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COMPARING THE ECONOMIC CONDITION OF MANUFACTURING BRANCHES IN POLAND ON THE BASIS OF OBJECTIVE STATISTICAL DATA AND BUSINESS SURVEYS

The paper presents two approaches to evaluating the condition of manufacturing branches in Poland. In the first (objective) approach the values of a composite indicator constructed on the basis of a vector of component variables whose source was statistical reports have been taken as the criterion for evaluating the effectiveness of management. In the second (subjective) approach the results of business surveys have been applied as the evaluation criterion. The authors made an attempt to compare the results obtained from both approaches and then to explain the causes of occurring discrepancies.

1. INTRODUCTION

Manufacturing companies in Poland fill in every month (and since 1999 in every quarter) statistical reports F-01 in which they give information on their incomes, cost and income summaries. Simultaneously about 3,500 of these companies participate in the monthly poll, business survey in which managers evaluate the present and future situation of the firms they manage. In cases of both statistical reports and business surveys information concerning individual companies are then aggregated e.g. to the level of branches and the section as a whole. The data coming from the reports can be considered objective and reliable. First of all because they most probably reflect the real situation, and, secondly, they measure it in the same way for all the companies. Information coming from the poll business surveys should be called subjective. They express first of all the opinions of managerial staff about the condition of their own companies. Proper evaluation depends then on the qualification of the staff, including their abilities to avoid excessive optimism or pessimism in formulating opinions.

In analysing the condition of a given economic branch against the background of other branches one can apply two approaches: 1) one based on objective evaluation, 2) one based on subjective evaluation (cf. Kwiatkowska-Ciotucha, Załuska 2000). The aim of the paper is to state whether there appear differences between the results obtained in both approaches and to attempt to explain the reasons for possible differences appearing.

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2. THE SCOPE OF THE RESEARCH
AND APPLIED METHODS OF EVALUATION

The research has been carried out on the basis of data gathered according to and covering the branches of its section D i.e. manufacturing (Table 1). Monthly data from January 1995 to March 1998 have been analysed. The source data has been taken from (*Badania koniunktury...* 1995–98) and (*Biuletyn statystyczny...* 1995–98).

Table 1
Specification of branches of section D: manufacturing

Division	Description
15*	Manufacture of food products and beverages.
16*	Manufacture of tobacco products.
17	Manufacture of textiles.
18	Manufacture of clothing and furriery.
19	Processing of leather and manufacture of leather products.
20	Manufacture of wood and wood, straw and wicker products.
21	Manufacture of pulp and paper.
22	Publishing and printing.
23	Manufacture of coke, refined petroleum products and derivatives.
24	Manufacture of chemicals and chemical products.
25	Manufacture of rubber and plastic products.
26	Manufacture of other non-metal mineral products.
27	Manufacture of basic metals.
28	Manufacture of metal products (except machinery and equipment).
29	Manufacture of machinery and equipment.
30*	Manufacture of office machinery and computers.
31	Manufacture of electrical machinery and apparatus.
32	Manufacture of radio, television and communication equipment and apparatus.
33	Manufacture of medical, precision and optical instruments, watches and clocks.
34	Manufacture of motor vehicles, trailers and semi-trailers.
35	Manufacture of other transport equipment.
36	Manufacture of furniture; other manufacturing.
37*	Waste management.

* – these branches have been skipped over in the research: branches 30 and 37 because of the lack of data, branches 15 and 16 due to different ways of presenting data in (*Badania koniunktury...* 1995–98) and *(Biuletyn statystyczny...* 1995–98).

Source: on the basis of NACE.

