OPERATIONAL COMPETITIVENESS AND ITS DRIVING FORCES IN THE HUNGARIAN MEAT SECTOR

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The meat sector in Hungary seems to be one of the biggest losers among the food-industry branches after the EU accession: in 2004 the increase of the meat and meat products import exceeded by 90% the increase of the export change. At the same time the meat industry is the largest one among the food branches regarding the total sales. The loss in the meat sector is much more dangerous if we take into account the considerable worsening of the live animal trade position as well.

At the same time Hungary's fundamental interest is that its enterprises become unavoidable actors of the enlarged European Union. The national economic policy has the obligation to create such a business environment (legislation, infrastructure, institutions, education, etc.) that the individual market players can utilize their best capabilities in the competition. What are the "meat-industry specific" tasks of the economic policy in this respect, if any? – this might be the main question of importance from which the other queries can be derived.

The transparent market usually makes its duty: in the equilibrium price acknowledges the appropriate cost. Although the food industry is rather concentrated in Hungary, these companies can not be regarded as big ones at European scale. Therefore the meat processors are in price-taker position. Consequently their appropriate response is that they squeeze their operation costs during the production.

In this framework we put several questions to the survey:

- What is the position of the meat industry regarding the operational competitiveness?
- What are the characteristics of the companies belonging to the meat industry in this respect?
- What are the main driving forces of the successful meat processors?

In order to give appropriate answers to these questions we deeply analysed the statistical data of the meat industry in the preparation phase for the EU accession (1997-2000). We also utilized the balance sheet as well as the profit and loss account data of the meat processing companies which were supplied by the Agricultural Research Institute, Budapest. As far as the methodological frame is concerned the application of *OCRA* procedure came handy for the analysis.

Methodology

OCRA

Operational Competitiveness Ratings Analysis is a non-parametric procedure which calculates relative efficiency. At an intuitive level, OCRA computes the efficiency of a plant relative to a set of plants by taking into consideration all the relevant input-consuming and outputgenerating activities of the plants and assigning ratings to gauge their relative efficiency in these activities[1].

The OCRA ratings illuminate the operational competitiveness of a particular industry (in general: production unit) in two aspects:

- they can indicate the relative *efficiency* of that branch compared to the others, or
- in contrary, the may point out its *inefficiency*.

The two indicators of the same industry are complementary for each other. The sum of the two ranks within the same survey is always constant. This constant sum is all the time greater then zero and its magnitude refers the difference between the operational competitiveness of individual industries in question.

In order to interpret the results we need to explain the role of *calibration constants*. These constants are weights, which can be formulated by the strategic decision maker according to his/her preferences. The standard OCRA procedure recommends using weights which are the ones of cost and revenue categories within the input consumption and output generation process of that particular company. These are the so called "*same*" calibration constants. In the case of „*separate*" constant we use the most efficient/inefficient input consumption/output generation ratio of the whole sample, according to the basic aspect of investigation.

The low value of OCRA ranking in *inefficiency* approach refers to high, while the high values of ranking show low level of operational competitiveness. The *efficiency* approach is just contrary to this one.

OCRA calculations

The published experiences about the application of OCRA procedure give the evidence that the method can be effectively used at national-, industrial- and company level as well. In this particular research first we wanted to justify the applicability of the procedure for the Hungarian circumstances. In addition to this we were also curious about the potential broader use of the method, therefore we extended it for regional comparison as well as we have introduced and verified the applicability of the "relative OCRA" term.

In order to make the calculations easily we extended the model and developed Excel macros to the original Excel spreadsheet calculus provided us by Celik Parkan, the author of OCRA procedure. Of course we collected the appropriate input consumption and output generation data from different sources (CSO, ARI) and have arranged them according to the research goals.

OCRA at industry level

In this part of the research the individual food branches represent the "Production Unit". During the analysis we have concentrated on 9 food industry branches: Meat-, Fruit and vegetable-, Vegetable oil-, Milk-, Milling-, Fodder-, Soft drinks-, Tobacco- and Other industry. The results of OCRA calculations are listed in tables 1 and 2.

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[1] The survey applied the procedure published by *Parkan and Wu* (1999). Excel macros have been developed by the author.

Table 1.

OCRA ratings of Food industry in Hungary (1997-2000)

(Equal calibration constants)

No.	Year / Branch	1997		1998		1999		2000	
		Ineffi-ciency OCRA	Effi-ciency OCRA	Ineffi-ciency OCRA	Effi-ciency OCRA	Ineffi-ciency OCRA	Effi-ciency OCRA	Ineffi-ciency OCRA	Effi-ciency OCRA
1	Meat	1,25	0,00	1,30	0,35	0,88	0,00	0,17	0,14
2	Fruit and vegetable	0,37	0,88	0,97	0,68	0,13	0,75	0,00	0,30
3	Vegetable oil	0,00	1,25	1,13	0,52	0,06	0,82	0,14	0,16
4	Milk	0,44	0,81	1,10	0,55	0,30	0,58	0,08	0,22
5	Milling	0,29	0,96	1,12	0,53	0,09	0,79	0,03	0,27
6	Fodder	0,21	1,04	1,22	0,43	0,15	0,73	0,10	0,20
7	Other	0,78	0,47	1,65	0,00	0,70	0,17	0,26	0,05
8	Soft drinks	0,46	0,79	0,00	1,65	0,43	0,45	0,30	0,00
9	Tobacco	0,04	1,21	1,02	0,63	0,00	0,88	0,10	0,21

Table 2.

