

**Theses of doctoral (PhD) dissertation**

**SPATIAL ANALYSIS OF COMPETITIVENESS OF  
VEGETABLE AND FRUIT PROCESSING IN HUNGARY**

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“When we were still a small company we had to stand on the shoulders of giants to grow up. If I have seen farther it was by standing on the shoulders of giants. However, copying others cannot make you great. So the key is to find a marvellous idea and create local innovation.”

**Pony Ma**, founder of Chinese internet service portal **Tencent**

## 1. INTRODUCTION

Food production and processing is an economic branch of strategic importance in all the countries in the world. The food demand of the growing population of the world is soaring, too, while there are fixed ecological limits to food production. Along with the over-production of food in certain areas, the supply of food to population in other areas is a serious socio-political problem. Moreover, global food trade enhances food security risks as well.

The actors of food production and processing compete with one another globally. Producers and food industry companies in Hungary, too, have to hold on in this global competition on the domestic market, the European Union’s single internal market and the global market. Furthermore, the expected further liberalisation of the global market will present new challenges to the entire food economy in Hungary.

### 1.1. MOTIVATION FOR AND IMPORTANCE OF CHOICE OF SUBJECT

A basic interest in Hungary is – by exploiting the outstanding conditions of the food economy and by creating its competitiveness – to be able to reliably satisfy the domestic food demand and to sell its products successfully on external markets as well, thus contributing to the development of the economy. This interest is important taking into account especially that food economy in Hungary has an essentially larger weight in the total national economy in view of production, employment and exports than in other countries with a similar level of economic development.

Vegetable and fruit processing relying mainly on domestic raw materials can be one of the breakouts for the strategically important food industry in Hungary as well, relying on centuries of tradition, the accumulated knowledge, the available labour force and the excellent conditions of production. However, because of weather or raw material problems the sub-sector is compelled to rely on imports in the case of certain products from time to time. Climatic extremities as well as sales difficulties and conditions often make the situation difficult for farms engaged in vegetable and fruit production producing raw materials.

“The sub-sector of vegetables and fruits is very intensive, producing a high value of production on a small area. Its demand for skills and labour has a major and important role in employing and keeping locally the rural population.” (*Medina, 2005*)

The sub-sector of vegetables and fruits belongs to less regulated areas in the European Union. In accordance with Regulations (EC) No. 2200/96 and 2201/96 the regulation of the vegetable and fruit market in the European Union is a “lax” market regulation, i.e. there are no quotas on production or subsidies there, the goods produced can be distributed without restrictions in case they meet quality regulations.

Thus, the enterprises in the sub-sector, if observing food safety, health and hygienic regulations, can sell their products in the internal market of the EU with no restrictions on competition, which generated very fierce competition for Hungarian enterprises after our EU accession. The majority of them were not prepared for this competition. The period between the regime change and our EU accession was not enough for food industry enterprises, and within this enterprises engaged in vegetable and fruit processing, to be prepared.

Following our EU accession, units engaged in vegetable and fruit processing had to transform their product structure, strategy and sales techniques fundamentally and raise their technical and technological levels to be able to meet the challenges of new market economy circumstances. Furthermore, they need continuous renewal and innovation to fall into line with consumers’ expectations, obtain access to multi-national retail chains and be successful on export markets.

“To maintain competitiveness in a continuously changing environment is a serious challenge at both sectoral and enterprise levels. Due to the liberalised regulation of the vegetable and fruit product chain, market conditions and competition are much truer here, which attributes an even more important role to competitiveness analyses.” (*Medina, 2005*)

Taking into account these circumstances, I examine in the study the competitiveness of fruit and vegetable processing and preservation, in view of the spatial location of this dynamically developing key sub-sector of food industry.

The timeliness of the study is ensured by the very fierce competition even on the domestic market for Hungary’s food industry and fruit and vegetable processing and preservation within this and by the marked presence of competitiveness analyses in regional sciences as well as by the availability – for statistical purposes – of fully-observed data from administrative data sources (National Tax and Customs

Administration of Hungary, Hungarian Central Statistical Office), which data allow competitiveness analyses covering all enterprises.

One of the most important economic interests of Hungary is that its enterprises should be even in the circumstances of an extremely fierce competition viable and vital economic actors, following a path of sustained growth, on the domestic, the European as well as the global market. For this, corporation heads and economic policy decision-makers need methods suitable for determining and analysing the competitiveness position of corporations and territorial units, which methods can be well used in practice too.

“Performance measurement is one of the central tasks of decision-makers at all the levels of economic entities. Measurement is a pre-condition of efficient performance control. ...” (*Módos*, 2004)

## 1.2. OBJECTIVES OF THE DISSERTATION

The objectives of the dissertation are the following:

1. Presentation of the national economic importance of the sub-sector of fruit and vegetable processing and preservation;
2. Taking account of the methods of measurement of sectoral competitiveness, as recommended in the literature;
3. Out of the recommended methods of measurement, selection – for analytical purposes – of those taking into consideration spatial aspects as well;
4. With the selected methods of measurement, setting up competitiveness rankings of counties in and the capital of Hungary for the sub-sector of fruit and vegetable processing and preservation, based on available data and methodological descriptions;
5. By comparing the rankings set up with the different methods and indicators, weighing the suitability of the methods and indicators for competitiveness analyses.

