugar production in individual EU countries, to changes in production quotas for the EU-wide level. The table also provides an overview of the sensitivity of sugar and sugar beet production to the changes in the reference prices, which were brought about by the reform process of 2006. The results show that new member countries react more sensitively to the changes of the quota system while strong producer countries such as France and Germany, which are able to lobby very effectively, the sensitivity to changes in production quotas, reference prices and purchase prices is very low.

If individual EU countries are divided into groups according to their sensitivity of sugar industry to the changes brought by the reform, it can be found that the following countries reacted the most sensitively to changes: Hungary, Finland, Spain, Greece, Slovakia, Italy, Belgium and Lithuania.

On the other hand, the following countries reacted the least sensitively to changes: France, Denmark, Germany, Sweden, Czech Republic, Austria and Great Britain together with the Netherlands.

In terms of the sensitivity of individual characteristics associated with changes in the sugar industry in recent years, the following countries are somewhere between these two groups: Poland and Romania.

Table 4 provides a brief overview of the balance of powers in the production of sugar within the EU during the pre-reform and post reform periods. The results show that a group of strong players who dominated the sugar market in the EU during the period before the reform came out of the reform process strengthened at the expense of other countries.

Table 4. Relative share of the EU Member States in the sugar quota and sugar production before and after reform

Group of EU member states	Share in the EU sugar quota before reform [%]	Share in the EU sugar quota after reform [%] (including French dom.)	Share in the EU sugar production before reform [%]	Share in the EU sugar production after reform [%]
France, Germany, Poland, Great Britain, Netherland	62	71	67.9	73.7
Italy, Spain, Belgium, Czech Republic, Denmark, Austria, Sweden	28	24	25	22.3
Hungary, Greece, Slovakia, Ireland, Finland, Latvia, Lithuania, Portugal, Slovenia, Romania, Bulgaria	10	5	7	4

Note: highlighted countries reduced their production quotas and production capacity to zero.  
Source: Ministry of Agriculture, 2011.

Generally, it can be stated that if the sugar production in 2006 is compared with the sugar production in 2011, it emerges that the reform caused a reduction of the total amount produced by about five million tons. The share of this reduction between individual EU countries is not adequate – the main carriers of the decline were the following countries: Italy (24.5%), Germany (11.7%), Poland (11.6%), Spain (10.9%), Hungary (7.5%) and Britain (6.8%). From the above-mentioned facts, it can be concluded that only Poland and Great Britain have reduced their production adequately to their market power. Other countries where the decrease of production corresponds with their EU market share include; Belgium, the Czech Republic, Denmark, Sweden, Lithuania, and Romania. Paradoxically, the strongest producer, France, was able to defend its exclusive position on the sugar market. Through a strong lobby, France managed to defend its quota. The reduction of French sugar production by 2.3% (comparing the year 2006 to 2011) is not adequate to the French share in the total EU sugar production which moved to about 28.44% in 2011 (the reform actually strengthened the country's position on the European market for sugar beet as before the reform, France's share was about 20%).



## CONCLUSIONS

The results arising from the analysis and findings above show that changes which recently affected the sugar industry in the EU are limiting the production potential of the whole Union. The amount of produced sugar beet was reduced by more than 20%. There was also a significant reduction in the production of sugar by about 25%. This decline in production also had an impact on the development of the number of sugar beet growers, which decreased by about 49%. The number of closures of processing capacities (about 40% of all sugar mills operating in 2006 were closed during the period) that occurred in recent years led to a reduction in the number of workers employed by more than 45%.

Another result of the reform was also the fact that many EU countries ceased acting as producers of the sugar beet. In the case of many countries, there was a significant reduction in the production capacity. Although the reform seems to be successful, there is still a bitter taste for those countries which had to sacrifice their production ambitions more than they were originally willing to while at the same time the countries with stronger production came out of the reform process either almost unaffected or affected only minimally. Countries, which dominated the sugar market in the EU during the period before the reform, came out of the reform process strengthened at the expense of other countries.

In the future, it is expected that the current state of the EU sugar market is far from being stabilised and in the coming years there will be further shifts due to the influence of either external or internal factors.

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