OCRA ratings of Food industry in Hungary (1997-2000)

(Separate calibration constants)

No.	Year / Branch	1997		1998		1999		2000	
		Ineffi-ciency OCRA	Effi-ciency OCRA	Ineffi-ciency OCRA	Effi-ciency OCRA	Ineffi-ciency OCRA	Effi-ciency OCRA	Ineffi-ciency OCRA	Effi-ciency OCRA
1	Meat	2,58	0,00	2,95	0,00	2,68	0,00	3,11	0,00
2	Fruit and vegetable	0,67	1,91	0,63	2,32	0,50	2,18	0,33	2,78
3	Vegetable oil	0,00	2,58	0,03	2,92	0,15	2,53	0,70	2,41
4	Milk	0,08	2,50	0,94	2,01	1,01	1,66	1,40	1,71
5	Milling	0,02	2,56	0,35	2,60	0,00	2,68	0,38	2,72
6	Fodder	0,02	2,56	0,00	2,95	0,04	2,63	0,39	2,72
7	Other	0,08	2,50	1,55	1,40	1,40	1,28	0,00	3,11
8	Soft drinks	0,89	1,69	0,17	2,78	1,04	1,63	1,92	1,19
9	Tobacco	0,05	2,53	0,04	2,91	0,04	2,64	0,59	2,52

Figures 1 to 4 show the formulation of efficiency OCRA ratings between 1997 and 2000.

Figure 1.

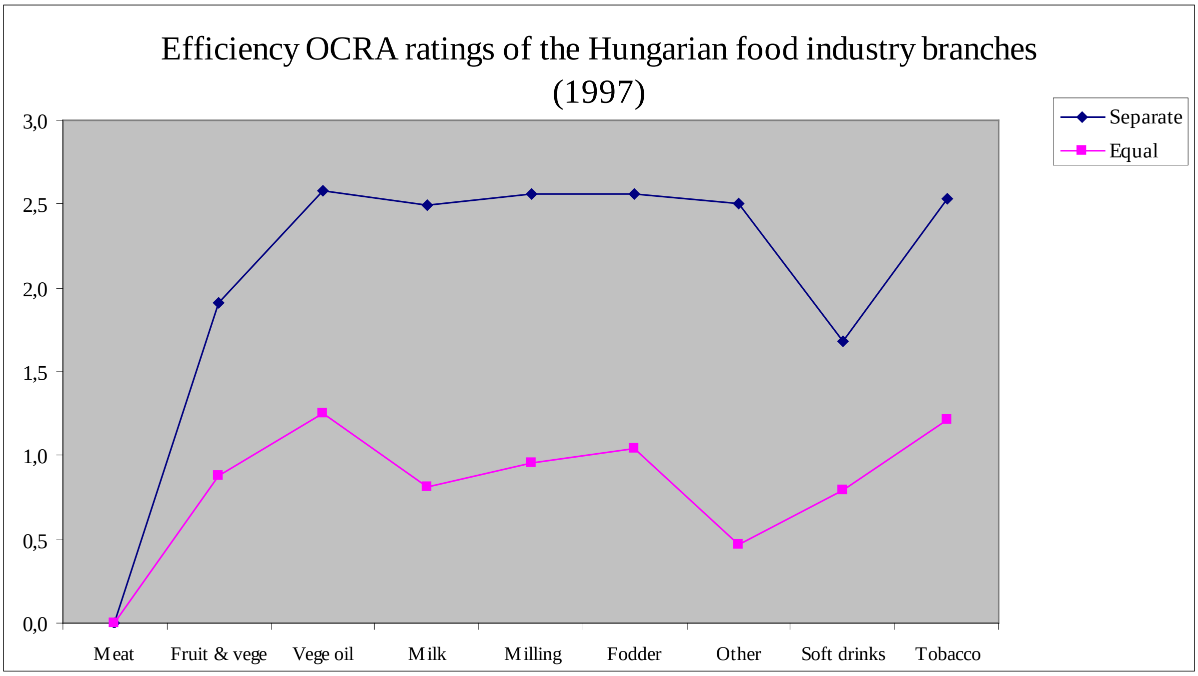


Figure 2.