## 2. METHODS OF RESEARCH IN THE SUBJECT

### 2.1. SOURCE OF DATA USED

I used in the study data from the common database of structural business statistics (SBS) of the Hungarian Central Statistical Office and of national accounts to evaluate the competitiveness of fruit and vegetable processing and preserving enterprises in Hungary compared to one another, from a spatial aspect. The source of this common database is the annual economic statistics survey of HCSO and tax returns sent to the National Tax and Customs Administration of Hungary. Unfortunately, we have to be satisfied with data broken down by headquarters as included in the database, since business units do not prepare a balance sheet report by local units.

I manage the data on enterprises having their headquarters in the same territorial unit (Budapest and the counties) aggregately in the analysis, i.e. I consider the totality of fruit and vegetable processing and preserving enterprises in a particular district/county as one “factory farm”.

### 2.2. METHODS APPLIED

To compare the different factors of competitiveness extremely many types of indicators can be used, which depend on the aim of the particular research and the group of accessible data and information.

“The most widespread method of analysis of the profitability and efficiency of organisations is in both domestic and international practice the calculation and interpretation of indicators derived from enterprise reports. Many of such indicators are available in the literature, and each of them expresses a characteristic of the management of an enterprise from a different angle. An analyst’s task is to decide which she/he deems relevant to judge the particular organisation.” (*Kadlecsik, 2013*)

Based on an inventory of methods and explanatory models for the measurement of competitiveness it can be concluded that there is neither a generally adopted definition nor a general method of measurement of sectoral and spatial competitiveness. However, the literature agrees that balance sheets and profit and loss accounts, reflecting the operation of business units from the point of view of financial efficiency, are appropriate data sources for competitiveness calculations.

Certainly, international trade theories also interpret the concept of competitiveness of a country, an area, a sector or a corporation. Despite this I do not use the tools and concepts of trade theories since the data used do not come from the theme of international trade but from the area of finance and accountancy.

After examining spatial concentration I used in the dissertation the OCRA (Operational Competitiveness Ratings Analysis) method, elaborated by Celik Parkan in 1994, to analyse from the point of view of spatial structure the competitiveness of enterprises in the sub-sector of fruit and vegetable processing and preservation. With the OCRA method I calculated the total efficiency of enterprises by territorial units, and then I ranked the counties and the capital city based on the values thus obtained.

Following this I made use of the tools of management accounting for the four economic areas the most often distinguished in the literature:

- wealth position,
- financial position,
- profitability,
- efficiency.

By analysing accounting indicators calculated for these four areas the measurement of competitiveness can be realised carefully and by comparing the results to the OCRA method the competitiveness rankings aimed at can be set up in a well-founded manner.

In examining both OCRA and accounting indicators I studied the period between 2008 and 2015. Namely, data according to the current version of TEÁOR (NACE) are available from 2008 and the latest tax returns for 2015.

### 2.2.1. OCRA indicator of competitiveness

In applying the OCRA (Operational Competitiveness Ratings Analysis) method, the revenue categories of net sales revenues and other revenues are compared to the expenditure categories of materials, personal expenditures, consumption of fixed capital and other costs and expenditures, taking into consideration the structure of these items of revenues and expenses, too. The OCRA method compares a particular corporation / group of corporations to the corporation / group of corporations reaching the highest operating profit, i.e. creating maximum output by using a unit of input.

The method was described in detail by *Parkan* (1994) and *Parkan – Wu* (1999a, 1999b). These studies determined relative competitiveness by a linear programming

model, which *Sinha* (1996) and *Jayanthi et al.* (1999) completed with moving marginal analysis. *Tóth* (2005) transformed this method of calculation into rankings which do not require the solution of the linear programming model.

In my analyses I calculated with the OCRA method the total efficiency of vegetable and fruit processing enterprises in a particular county, i.e. I placed in the rankings of counties the unit input use of the particular county compared to the county producing maximum output. The OCRA method can be applied at the level of the national economy, group, classes as well as corporations.

The higher value the OCRA efficiency indicator of competitiveness has, the more efficient the enterprises in a particular class and in a particular territorial unit are compared to the rest of the territorial units. From the distance between the different values one can deduce the extent of the differences. The examination covered the years between 2008 and 2015, so that the enterprises in a particular class and in a particular county, making up one “unit of production”, were given one OCRA value of competitiveness, compared to the enterprises in the same class in the rest of the counties.

From the values of the OCRA indicator of competitiveness we calculate the ratio of the OCRA efficiency indicator of competitiveness to the maximum OCRA efficiency indicator of competitiveness. The values of this indicator (for easier reference I abbreviate it after *Tóth* hereinafter as *HTK%*) can range between 0 and 100. Similarly to the OCRA indicator of competitiveness, high values mean high efficiency here as well.

### 2.2.2. Analysis tools of management accounting

After examining spatial concentration and reviewing the OCRA indicator of competitiveness I referred to the tools of management accounting in order to measure competitiveness.

In selecting indicators establishing competitiveness and efficiency rankings one should take into consideration that “many indicators can be made from the report, however, each of them expresses a characteristic of the management of an enterprise from a different angle”. (*Kadlecsik*, 2013)

Care must be taken in evaluating an indicator on its own since the analyst can be misled if she/he does not examine the operation of a particular corporation / group of corporations / division in its complexity. Furthermore, the incidental fluctuation or significant change in indicator values can be due not only to changes in management but also to organisational or tax changes. This problem can be relieved by using in the analysis average indicators coming from the results of many years of management and by comparing the calculated indicator values not only to the basis but also to the average of the group or the best of the group.

Considering all these factors I selected the accounting indicators below for the spatial competitiveness analysis of the group.