For evaluating the condition of each branch of manufacturing in the first, objective approach as a criterion of effectiveness of management, the values of composite indicator built on the basis of a vector of component variables coming from statistical reports of non-financial enterprises aggregated in specific branches of section D have been accepted. The following four

component variables have been assumed (cf. Kwiatkowska-Ciotucha, Załuska 1998):

– X_1 – *dynamics of incomes from sale* in fixed prices from March 1998 – index of a constant basis – January 1995 = 100%, being in the capacity of a **stimulant**,

– X_2 – *profitability rate of net turnover in %*, treated as a **stimulant**,

– X_3 – *liquidity ratio of the third degree* (the relation of current assets to short-term liabilities) being a **nominant** with the recommended range of values from 1.2 to 2.0,

– X_4 – *share of enterprises showing net profit*, being in the capacity of a **stimulant**. (The variable was obtained by averaging two other variables: the share of the companies showing net profit in the general number of the companies in a branch and the share of incomes of the companies showing net profit in the incomes of the whole activity of a division).

Variable X_2, i.e. profitability rate of net turnover, also requires a few remarks. In the literature there prevails the view that this variable should be treated as a stimulant with the veto threshold on level 0. However it seems that for the sake of ordering a set of objects such treatment of profitability leads to a considerable flattening of the results and to the lack of differentiation, for example (in the case of this concrete research), between the branches showing a slight net loss and the branches whose results were much worse. For this reason this variable was treated in the research as a stimulant.

The values of composite indicator Z (being in the capacity of a **stimulant**) in individual periods for analysed branches have been calculated as a weighted average of the values of normalized component variables according to the formula:

$$Z_{kjt} = \sum_{i=1}^{4} Z_{kijt} W_i$$

where:

k – variant of normalization, $k =$ I or II,

Z_{jt} – value of composite indicator in period t for branch j,

Z_{ijt} – value of normalized i-th component variable in period t for branch j,

W_i – weight ascribed to i-th component variable,

i – number of component variable, $i = 1, ..., 4$, $W_i \in (0,1), \sum W_i = 1$

j – number of division, $j = 17, ..., 36$ (except 30),

t – number of period, $t = 1, ..., 39$.

Two normalization variants of component variables have been accepted (Table 2). In variant I, composite indicator Z_1, for the variables X_1, X_2 and X_4, in the normalization process the comparison to the average value from section D

overall in a given period, and in variant II, composite indicator Z_2, the comparison to the maximum value of the variable in a given period. In both variants the same weights have been accepted. The greatest importance has been given to net profit (weight 0.4), the other variables have been given 0.2 weight.

In the second, subjective approach, the basis to evaluate the condition of individual branches have been business surveys obtained from the monthly opinion polls of the managers of manufacturing enterprises. To evaluate the conditions the authors utilized the balances of answers to questions of a diagnostic character referring to the assessment of: general economic situation of an enterprise, sold production, demand for company's products, stock level of final goods, capability to pay current financial liabilities, level of total receivables. The role of the respondents was to choose one of the given variants of the answers. The balances of answers published in (*Badania koniunktury...* 1995_98) have been calculated as a difference between the percentage of answers to the variant indicating improvement and percentage of answers to the variant indicating an deterioration of an enterprise's situation in relation to the preceding month or as a difference between the percentage of answers to the variant indicating the situation favourable for an enterprise in a given period and the percentage of answers to the variant indicating the unfavourable situation. Thus all the indexes of economic situation in the form of balances were in the capacity of stimulants and they took values from the range [–100%, 100%]. A positive value of the index indicated good economic situation, and negative – a bad one. An increase of the index over time implied an improving situation and its decrease – deterioration.

In this approach two variants of evaluating the condition of individual branches of manufacturing have been assumed: 1) on the basis of balances of answers to the question concerning the assessment of the general economic condition of an enterprise (index S_1), 2) on the basis of the simple average of cumulated balances of answers to the remaining questions (index S_2). Applying two methods of concluding results from the fact that index S_1 has been calculated on the basis of the answers to the question concerning a complex phenomenon which is of a general economic condition and thus should thoroughly describe the condition of individual branches of manufacturing. Such an evaluation from the respondents' point of view is however more difficult than answering the remaining questions referring to simple phenomena, that is those which have been applied when calculating index S_2. On the other hand we cannot be sure whether these simple phenomena fully describe the condition of individual companies.