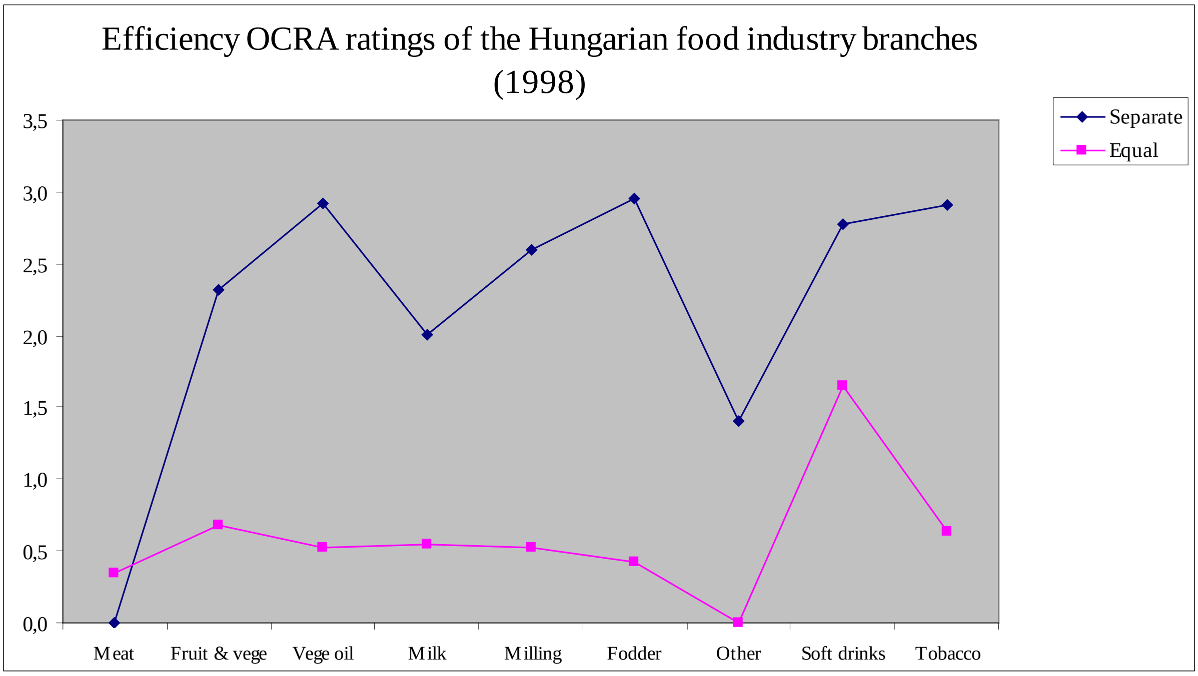


Figure 3.

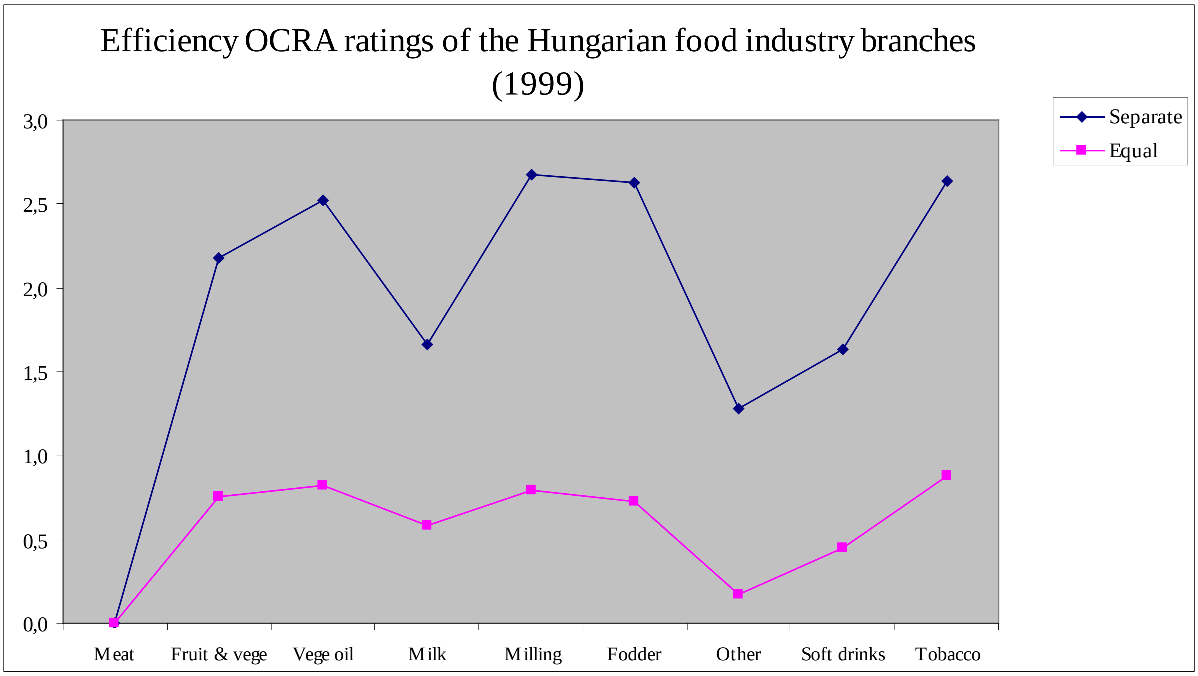
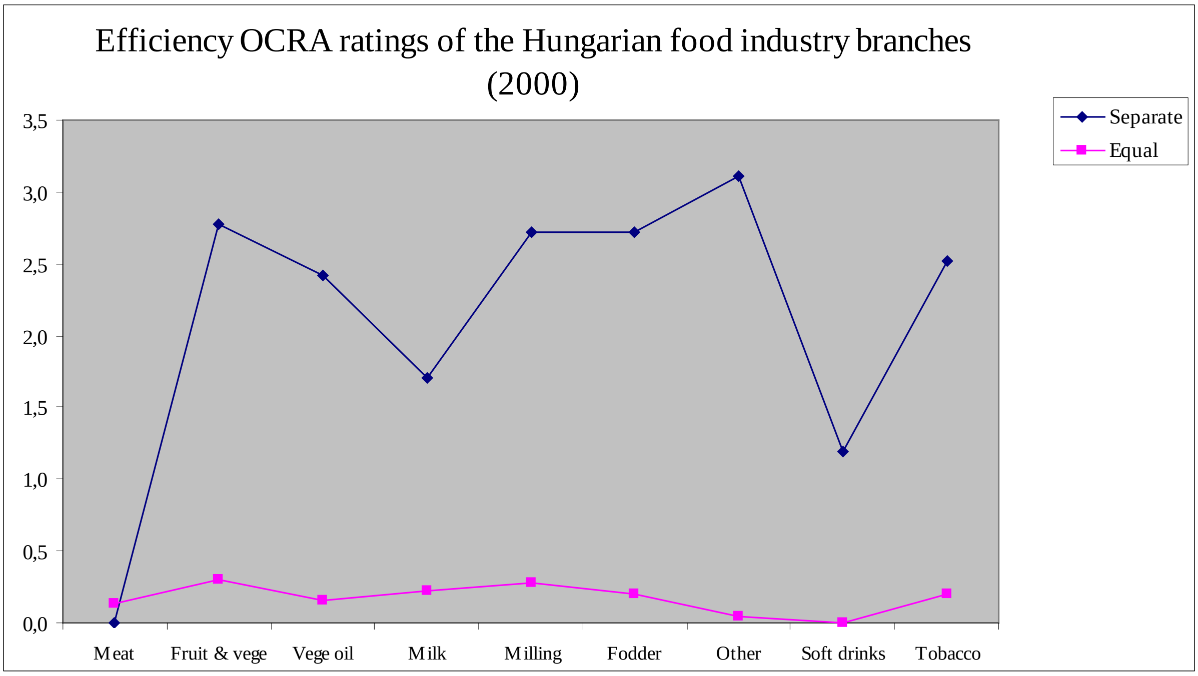