### **2.2.2.1. Analysis of wealth position**

Wealth position can be examined by indicators of the structure of assets and liabilities + owners' equity. I used the following **assets structure indicators** for the analysis:

#### **1. Proportion of fixed assets = Fixed assets / Total assets**

The most general assets structure indicators compare the value of fixed assets or current assets to the value of total assets.

#### **2. Coverage of tangible assets = Owners' equity / Tangible assets**

“It indicates the extent to which owners' equity covers the financing of tangible assets – lastingly invested assets directly involved in production – within fixed assets. It is favourable if owners' equity covers primarily this group of assets to the highest extent.” (Pucsek, 2013)

**Indicators of structure of liabilities and owners' equity used:**

#### **3. Capital intensity = Owners' equity / Total liabilities + owners' equity**

The rate of capital intensity, also called capital supply, “shows the share of owners' equity in total liabilities + owners' equity. The indicator can also be interpreted as the proportion of the assets of the enterprise financed by owners' equity.”

<http://szamvitelezz.hu>

#### **4. Owners' equity growth indicator = Owners' equity / Subscribed capital**

In analysing the development of owners' equity, the owners' equity growth indicator, also called owners' equity/subscribed capital ratio, is a frequently applied ratio, which examines "the total growth of owners' equity (so not solely in the current year). Its value is favourable if the indicator is higher than 100%. However, an indicator of below 100% refers to loss of capital, which, if becomes lasting, anticipates problems." <http://szamvitelezz.hu>

#### **2.2.2.2. Analysis of financial position**

The following indicators are suitable to examine the financial position of enterprises:

#### **5. Degree of indebtedness = Liabilities / Total assets**

"It shows the percentage of liabilities covered by assets. Efforts should be made to see that the value of the indicator should be lastingly (considerably) below 1." <http://szamvitelezz.hu>

#### **6. Loan coverage indicator = Accounts receivable / Current liabilities**

The indicator informs on the extent to which the accounts receivable of enterprises cover their current liabilities.

#### **7. Liquidity ratio = Current assets / Current liabilities**

Current ratios seek to answer what percentage of liabilities due within a year (denominator) are covered by the total of or a selected part of current assets (numerator). <http://szamvitelezz.hu>

#### **8. Quick liquidity ratio = (Accounts receivable + Securities (part of current assets) + Money instruments) / Current liabilities**

"The quick ratio is a "more severe" version of the previous ratio. By severity we mean that stocks, as current assets that can be converted into cash relatively slowly, are omitted from the numerator." <http://szamvitelezz.hu>

#### **2.2.2.3. Analysis of profitability**

The profitability of enterprises is the main goal of their management. The numerator of profitability indicators contains an income category (for example operating profit, profit before taxes or profit after taxes) and their denominator a resource needed for the

generation of income (value of fixed assets, number of employees, etc.). Indicators used in the analysis:

**9. Return on equity (ROE) = Profit before taxes / Owners' equity**

Return on equity is the most important indicator of profitability because of owners. It expresses the size of annual income generated by an enterprise by a unit of owners' equity. The higher its value is and increasing over time, the more favourable it is for the enterprise.

**10. Return on assets (ROA) = Profit before taxes / Total assets**

Return on assets is an outstandingly important indicator as well, which shows income that can be earned by the investment of a unit of assets. As in the case of the previous indicator, the higher its value is and increasing over time, the more favourable it is for the enterprise. (*Pucsek, 2013*)

**11. Return on sales (ROS) = Profit before taxes / Total revenues**

Return on sales shows the size of profit before taxes generated from a unit of revenues, thus it indicates the effectiveness of cost management, too. (*Pucsek 2013*)

**12. Return on personal expenditures = Profit before taxes / Personal expenditures**

Return on personal expenditures expresses the size of profit before taxes generated by a unit of personal expenditures, an outstanding type of expenditures.

<http://szamvitelez.hu>

**2.2.2.4. Analysis of efficiency**

**13. (Net) revenues per employee = (Net) sales revenues / Number of employees**

The numerator can be made up of production value or value added at factor cost instead of (net) sales revenues.

**14. Wage efficiency = (Net) sales revenues / Personal expenditures**

The denominator can be the amount of personal expenditures instead of live labour, i.e. the number of employees. This way the indicator expresses units of sales revenues associated with a unit of personal expenditures.

### **15. Circulation of all assets = (Net) sales revenues / Total assets**

It shows how many times total assets are paid back from net revenues in a particular year. The indicator can be influenced by many factors including the revaluation of assets.

### **16. Capital efficiency = (Net) sales revenues / Owners' equity**

The indicator of capital efficiency informs on how many times higher sales revenues an enterprise earns by a unit of owners' equity. A growth in the value of the indicator indicates a favourable trend.

In addition to relatively simple and complex indicators from accounting information systems, there are other indicator systems, taking into account also factors beyond financial performance, such as the Balanced Scorecard, which aims to balance between financial and non-financial results. However, I examine exclusively quantifiable financial and accounting results in my paper, relying on the SBS database, so non-financial information gained from questionnaire surveys often applied by researchers (e.g. business sentiment index) is not the subject of my analysis.

Similarly, I do not make analyses of external trade competitiveness – having an exceptionally rich literature with a long past – either, since no harmony could be realised to date between external trade statistics databases and performance statistics databases either in Hungary or abroad. Thus, it is not appropriate to make parallel, incidentally comparative analyses in the lack of this harmony.

## **3. RESULTS**

### **3.1. THE OCRA COMPETITIVENESS INDICATOR**

The OCRA (Operational Competitiveness Ratings Analysis) indicators and the distance between the maximum and minimum HTK% values calculated from them as well as the distribution of other HTK% provides information on differences in the competitiveness of territorial units.