Table 2. The description of the assumptions accepted in individual variants of determining the value of a composite indicator

No	Partial variable	Variant	Variable's characteristics	The way of component variables' normalization depending on variant (Z_i – normalized variables)		Weight
1	Sale dynamics (X_1)	I and II	Stimulant	I: $z_{1jt} = \dfrac{x_{1jt}}{av\, x_{1t}}$	II: $z_{1jt} = \dfrac{x_{1jt}}{max\, x_{1jt}}$	0.2
2	Net profitability (X_2)	I and II	Stimulant	I: $z_{2jt} = \begin{cases} \dfrac{x_{2jt}}{av\, x_{2t}} & \text{for } x_{2jt} \geq 0 \\[2ex] \dfrac{x_{2jt}}{max\, av\, x_2} & \text{for } x_{2jt} < 0 \end{cases}$ II: $z_{2jt} = \begin{cases} \dfrac{x_{2jt}}{max\, x_{2jt}} & \text{for } x_{2jt} \geq 0 \\[2ex] \dfrac{x_{2jt}}{max\, max\, x_2} & \text{for } x_{2jt} < 0 \end{cases}$		0.4
3	Liquidity of 3rd degree (X_3)	I and II	Nominant with recommended value range of [1.2 , 2.0]	I and II: $z_{3jt} = \begin{cases} 1 & \text{for } 1,2 \leq x_{3jt} \leq 2,0 \\[1.5ex] \dfrac{x_{3jt}}{1,2} & \text{for } x_{3jt} < 1,2 \\[2ex] \dfrac{2}{x_{3jt}} & \text{for } x_{3jt} > 2,0 \end{cases}$		0.2
4	The percentage of companies showing net profit (X_4)	I and II	Stimulant	I: $z_{4jt} = \dfrac{x_{4jt}}{av\, x_{4t}}$	II: $z_{4jt} = \dfrac{x_{4jt}}{max\, x_{4jt}}$	0.2

Where: x_{ijt} – the value of variable X_i in j-th branch in period t

$av\, x_{it}$ – average value of variable X_i for section D in period t

$max\, av\, x_i$ – maximum of all average values of variable X_i for section D during the whole examined period

$max\, max\, x_i$ – maximum value of variable X_i during the whole examined period

$max\, x_{ijt}$ – maximum value of variable X_i in period t

j – number of branch, takes its values from 17 to 36 (without 30)

t – number of period, $t = 1, ..., 39$ (from 01.1995 to 03.1998)

Source: on the basis of (Strahl, 1996).

3. THE METHOD OF THE RESEARCH AND THE RESULTS OBTAINED

First examining the similarity of the results of evaluating individual branches of section D obtained in both approaches has been conducted on the basis of the Spearman coefficient of rank correlation (Figure 1). After analysing the graphs we can notice a very similar shaping of the Spearman coefficients for the ordered pairs (Z_1, S_1), (Z_2, S_1) and (Z_1, S_2), (Z_2, S_2). In connection with that for further analysis only one variant of composite indicator has been chosen, that is variant I (variable Z_1).
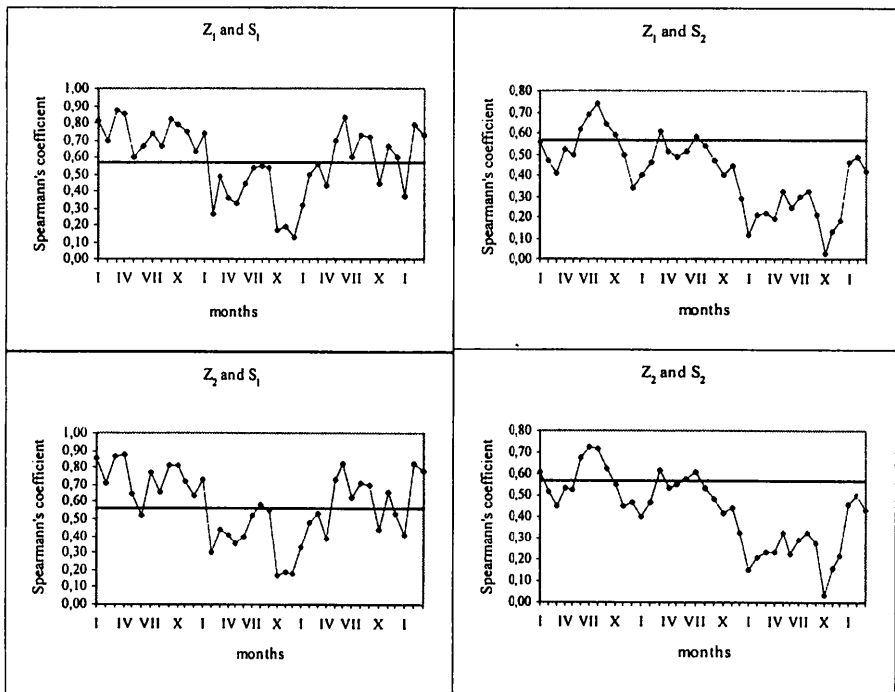
Remark: critical value for the coefficient at the significance level $\alpha = 0.01$ equals 0.564.
Figure 1. Spearman's coefficients of rank correlation for the ordered pairs on the basis of composite indicators Z_1 and Z_2, and indexes S_1 and S_2 in the period from January 1995 to March 1998.
Source: Own computation.