Figure 4.



With regard to the meat industry in Hungary – based on our calculations – we can come to the following conclusions:

- The meat industry has experienced disadvantage in operational competitiveness compared to the other branches of food industry.
- The shortcomings can be characterized as big one. There is no other branch within the food industry which would be so far away from its nearest neighbor.
- Our statements are underlined in both: *efficiency* and *inefficiency* approaches.
- The results are consistent in the sense, that they derive from the *separate* and *equal* calibration constant calculations as well.

The aggregate results introduced here allow us to obtain no other conclusions. However, the detailed calculation procedure resulted in quite interesting findings. Especially when we were curious about the reasons of disadvantages of the meat industry, we found that the most critical factor in this respect was the inefficient use of material cost – compared to the other branches. This finding may lead us to further investigation, but this is beyond the scope of this study.

The main constrains which have to take into consideration when we evaluate the results:

- The statistical observation and classification has got other borders then that of the type of products. Therefore the results can not entirely refer to the meat products.
- At the same time we can state that the meat industry's production cost are relatively high compared to other branches of which the direct reason is the inefficient use of material cost.
- Although the meat industry's production is relatively expensive, Hungary has experienced comparative advantages in that particular period of time thanks to the Far East market possibilities. These circumstances draw our attention that the relatively low competitiveness of the Hungarian meat sector is in striking contrast to the country's interest.

OCRA at company level

Deriving from the contradiction between the relative inefficiency of the meat industry and its Revealed Comparative Advantages we can put the question whether the meat processing plants show up differences in OCRA and what are the main influencing factors in this respect. As a next step we analyzed the profit and loss account data of the companies belonging to meat industry.

Our calculations have been prepared for the 2001. financial year. In the database originally we had 434 meat industry enterprises. Because of the small scale of activity as well as of some data inconsistency we had to exclude quite a few of them. At the end we included 338 company data into the analysis.

We used the following – rather aggregated – cost and revenue categories:

- material cost
- personal cost
- depreciation
- other cost

- net sales and other revenues

The preliminarily analysis of data made it clear that we can not treat the whole sample as a single group: there is no reason to compare a company's performance with another if there is a deep gap between their technological level and between their economic activity. Therefore we have divided the sample into 3 categories according to their total turnover:

- turnover is less than 100 m HUF (≈ 400 thousand €)
- turnover is between 100 m HUF and 1 mrd HUF (≈ 400 thousand € and 4 m €)
- turnover is over 1 mrd HUF (4 m €)

This classification is in line with the Hungarian "small", "medium" and "large" categories, however we are aware that the "large" meat processing plant not necessarily can be regarded as large one at EU level.