During my examinations, I highlighted the counties with the most significant fruit and vegetable processing capacities, since in 2015, 77% of the national net sales revenues of the subsection came from the following four counties; Pest (28%), Bács-

Kiskun (19%), Hajdú-Bihar and Szabolcs-Szatmár-Bereg counties (15-15%). The share of other regional units ranged between 0% and 3.7%.

Based on my research, I have found that there is no big difference in the relative competitiveness of profitably producing territorial units over the long term (for the years 2008 to 2015), there are no exceptionally competitive counties. On the other hand, there are significant differences over a one-year period, which can be explained by the insufficient stability of the operation of the enterprises concerned. In the years under review, there were much greater differences in loss-making territorial units.

Furthermore, I found that there was no link between the volume of net sales revenue and the competitiveness calculated according to the OCRA method. In other words, in a territorial unit with significant fruit and vegetable processing capacities, e.g. in Pest county the fruit and vegetable processing and preservation subsection may be less competitive even over a long period of time despite the fact that it produces profits. In contrast smaller businesses can be more competitive than the big ones. (For example, enterprises in Zala County)

### 3.2. ANALYTICAL TOOLS OF MANAGEMENT ACCOUNTING

Using accounting indicators I tried to give a more comprehensive picture - within the space limitations - on the financial, profitability and efficiency situation of businesses operating in the vegetable processing and preservation subsection. It was also well suited to showcase their competitive position aggregated at county and metropolitan level.

In case of most of the indicators included in the management accounting system, similarly to the OCRA indicator, there were hectic changes both in the value of the indicators calculated per territorial unit and in the ranking of the counties by indicators. In case of some indicators, the values of the given year were closer to each other and changed only to a lesser extent year after year. In case of other indicators, the differences in the given year were bigger and their value changed more significantly over time.

Data collected from the SBS database can also be used to analyse the enterprises of smaller territorial units than counties (districts and even settlements) and their management. This was illustrated by using maps.

If we are not looking for the competitive potential of a particular year, but for the change in competitiveness over time, I have to say according to my calculations that

with the help of time series analysis I could not detect trends in how the competitiveness of the enterprises in the subsection changed neither in case of the OCRA indicator nor in case of the indicators used by the management accountancy.

According to my suggestion, the problem may be mitigated by summarizing the basic data for the years 2008 to 2015 to study competitiveness using the indicators calculated as the average of the years under review and to compare the indicators calculated for the given territorial units with the national average of the sub-section or with the best ones of the sub-section.

### *Indicators calculated in the average of years 2008 to 2015*

As outlined, I calculated and summarized in Table 1 the ratios of the aggregated indicators of enterprises in the fruit and vegetable processing and preservation subsection according to territorial units to the maximum indicator values as averages for the 2008-2015 years. Thus, all territorial units were represented on a scale of 0-100 on which 100% is the maximum value of a given indicator. In this way, all of the calculated indicators has become comparable with each other. For some indicators, the territorial units show quite a large spread, but other indicators show significant concentration, i.e. the differences are smaller.

After calculating the indicators of enterprises in the subsection of processing and preserving fruits and vegetables grouped according to territorial units using averages for the years 2008-2015, in addition to the OCRA Competitiveness Index, I formed **4 indicator groups** with the help of averaging from the indicators used to assess the asset and financial situation as well as profitability and efficiency. The values thus obtained are summarized in Table 2.

Based on data presented in Table 2, the ranking of territorial units was as follows in case of the OCRA indicator and the calculated accounting indicator groups in the average of years 2008 and 2015. (Highlighting the best-performing and the highest-producing counties in terms of the given indicator (Pest, Szabolcs-Szatmár-Bereg, Bács-Kiskun and Hajdú-Bihar county):

**Table 1 : Ratios of the aggregated indicators of enterprises in the fruit and vegetable processing and preservation subsection according to territorial units to the maximum indicator values as averages for the 2008-2015 years**

Source: Own editing (based on HCSO SBS database)

(%)

Territorial unit	OCRA Competitiveness Index (profit generating territorial units)	OCRA Competitiveness Index (loss generating territorial units)	Proportion of fixed assets	Coverage of tangible assets	Capital Intensity	Increase in equity	Degree of indebtedness	Loan coverage	Liquidity indicator	Liquidity rapid rate	Return On Equity (ROE)	Return On Assets (ROA)	Return On Sales (ROS)	Personal income-proportionate profitability	(Net) sales per employee	Wage efficiency	Total assets rotation	Capital efficiency
Bács-Kiskun	34		41	57	54	3	61	42	41	25	0	1	1	2	45	62	56	33
Baranya	42	83	37	17	26	1	62	14	43	10	-4	-4	-3	-8	45	71	51	87
Békés	46	23	62	30	48	2	63	18	31	14	1	2	3	3	22	31	33	23
Borsod-Abaúj-Zemplén	65	76	84	14	29	2	70	20	19	15	0	0	0	0	17	37	17	19
Budapest	40	73	51	35	44	1	65	68	41	42	3	8	5	12	26	59	55	41
Csongrád	49	4	69	-4	-6	0	100	21	21	15	87	-26	-17	-28	23	46	60	-345
Fejér	46	62	54	38	48	1	68	28	32	17	-5	-13	-10	-13	26	35	50	33
Győr-Moson-Sopron	68	73	22	100	62	5	48	100	67	58	-1	-4	-4	-8	31	46	31	19
Hajdú-Bihar	54	1	48	29	36	2	75	28	35	17	0	-1	-1	-1	33	48	44	40
Heves	47	66	53	25	29	5	83	26	30	14	-3	-5	-4	-8	33	45	42	45
Jász-Nagykun-Szolnok	42	15	56	55	74	100	45	63	69	43	0	0	0	1	31	48	38	16
Komárom-Esztergom	60	34	48	34	40	3	73	69	33	42	4	9	4	9	30	68	91	71
Nógrád	58		74	29	54	2	57	38	33	31	0	1	0	1	38	45	63	37
Pest	25	89	35	57	49	2	59	36	49	26	1	2	1	3	47	70	63	44
Somogy	32	88	51	26	34	1	64	48	33	31	3	6	2	8	100	100	100	100
Szabolcs-Szatmár-Bereg	66	4	46	41	47	2	64	26	40	19	3	6	3	14	38	64	40	28
Tolna	51	74	100	17	42	3	54	27	19	18	-13	-29	-47	-41	6	19	19	14
Vas	26	40	86	20	39	0	65	62	36	35	4	9	11	13	11	28	26	22
Veszprém	22	67	44	17	19	0	88	24	36	30	100	100	100	100	8	26	36	63
Zala	75		54	75	100	18	25	68	100	100	-1	-7	-5	-9	26	49	56	18
<b>Hungary</b>			<b>45</b>	<b>42</b>	<b>47</b>	<b>2</b>	<b>64</b>	<b>34</b>	<b>41</b>	<b>23</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>38</b>	<b>58</b>	<b>50</b>	<b>36</b>