Then the consistency of evaluations obtained in both approaches for individual branches of section D has been tested by comparing the locations occupied by a given branch in subsequent months at ordering on the basis of the value of composite indicator Z and ordering on the basis of indexes S_1, S_2 – for this purpose the differences between the locations occupied by a specific branch in individual months according to Z and S_1 and Z and S_2 have been calculated and next the simple average and standard deviation of the differences for the whole period examined (39 months)

and the arithmetic average of absolute values of these differences have been calculated (Table 3).

Table 3

Comparing the differences of the locations occupied by a given branch at ordering on the basis of composite indicator and index S_1 and index S_2 during the whole examined period

Composite indicator and index S_1																		
Branch	17	18	19	20	21	22	23	24	25	26	27	28	29	31	32	33	34	35	36
Min*	-12	-5	-7	-7	-6	-5	-11	-7	-11	-10	-4	-8	-13	-12	-11	-7	-18	-7	-2
Max**	2	3	3	5	17	10	15	5	7	6	13	11	5	2	12	8	12	12	11
Average difference	-2.5	-1.2	-1.3	0.4	4.7	1.9	2.7	-0.9	-0.5	-2.8	5.3	-2.2	-2.7	-3.6	2.3	0.0	-4.7	2.4	2.9
Standard deviation	3.43	2.41	2.3	2.63	5.6	3.82	6.61	2.44	3.69	3.62	4.12	3.74	3.8	3.68	5.82	3.63	7.48	3.42	3.01
Average***	3.0	2.3	1.7	2.0	5.5	3.5	6.2	2.1	2.6	4.0	5.6	3.6	3.5	4.3	4.7	3.2	6.9	3.2	3.1
Composite indicator and index S_2																		
Branch	17	18	19	20	21	22	23	24	25	26	27	28	29	31	32	33	34	35	36
Min*	-12	-11	-5	-16	-2	-7	1	-4	-15	-12	0	-8	-6	-3	-9	-7	-1	-1	-11
Max**	3	-1	4	5	12	7	16	5	2	3	6	5	11	4	10	6	16	11	5
Average difference	-3.1	-4.9	0.8	-6.9	3.9	-1.2	8.8	-0.9	-5.9	-6.3	4.0	-3.0	4.6	0.8	0.6	-0.2	7.0	7.9	-4.2
Standard deviation	3.41	2.44	2.09	4.56	4.86	3.74	4.33	2.08	3.36	4.27	1.54	2.39	4.56	1.74	4.52	3.28	4.46	2.92	3.70
Average***	3.6	4.9	1.8	7.3	4.7	3.4	8.8	2.1	6.0	6.6	4.0	3.4	5.7	1.5	3.8	3.1	7.1	8.0	4.6

Remarks: negative value at min, max and average difference means that own evaluation of the situation made by enterprises of a given branch was lower than the evaluation made on the basis of an objective criterion, and positive value – the opposite situation;
* – indicates the greatest underestimation of own situation in comparison to objective evaluation,
** – indicates the greatest overestimation of own situation in comparison to objective evaluation,
*** – indicates the average of the absolute values of differences.
Source: Own computation.