The OCRA ratings are summarized in Figure 4 – 6.

Figure 4.

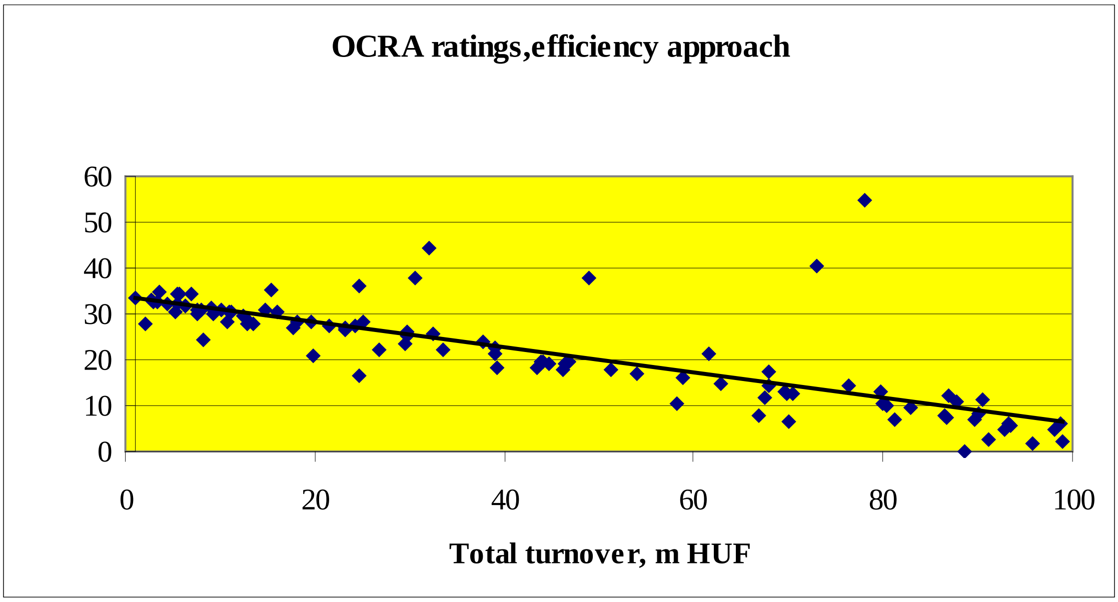


Figure 5.

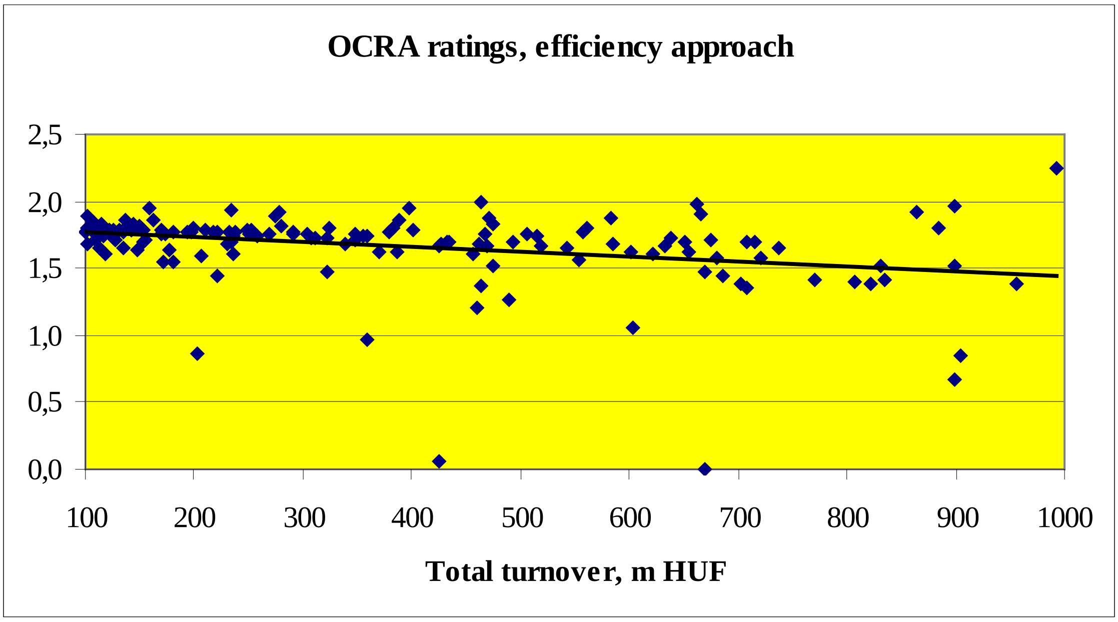
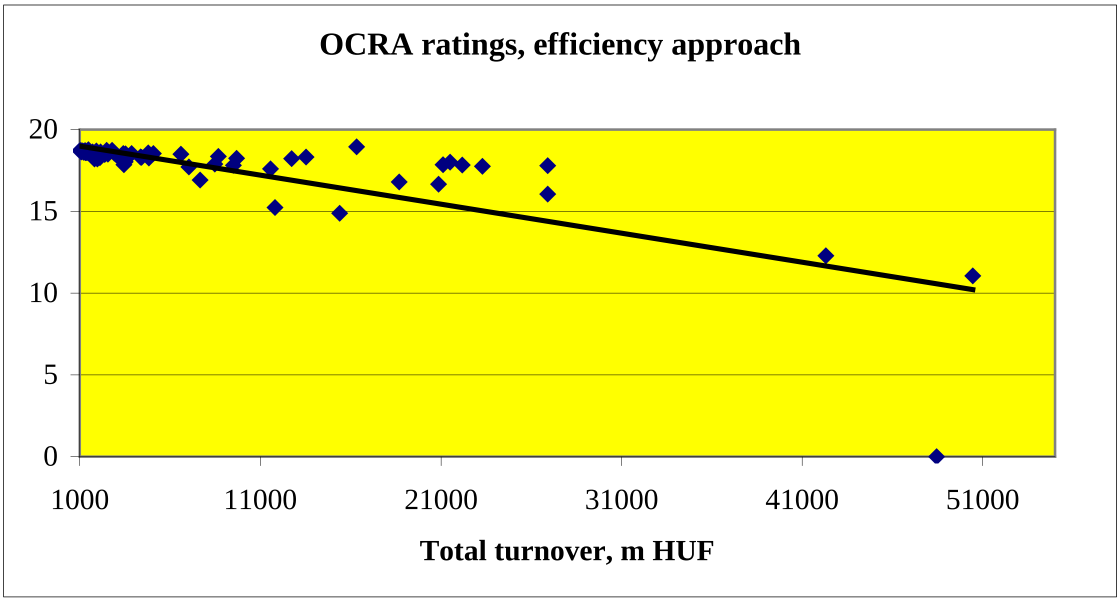