**Table 2 : Values of indicator groups calculated from data of enterprises in the subsection of processing and preserving fruits and vegetables aggregated according to territorial units, averages for 2008-2015**

Source: Own editing (based on HCSO SBS database)

	(%)					
<b>Territorial unit</b>	<b>OCRA Competitiveness Index (profit generating territorial units)</b>	<b>OCRA Competitiveness Index (loss generating territorial units)</b>	<b>Examination of asset position</b>	<b>Examination of financial position</b>	<b>Examination of profitability</b>	<b>Examination of efficiency</b>
Bács-Kiskun	34		39	42	1,0	49
Baranya	42	83	20	32	-4,8	64
Békés	46	23	36	32	2,3	27
Borsod-Abaúj-Zemplén	65	76	32	31	0,0	23
Budapest	40	73	33	54	7,0	45
Csongrád	49	4	15	39	4,0	-54
Fejér	46	62	35	36	-10,3	36
Győr-Moson-Sopron	68	73	47	68	-4,3	32
Hajdú-Bihar	54	1	29	39	-0,8	41
Heves	47	66	28	38	-5,0	41
Jász-Nagykun-Szolnok	42	15	71	55	0,3	33
Komárom-Esztergom	60	34	31	54	6,5	65
Nógrád	58		40	40	0,5	46
Pest	25	89	36	43	1,8	56
Somogy	32	88	28	44	4,8	100
Szabolcs-Szatmár-Bereg	66	4	34	37	6,5	43
Tolna	51	74	41	30	-32,5	15
Vas	26	40	36	50	9,3	22
Veszprém	22	67	20	45	100,0	33
Zala	75		62	73	-5,5	37
<b>Hungary</b>			34	41	1,0	46

#### **OCRA competitiveness indicator:**

- OCRA competitiveness indicator for profit-generating territorial units (taking into account those years when the respective territorial units produced profits):

*Zala county → 1st place*

*Szabolcs-Szatmár-Bereg county → 3rd place*

*Hajdú-Bihar county → 7th place*

*Bács-Kiskun County → 16th place*

*Pest county → 19th place*

- OCRA competitiveness indicator for loss-making territorial units (taking into account those years when the respective territorial units produced a loss):

*Pest county → 1st place*

*Szabolcs-Szatmár-Bereg county → 15th place*

*Hajdú-Bihar county → 17th place*

**Examination of asset position:**

*Jász-Nagykun-Szolnok county → 1st place*

*Bács-Kiskun County → 6th place*

*Pest county → 8th place*

*Szabolcs-Szatmár-Bereg county → 11th place*

*Hajdú-Bihar county → 15th place*

**Examination of financial position:**

*Zala county → 1st place*

*Pest county → 9th place*

*Bács-Kiskun County → 10th place*

*Hajdú-Bihar county → 13th place*

*Szabolcs-Szatmár-Bereg county → 15th place*

**Examination of profitability:**

*Veszprém county → 1st place*

*Szabolcs-Szatmár-Bereg county → 5th place*

*Pest county → 9th place*

*Bács-Kiskun County → 10th place*

*Hajdú-Bihar county → 14th place*

**Examination of efficiency:**

*Somogy county → 1st place*

*Pest county → 4th place*

*Bács-Kiskun county → 5th place*

*Szabolcs-Szatmár-Bereg county → 8th place*

*Hajdú-Bihar county → 9th place*

The above results support the ideas that have been formulated many times in the scientific literature, according to which a number of indicators can be selected to examine the profitability and efficiency of businesses, each of which examines business management from a different perspective (Kadlecsek, 2013). So we have to accept that the asset, financial, profitability and efficiency indicators and the OCRA competitiveness index do not result in the same rankings.

My calculations also support the assertion in the scientific literature (*Tóth, 2005*) that the largest revenue-generating enterprises and territorial units (Pest, Szabolcs-Szatmár-Bereg, Bács-Kiskun and Hajdú-Bihar counties) are not necessarily the most competitive, profitable and efficient and they have not necessarily the most stable assets and finances. Since according to the OCRA indicator and all of the calculated accounting indicator groups territorial units with low production value are at the top of the rankings. Based on the scientific literature cited, this can be primarily explained by organizational, coordination and adaptability factors.