Comparing the results obtained by ordering branches of section D on the basis of composite indicator Z and index S_1 and composite indicator Z and index S_2, it becomes clearly visible that a greater similarity of ordering appeared in the first case. The following proves this: average values of Spearman's coefficient for the whole period examined (respectively 0.58 and 0.47), the number of significant Spearman's coefficients in individual months, and the average difference of the locations of all the branches (respectively 3.7 and 4.7). That is why in the further part of the paper the Authors have focused on the analysis of this particular instance.

Spearman's coefficient of rank correlation average value for the whole examined period was higher than critical value for the level of significant $\alpha = 0.01$. Unfortunately the analyses of the value of the coefficient over time do not fill with optimism. If, in the period from January 1995 to January 1996, all the coefficients

have been significant, then, for instance from February 1996 to April 1997 none of them have exceeded critical value.

Comparing the differences between the locations occupied by individual branches in subsequent months and average values of these differences one can notice, that, among other things:

– on average in the whole examined period the most similar evaluation to the evaluation made on the basis of objective criterion appeared in branch 33; however, taking into consideration standard deviation (3.63) and the average of absolute values of the differences of locations (3.2), it becomes clear that in individual months both evaluations were significantly different;

– in their own evaluation of the situation branch 27 overestimated its condition (approximately by 5.3 locations) most of all, and branch 34 underestimated it (approximately by 4.7) most of all;

– the greatest value of standard deviation (7.48) and the average of absolute values of the differences of locations (6.9) characterized branch 34 showing the greatest discrepancies (from –18 to +12) of the locations occupied by this branch in ordering brought about on the basis of both considered criteria;

– the least standard deviation (2.3) and the lowest average of absolute values of the differences of locations (1.7) appeared in branch 19; the branch which in its evaluations turned out to be the most realistic one was branch 18 (the differences of locations in the individual months vary between –5 and +3);

– the average value of the differences of locations for all the branches equalled 3.7 which indicates little similarity of the orderings in the whole examined period.

The differences between the locations taken by various branches of section D at the ordering on the basis of both criteria were undoubtedly affected by the economic and political events in Poland. The abilities of company executives to discredit the information, e.g. on the changes in economic law, could be the cause of big discrepancies between objective and subjective evaluations. For example, Figure 2 presents the locations taken by branch 21, i.e. manufacturing of pulp and paper, and major political and economic events between January 1995 and March 1998. According to the value of composite indicator Z_1 branch 21 throughout 1995 occupied the first location. However, from January 1995 on, the locations occupied by this branch at the ordering on the basis of objective evaluations were worsening, to the end of 1996, and in 1997 dropped to locations much below the average of the total section D. The cause of such a substantial decrease of results was, first of all, the bad economic situation in world-wide paper markets in general. The world-wide overproduction of pulp and paper, together with the suspension of entry duties for paper in Poland (since July 1995) led to a price drop and decrease the profitability of pulp and paper manufacturing. Besides, the companies, in order to increase the competitiveness of their products, were forced to spend big sums on innovating their machinery and changing and expanding the range of their products.

Figure 2. Locations occupied by the branches 21 (pulp and paper manufacturing) at the ordering of the branches of section D on the basis of the values of composite indicator Z_1 (dark grey) and on the basis of indicator S_1 (light grey) in the period from 01.1995 to 03.1998 and important political and economic events which took place in Poland during that period.

Source: authors' own.