Figure 6.



The most important findings – based on the previous figures – are as follows:

- There is quite reasonable to make difference between the groups, because the OCRA ratings show specific features in line with increasing the total turnover category. The most important one is that the more efficient way of operation comes together with the higher turnover level. It derives from the fact that the higher the turnover category is, the elevated the trend line in comparison with the top value of the OCRA rating in that category.

- At the same time within each category we can observe the definite decrease of OCRA rating if the turnover is growing. (It refers back to the negative slope of the trend line.) Although the phenomena requires deeper consideration, there might be an organizational-coordination problem in the background, because the scale of activity has got the higher impact within the small category (here experience we the highest negative slope of the trend line).
- The “small” as well as the “large” category need to be analyzed further on, because we calculated extreme values of the ratings. It shows us that we need to develop much more homogenous groups in order to prepare more accurate analysis.

Driving forces of competitiveness at company level

The ability of calculating appropriate measurement ratios of operational competitiveness itself – even if the procedure fulfils the requirements of being intuitive, user friendly and using reliable information sources – is not enough to point out the key elements of the company’s strategy. Therefore we composed a model which helps us in determining the driving forces – related either to the management practice or to the strategic level - of competitiveness.

The driving forces of competitiveness are the factors which are to be changed in order to increase the operational competitiveness of different production or service units of the company. The accurate knowledge about the effects of these changes is in the heart of strategic decision making.

According to the literature (c.f. *Oral, M. (1993)*) there are two groups of driving forces influencing the competitiveness:

- *Structural* drivers are the decisions which are related to “bricks and mortar”. This is why they can only be changed – similarly to the construction elements of a building – just over a longer period. (E.g. plant size, capacity, regional location of the plant.)
- *Infrastructural* drivers are the decisions which are related to the company policies influencing how the “bricks and mortar” are managed. These decisions typically belong to the operation management and – compared to the structural drivers – they can be relatively easily changed. Infrastructural decisions embrace the company policies associated with equipment, quality, innovation, inventory, human resource and marketing.

As for today the standardization of food items has archived such a high level that the price became the most determining factor of market competition. The price rivalry enforces the companies that they have to decrease their costs. In this competition the food industry companies are in the position that they can reduce the cost of production primarily via appropriate *infrastructural* changes. This is why the operational competitiveness plays a determining role in the market competition. Consequently the measurement of operational competitiveness seems to be an adequate procedure for introducing the competitive status of a particular plant.

Structural drivers

Capacity utilization

Although the progressive development in the agricultural sciences in the recent decades the climate and soil conditions do create a geographical and time restriction in the production of some plants (e.g. wheat). These limitations necessarily come together with significant peak utilization of capacities in very many of the processors, while there is an extraordinary under exploitation of capacity beyond the peak season. The same effect can be reported of a non-well managed animal husbandry especially if the production cycles are not harmonized.