### ***Indicators for 2015***

The indicators calculated for 2015 are summarized in Table 3 (This is the most recent year for which the required data are available). The indicators were shown in a range of 0-100. 100% here also represents the maximum value of the given indicator. This ensures the comparability of indicators.

In case of some indicators, the field of territorial units is quite stretched here, but other indicators show concentration, that is, smaller deviations.

After calculating the 2015 indicator values from the data of businesses in the fruit and vegetable processing and preservation subsection aggregated according to territorial units, in addition to the OCRA Competitiveness Index, I created 4 sets of indicators from the indicators used to evaluate the asset and financial situation as well as profitability and efficiency. I used average calculation for the identification of the indicator groups as described above (averages of years 2008-2015) in order to illustrate the most recent situation. The resulting values are summarized in Table 4.

Based on the data in Table 4, in case of the OCRA indicator and the calculated accounting indicator groups the ranking of the territorial units in 2015 is as follows (highlighting the best-performing and the highest-producing counties (Pest, Szabolcs-Szatmár-Bereg, Bács-Kiskun and Hajdú-Bihar counties) in terms of the given indicator):

**Table 3 : Ratios of indicators of enterprises in the subsection of processing and preserving fruits and vegetables aggregated according to territorial units to the maximum indicator values, 2015**

Source: Own editing (based on HCSO SBS database)

	%																	
Territorial unit	OCRA Competitiveness Index (profit generating territorial units)	OCRA Competitiveness Index (loss generating territorial units)	Proportion of fixed assets	Coverage of tangible assets	Capital Intensity	Increase in equity	Degree of indebtedness	Loan coverage	Liquidity indicator	Liquidity rapid rate	Return On Equity (ROE)	Return On Assets (ROA)	Return On Sales (ROS)	Personal income-proportionate profitability	(Net) sales per employee	Wage efficiency	Total assets rotation	Capital efficiency
Bács-Kiskun	100		34	88	60	3	49	51	7	17	4	5	3	5	83	66	49	3
Baranya	24		5	29	26	0	10	22	100	7	25	2	1	2	100	100	79	100
Békés	9		47	70	63	13	48	57	6	25	9	13	11	12	48	45	37	2
Borsod-Abaúj-Zemplén	0		68	48	65	2	35	97	10	37	68	99	100	100	30	41	32	2
Budapest	1		44	59	48	1	65	55	5	20	31	34	17	36	61	86	62	5
Csongrád	4		47	3	3	0	100	29	4	14	-671	-42	-22	-32	62	61	63	82
Fejér	33		60	46	50	1	61	34	3	11	2	3	2	2	68	46	44	3
Győr-Moson-Sopron	19		22	32	49	1	18	80	45	31	-56	-18	-9	-12	62	53	60	16
Hajdú-Bihar	38		39	59	49	2	58	45	6	16	-37	-38	-29	-45	75	62	40	3
Heves		92	43	30	21	12	90	26	4	8	4	2	2	2	44	33	29	5
Jász-Nagykun-Szolnok	15		47	82	75	100	38	100	11	38	0	1	1	1	87	59	34	2
Komárom-Esztergom	0		40	56	44	3	66	71	4	26	100	100	32	74	68	96	100	8
Nógrád	10		62	59	70	2	39	39	5	25	0	0	0	0	73	50	52	3
Pest		76	23	98	55	3	29	52	20	33	5	3	1	2	87	74	78	10
Somogy		99	55	50	53	2	41	50	7	26	20	25	20	42	51	81	37	3
Szabolcs-Szatmár-Bereg		0	38	59	47	2	57	34	7	13	9	9	8	11	58	55	33	3
Tolna		99	100	18	35	1	48	10	1	4	-169	-133	-243	-120	12	19	16	2
Vas	0		98	14	27	0	73	11	1	9	27	16	43	18	7	11	8	1
Veszprém	1	100	31	71	44	1	70	41	5	20	-16	-16	-5	-5	17	34	88	7
Zala			50	100	100	23	13	78	22	100	2	3	3	2	29	32	36	1
<b>Hungary</b>			<b>37</b>	<b>66</b>	<b>52</b>	<b>2</b>	<b>50</b>	<b>44</b>	<b>8</b>	<b>17</b>	<b>-3</b>	<b>-3</b>	<b>-2</b>	<b>-3</b>	<b>73</b>	<b>63</b>	<b>49</b>	<b>4</b>

**Table 4: Values of indicator groups calculated from data of enterprises in the subsection of processing and preserving fruits and vegetables aggregated by territorial units, 2015**

Source: Own editing (based on HCSO SBS database)

(%)

Területi egység	OCRA Competitiveness Index (profit generating territorial units)	OCRA Competitiveness Index (loss generating territorial units)	Examination of asset position	Examination of financial position	Examination of profitability	Examination of efficiency
Bács-Kiskun	100		46	31	4	50
Baranya	24		15	35	8	95
Békés	9		48	34	11	33
Borsod-Abaúj-Zemplén	0		46	45	92	26
Budapest	1		38	36	30	54
Csongrád	4		13	37	-192	67
Fejér	33		39	27	2	40
Győr-Moson-Sopron	19		26	44	-24	48
Hajdú-Bihar	38		37	31	-37	45
Heves		92	27	32	3	28
Jász-Nagykun-Szolnok	15		76	47	1	46
Komárom-Esztergom	0		36	42	77	68
Nógrád	10		48	27	0	45
Pest		76	45	34	3	62
Somogy		99	40	31	27	43
Szabolcs-Szatmár-Bereg		0	37	28	9	37
Tolna		99	39	16	-166	12
Vas	0		35	24	26	7
Veszprém	1	100	37	34	-11	37
Zala			68	53	3	25
Bács-Kiskun	100		46	31	4	50