Comparing objective and subjective evaluations for branch 21 indicates that they were comparable only in 1995. In 1996, despite a much worse objective evaluation, managers still evaluated highly the general economic condition of companies (this branch occupied the first position as many as seven times). However, in 1997, at the permanently negative objective assessments, we could observe big differences between the locations occupied on the basis of subjective evaluation during successive months (e.g. in March location 4, in April, location 15). This indicates elements of a specific hysteria in managers' evaluation of the economic conditions of their own companies (compare also Figure 3). Spectacular here can be the case of July 1997, when, probably as a result of the flood and the temporary increase related to it in the demand for hygiene articles, managers assessed the situation as especially profitable and beneficial (the first location, according to S_1), whilst a month earlier and a month later they stated that the situation was unsatisfactory (June 1997 – location 13, August – 12). During all the months in the years 1996–1997 the subjective evaluations surpassed the objective ones. The average difference for this period was equal to even eight positions. This indicates the managers' erroneous perception of the changes in their companies' environment when evaluating the economic condition and of their excessive optimism.
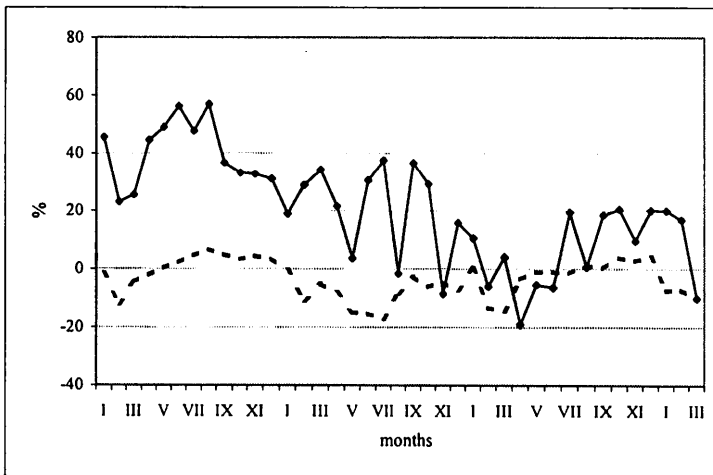
Remarks: - dashed line – indicator S_1 for the section D overall
         - solid line – indicator S_1 for the branch 21
Figure 3. The balances of the answers to questions concerning the evaluation of the general economic condition of a company (Indicator S_1) for the section D overall and the branch 21 from January 1995 to March 1998.

Source: Authors' own.

4. CONCLUSIONS

The big discrepancies observed here between the results obtained in both approaches can be caused, among other things, by:
– various sensibility and attitudes of the managers of enterprises from individual branches to political changes (e.g. elections), legal changes (e.g. duties, taxes, rebates), the privatization process,
– putting a different stress evaluating the enterprise's situation on individual elements of this phenomenon,
– the fact that (absolute) improvement of the situation in a given branch does not necessarily definitely lead to improving its location against other branches e.g. when economic situation is good in the whole economy,
– psychological element – managers evaluating the situation can be influenced by excessive optimism or pessimism, e.g. even a slight deterioration of the situation in the "leader's" branch or improvement in the "outsider's" branch can cause too heedless changes in managers' evaluation of the condition of enterprises,
– managers perceiving the chance for improving their situation because of bankruptcy or liquidation of non-profitable competitors from the division, which is short-sighted thinking at a low competitiveness in respect to import (e.g. branches 27 or 35),
– the fact that investments aimed at, among other things, the increase of competitiveness in respect to import or competitiveness in export and justifying an improvement of their own evaluation are not immediately reflected in the values of composite indicator, but on the contrary, they can even cause a temporary decrease of the values of indexes indicating the effectiveness of managing (e.g. branch 21).

It seems that in order to conclude the economic condition of individual branches of manufacturing it is worth taking into consideration both the objective indicators and subjective evaluations. Subjective evaluations deserve recommendation only under the condition that the skills of the managers are high enough, i.e. they are capable of properly evaluating the economic condition of their own companies. As the results of the conducted research have shown, we cannot consider the analytical abilities of Polish managers to be satisfactory, and, in connection with that, the evaluations from the business surveys should be treated rather as an expression of the moods.

It also has to be stressed that the data from the statistical reports encompass the whole population of manufacturing companies, and in the research, (which was conducted by means of a poll method – business

survey) as little as just 10 percentage of them took part. This fact can also influence the discrepancies in the obtained results.

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