Plant size

At a given technological level the optimal plant size ensures the lowest unit cost. The economy of scale can be very significant in case of the food industry. The economy of scale at the same time can determine the entry barrier to the industry, depending on how great a cost disadvantage the suboptimal plant size poses. At the same time we have to note that the smaller processors can be competitive enough because they are rather flexible.

Regionality

The competitiveness of a certain company is highly influenced by its geographical location. The competitive advantages of the different industries in many cases are connected just to a few cities or micro regions. These advantages can become stable especially when there is a certain clustering of economic activities in the region.

Infrastructural drivers

Equipment policy

The emphasis in this respect is on the maintenance of equipment which influences fundamentally (i) the safety of processing and (ii) efficient utilization of processing, packaging and material handling equipment. Efficient maintenance is expensive, because skilled staff have to be kept in readiness, but it offers highest all-round availability of equipment.

Quality policy

Processing technologies such as aseptic processing and packaging and food irradiations that are integral to a modern processed food manufacturing plant require strong quality control. Furthermore, for a processed and packaged food product to be considered a quality product that will sell in the market place, it must cater to consumers' preferences such as those related to sensory properties (color, flavor, texture and overall appearance), nutritional value, shelf life, packaging, ease of preparation, microbiological safety etc. In essence, competitiveness of a food processing plant is determined by policies related to both internal and external quality.

Inventory policy

The seasonal feature of agricultural production as well as the perishable nature of products makes unavoidable for the processors that they keep quit large raw material and finished good stock. The necessity of keeping large inventory from packaging materials means additional expenses for the processors. This is due to the fact that these processors use packaging technologies (e.g. aseptic packaging, and the development of new packaging materials) to improve shelf-life and decrease cost of storage. Further, because of the consumer-oriented nature of processed food product, packaging materials play an important role in differentiating competing products.

Labor force policy

Technologically well trained labor force is a continuously increasing need in order to keep the equipments and machines in operation and maintenance. This is why the processing company is assumed to invest into human capital.

Marketing policy

The food processing industry is characterized by product proliferation that is unlike any other industries. At the beginning of the 90's there were some 50 thousand food products in commerce all over the word and about 2.500 have been introduced year by year. This means for the processing companies that the level of operation is under the optimal intensity. The broad product profile and the common change in the production process lead to suboptimal operation.

Model specification

The relative operational competitiveness ratings gained by OCRA play the dependent variable role in the regression analysis. The *structural* and *infrastructural* group of independent variables will be represented by observed and proxy variables.

$$Y = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + \beta_4 Z_4 + \beta_5 Z_5 + \varepsilon$$

where:

- Y: OCRA rating of the company
- X_1: plant size (e.g. equity, number of employees, etc.)
- X_2: capacity utilization (e.g. slaughtered animal in tons/slaughtering capacity)
- X_3: dummy variable for regionality (e.g. counties, NUTS-2 regions)
- Z_1: maintenance intensity of machines and equipments
- Z_2: variable related to quality policy of the company
- Z_3: inventory variable
- Z_4: expenses of labor training and education
- Z_5: product innovation variable
- ε: error term, standard normal distribution

We can realize that there has been sharp difference between the structural and infrastructural variables. The formulation of structural variables belongs to the strategic level, while the infrastructural ones can be modified and influenced by the management. The efficiency of the company’s operation highly depends on the harmonic cooperation between the two governance level.

Our database could not provide us the appropriate variables in each case. Therefore we used proxy variables instead. The list of them is as follows:

Structural variables

- own equity and the share of foreign capital – as proxies for plant size
- NUTS-2 regions – dummies, reference is the central region

Infrastructural variables

- long term liabilities
- short term liabilities
- Net/Gross value of real estate
- Net/Gross value of machines and equipments

We expect that the higher own equity, the higher share of foreign capital and the higher value of all the infrastructural variables (because of the specific market condition) comes together with higher competitiveness. There might be positive or negative deviation from the central region competitiveness.

Results are comprised in Table 3. SPSS 9.0 has been used for parameter estimation.

Table 3.

OCRA REGRESSION

Coefficients	1-100 m HUF	100-1000 m HUF	1 mrd HUF
Konstans	**33,545*** ** (7,773)	**1,713*** ** (9,62)	**19,286*** ** (11,27)
NUTS-2	**-12,505*** ** (-2,724)	**-0,278** ** (-4,54)	**-3,657*** ** (-3,865)
NUTS-3	**-13,866** ** (-2,316)	**-0,182* ** (-1,855)	**-0,04171** (-0,055)
NUTS-4	**-7,9* ** (-1,791)	**0,139** (1,437)	**-1,6** (-1,681)
NUTS-5	**-3,107** (-0,67)	**0,05859** (0,54)	**-0,603** (-0,525)
NUTS-6	**14,679*** ** (4,66)	**0,07234** (0,873)	**0,854** (0,899)
NUTS-7	**-5,781* ** (-1,759)	**0,01697** (0,2)	**-0,168** (-0,259)
Own equity	**0,000007766* ** (1,852)	**0,000001032*** ** (3,168)	**-0,0000001681*** ** (-5,362)
Foreign/Subscribed capital	**-0,006774** (-0,145)	**-0,001305** (-1,536)	**0,03268*** ** (5,314)
Long term liabilities	**-8,005E-06** (-0,224)	**9,567E-08** (0,414)	**-0,0000009158* ** (-1,907)
Short term liabilities	**-0,00003156** (-0,719)	**-0,0000009464*** ** (-2,891)	**-0,000000599*** ** (-8,015)
Net/Gross value of real estate	**-13,763*** ** (-5,215)	**0,09034** (0,963)	**1,72** (1,094)
Net/Gross value of machines & equipments	**-9,868*** ** (-3,433)	**0,08898** (0,757)	**-0,79** (-0,423)
R	**0,851**	**0,549**	**0,969**
R^2	**0,724**	**0,301**	**0,939**