#### OCRA Competitiveness Indicator:

- OCRA competitiveness indicator for profit-generating territorial units (taking into account those years when the respective territorial units produced profits):

*Bács-Kiskun county → 1st place*

*Hajdú-Bihar county → 2nd place*

*Pest county → 16th place*

*Szabolcs-Szatmár-Bereg county → 18th place*

- OCRA competitiveness indicator for loss-making territorial units (taking into account those years when the respective territorial units produced a loss):

*Veszprém county → 1st place*

*Pest county → 5th place*

*Szabolcs-Szatmár-Bereg county → 6th place*

**Examination of asset position:**

*Jász-Nagykun-Szolnok county → 1st place*

*Bács-Kiskun county → 5th place*

*Pest county → 7th place*

*Hajdú-Bihar county → 12th place*

*Szabolcs-Szatmár-Bereg county → 14th place*

**Examination of financial position:**

*Zala county → 1st place*

*Pest county → 11th place*

*Hajdú-Bihar county → 13th place*

*Bács-Kiskun County → 14th place*

*Szabolcs-Szatmár-Bereg county → 16th place*

**Examination of profitability:**

*Borsod-Abaúj-Zemplén County → 1st place*

*Szabolcs-Szatmár-Bereg county → 7th place*

*Bács-Kiskun County → 9th place*

*Pest county → 10th place*

*Hajdú-Bihar county → 18th place*

**Examination of efficiency:**

*Baranya County → 1st place*

*Pest county → 4th place*

*Bács-Kiskun County → 6th place*

*Hajdú-Bihar county → 9th place*

*Szabolcs-Szatmár-Bereg county → 13th place*

My calculations also support the assertion in the scientific literature (Tóth, 2005) that the largest revenue-generating enterprises and territorial units (Pest, Szabolcs-Szatmár-Bereg, Bács-Kiskun and Hajdú-Bihar counties) are not necessarily the most competitive, profitable and efficient and they have not necessarily the most stable assets and finances. Since, except

for the OCRA indicator, territorial units with low production value are at the top of the rankings for each calculated accounting indicator group in 2015.

After completing my examinations, I agree with the authors who take the view that there is no method that takes into account all factors and there is no indicator that measures everything at once. That is why I share Attila Molnár's statement that we can not talk about the "uniform acceptance of the competitiveness measurement methods". (*Molnár, 2006*)

However, the system of indicators I have set up and applied provides a number of useful information in the examined areas, which incorporates information into a system and illustrates them well. Both the OCRA Competitiveness Indicator and the selected Management Accounting Indicators can be used to sort the counties and Budapest in order according to the asset and financial standing as well as the profitability, efficiency and competitiveness of businesses in the fruit and vegetable processing and preservation subsection.

In the light of all of this, in agreement with the scientific literature I can state that the balance sheet and profit statements demonstrating the operation of economic organisations from the perspective of financial effectiveness/ profitability / efficiency and thus competitiveness are suitable data sources for competitiveness calculations. Also, the SBS database is well suited for obtaining basic data for competitiveness calculations not only from a sectoral but also from a territorial point of view, making it an unexplored treasure haven for territorial researchers / regionalists, of course not forgetting about the headquarters-site problem.

#### 4. CONCLUSIONS, SUGGESTIONS

During the spatial analysis of the competitiveness of enterprises in the fruit and vegetable processing and preservation subsection I found significant fluctuations in the ratio (HTK%) of the Efficiency OCRA Competitiveness Index (HTK) to the Maximum Efficiency OCRA Competitiveness Index in the years 2008 to 2015 for all territorial units. At the same time, the ranking of counties changed significantly year after year.

In the case of most of the indicators included in the management accounting system, similarly hectic changes were seen both in the value of indicators calculated per territorial unit and in the ranking of counties by indicators.

The significant change in the indicator values may be mainly due to the fact that the fruit and vegetable processing and preservation subsection depends heavily on the effectiveness of agricultural production (the amount of crop for a given year as well as raw material purchasing prices and manufacturing labor costs significantly dependent on the crop yield). For the more predictable operation of businesses in the subsection stable, homogeneous and reliable quality domestic fruit and vegetables are needed, as the sub-section mainly uses raw materials originating from Hungary. The fruit and vegetable production are particularly vulnerable to weather and market conditions. This can be inferred from a shift of similar direction and magnitude per territorial unit in the indicators of (net) sales per employee and wage efficiency as well as from the significant yearly deviation in the value of the material-type expenditures shown in Appendix 1 of the dissertation. Not only management but many other reasons may be behind the sometimes fierce fluctuations of the index values (E.g. organizational factors or tax changes).

Based on the results, integration (organized cooperation between farmers and food processors) in fruit and vegetable processing - as in the whole food economy - has to be strengthened, as this may help to make the supply of agricultural raw materials to the processing industry more stable and more predictable. Farmers may benefit greatly from financing provided by food processors.

It is also important for economic and social reasons that the products of the fruit and vegetable processing and preservation subsection, which is based on excellent natural conditions and rich agrarian traditions, reach the consumers with the highest processing and added value. Today, a significant proportion of fruit and vegetable produce leaves the country as unprocessed goods. This can be altered by further developments that create new jobs and increase salaries in the manufacturing industry.

Hungary, due to its size, cannot achieve results with quantitative production in international competition. For us, unique, high quality and even handicraft products can bring success. There are many conditions that have now come together to improve the food industry (EU tenders, loan program, low interest rates), so the fruit and vegetable processing and preservation subsection now has a "historical" opportunity for development. Product quality, technical-biological factors, product structure, logistics and cooperation between producer and sales organizations need to be improved in order to secure the supply of goods.

## 5. NEW SCIENTIFIC RESULTS

1. In the dissertation, I have presented a comprehensive overview of the role of the fruit and vegetable processing and preservation subsection in Hungary's economic life both in national and territorial terms in such an approach which was not previously available in the scientific literature.

2. I reviewed the sectoral competitiveness testing methods and procedures recommended by the scientific literature, and I have selected those that are suitable for taking account of territorial considerations.

3. Using the OCRA method and the management accounting system I have set up an indicator system. This indicator system is comprised of OCRA indicators selected from the literature and accounting indicators for asset and financial position, profitability and efficiency of businesses. From the indicators surveying asset and financial position, profitability and efficiency I formed 4 index groups by averaging. My analysis suggests that the index system is suitable for determining the competitiveness, efficiency and profitability ranking of territorial units from a sectoral point of view. By this indicator system I determined the annual ranking of Hungarian counties and Budapest from 2008 to 2015 in terms of the OCRA indicator, the asset and financial position, profitability, efficiency and so competitiveness by using the data coming from the balance sheet and profit and loss accounts available in the SBS database. There was no such territorial analysis of enterprises engaged in vegetable and fruit processing before this dissertation.

4. The results obtained also support the assertion in the scientific literature that the largest revenue-generating enterprises and territorial units (Pest, Szabolcs-Szatmár-Bereg, Bács-Kiskun and Hajdú-Bihar counties) are not necessarily the most competitive, profitable and efficient and they have not necessarily the most stable assets and finances.

## 6. RESULTS IN PRACTICAL USE

The indicator system presented in the dissertation is suitable for comparing specific businesses, territorial units and even sectors from the point of view of competitiveness, profitability and efficiency. The calculations presented are relatively easy to perform using data from business balance sheets and profit and loss statements.

The SBS database of the Central Statistical Office is available for the investigations of researchers and economic experts, but corporate and policy decision-makers can also successfully use accounting data from other sources since the indexing system does not require any presuppositions. The advantage of the indicator system is its very versatile and flexible use and reliability due to controlled data.

In addition to setting up rankings and operational decision support, it also supports the design and formulation of corporate or even regional development strategies.

## 7. SUMMARY

In the dissertation, I presented the role of the fruit and vegetable processing and preservation subsection in the economic life of Hungary, and in this context I also described the national and regional aspects of the sector.

I summarized the sectoral competitiveness testing methods and procedures recommended by the scientific literature and selected those that are suitable for taking account of territorial considerations.

Using the OCRA method and the management accounting system I have set up an indicator system by which I determined the annual ranking of Hungarian counties and Budapest from 2008 to 2015 in terms of the OCRA indicator, the asset and financial position, profitability, efficiency and so competitiveness by using the data coming from the balance sheet and profit and loss accounts available in the SBS database.

However, I experienced a significant fluctuation of the OCRA Competitiveness Index (HTK) in the years 2008 to 2015 for all territorial units. At the same time, the ranking of counties changed significantly year after year. In the case of most of the indicators included in the management accounting system, similarly hectic changes were seen both in the value of indicators calculated per territorial unit and in the ranking of counties by indicators. Therefore, with the help of time series analysis I could not detect trends in how the competitiveness of the enterprises in the subsection changed neither in case of the OCRA indicator nor in case of the indicators used by the management accountancy.

To mitigate the problem, summarizing the basic data for the years 2008-2015 as the average of the years under review, I compared the indicators computed per territorial unit to the best of the subsection. Subsequently, in addition to the OCRA Competitiveness Index, I created 4 sets of indicators from the indicators used to evaluate the asset and financial situation as well

as profitability and efficiency. I used average calculation for the identification of the indicator groups.

The results thus obtained refuted my hypothesis and also supported the assertion in the scientific literature that the largest revenue-generating enterprises and territorial units (Pest, Szabolcs-Szatmár-Bereg, Bács-Kiskun and Hajdú-Bihar counties) are not necessarily the most competitive, profitable and efficient and they have not necessarily the most stable assets and finances.

The system of indicators I have set up and applied provides a number of useful information in the examined areas, which incorporates information into a system and illustrates them well. The ranking based on the indicator system can be used well to determine the asset and financial standing, profitability, efficiency and competitiveness of enterprises being in the fruit and vegetable processing and preservation subsection of the counties and Budapest.

In the light of all of this, in agreement with the scientific literature I can state that the balance sheet and profit statements demonstrating the operation of economic organisations from the perspective of financial effectiveness/ profitability / efficiency and thus competitiveness are suitable data sources for competitiveness calculations and the SBS database is well suited for obtaining basic data for competitiveness calculations not only from a sectoral but also from a territorial point of view.

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## 8. PUBLICATIONS IN THE TOPIC OF THE DISSERTATION



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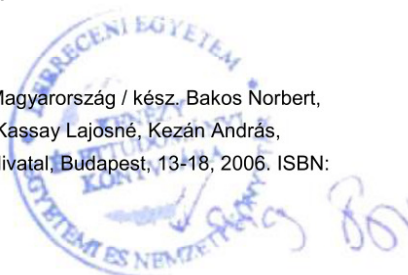
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