Note: independent variable: OCRA rating, efficiency approach
t- values in parenthesis
*** significant at 1%
** significant at 5%
* significant at 10%

The results of Table 3. can be explained in the following way:

- The regional location of **small** processors has got a rather significant influence on the competitiveness, in majority negative direction compared to the central region. In that category if the own equity is higher it comes together with higher competitiveness as well. At the same time they are not able to utilize their equipments and machines.

- The companies belonging to the **middle** category are also some-how sensitive for the regional location, however not as much extent as the smaller ones do. Here we can more significantly observe the positive linkage between the own equity and OCRA rating. The negative parameter of the short liabilities draw up our attention that this is quite heavy burden for them.
- The **large** processors can almost entirely be independent from the regional location. The own equity in this group shows negative relationship to the OCRA rating, which is quite surprising. However this is the only group, where the effect of the foreign capital is significant and – in line with our expectations – positive. Both the long- as well as the short term liabilities are negatively influencing the competitiveness which shows that there might be some managerial problems in this respect.

OCRA ratings and profitability

This part of the study is basically the verification of the applicability of OCRA. The question is whether the more competitive companies show up higher profitability? Therefore in the next model we included the OCRA rating as an additional independent variable and regressed them against the profit of the company. In order to make results of the 3 group comparable we introduced the term of "relative OCRA", which is the ratio of the OCRA value to the constant sum of efficiency and inefficiency OCRA. The results are summarized in Table 4.

Table 4.

MODELS FOR PROFIT BEFORE TAXATION

Coefficients	Together	1-100 m HUF turnover	100m – 1 mrd HUF turnover	Turnover more than 1 mrd HUF
Constant	**-200909,7***** (-3,120)	**-4876,2**** (-1,998)	**-72081,3***** (-6,521)	**-7241739,3***** (-7,334)
NUTS-2	**-53219,0** (-0,773)	**2303,0** (0,934)	**-8278,8** (-1,181)	**-163366,8** (-0,732)
NUTS-3	**73046,6** (1,189)	**3400,4** (1,293)	**289,73** (0,052)	**242476,1** (1,194)
NUTS-4	**84597,4** (1,379)	**1415,1** (0,669)	**10563,8*** (1,710)	**-851,4** (-0,004)
NUTS-5	**29721,7** (0,468)	**1214,3** (0,494)	**-2061,6** (-0,346)	**139307,1** (0,657)
NUTS-6	**24082,3** (0,442)	**7386,1***** (2,822)	**7304,4** (1,478)	**12842,3** (0,073)
NUTS-7	**83241,7** (1,625)	**725,3** (0,384)	**4626,7** (0,912)	**129708,3** (0,774)
Own equity	**0,0786***** (7,662)	**0,0707***** (7,096)	**0,132***** (4,689)	**0,140***** (7,295)
Foreign/Subscribed capital	**1662,1***** (2,888)	**-49,0** (-1,619)	**-66,6** (-1,150)	**717,5** (0,461)
Long term liabilities	**0,314***** (3,0)	**-0,143***** (-3,739)	**-0,064*** (-1,971)	**0,342**** (2,008)
Net/Gross value of real estate	**-36851,8** (-0,834)	**580,6** (0,401)	**49,5** (0,011)	**-347410,6** (-1,611)

Net/Gross value of machines & equipments	**1024,2** (0,018)	**1886,0** (0,964)	**6348,9** (1,201)	**172565,0** (0,688)
Interest to be paid	**-3,7** (-17,095)	**-4,3*** (-4,816)	**-0,6* (-1,798)	**-0,5** (-0,944)
Relative OCRA (%) (efficiency approach)	**3215,1*** (4,646)	**83,9** (2,340)	**919,1*** (7,135)	**76269,8*** (7,794)
R	**0,769**	**0,736**	**0,699**	**0,905**
R^2	**0,592**	**0,542**	**0,489**	**0,819**

Note: independent variable: Profit before taxation
t- values in parenthesis
*** significant at 1%
** significant at 5%
* significant at 10%

We won't analyze the results of Table 4. in detail, because we only wanted to verify the applicability of OCRA in Hungarian circumstances. In any case we think that our hypothesis about the applicability of the procedure can be regarded as verified one. The OCRA rating in each group as well as for the whole sample shows up significant relationship in formulating the profit of the companies.

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