# The Competitiveness of Industrial Sectors in CEECs Countries as the Base for their Successful Economic Integration to the EU

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**Abstract.** In this paper it is outlined the methodology of the model MIREM (Multicriteria Industrial and Regional Economic Model) as the empirical framework for the implementation of an industrial policy in the CEECs countries aspiring to enter the European Union. Its epistemological foundations are taken from M. Porter Theory of Competitive Advantage and B. Balassa Theory of Economic Integration and focus mainly on the *competitiveness concept*.

The choice of multicriteria decision making (MCDM) method "Electre-tri", presentation of criteria families and simulation of the MIREM by means of an analogue model are presented in order to assess the adequacy of the multicriteria methodology to the problematic of integration.

**Key words:** economic integration, competitive advantage, multicriteria methodology, industrial policy

## 1. Introduction

The integration of the CEECs countries to the European Union is probably one of the most challenging issues for the next decade that should be solved in its theoretical dimension as well as in its practical aspect linked to the political action. In particular, the articulation of the industry in these countries (ex-socialist) to the EU industry (post-industrial economies) will endanger the regional inequalities in a deeper way than the last southeastern enlargement. The CEECs industry having developed its bases in the context of *shortage economy* (Kornai, 1980) could have been characterised as following at the beginning of 90's:

- a *skewed specialisation* whose products demands tends today to decrease and that have not been modified or differentiated;

- the *low quality* of the products that mainly answered to the requirements of CMEA;

- the *low level of technological integration* and the *unreliability* of the manufacturing process;

- the *inadequacy* of the systems of financial management;

- a *bad labour organisation, absence* of commercial strategy due to the socialist process which led to the production without the customer approach;

- a *waste of human resources* related to the ideology of the system.

Since then, industrial sectors had to develop in unfavourable conditions posed by "the therapy of shock": reforms introduced by governments of these countries, aiming principally great macroeconomic imbalances of the system and only marginally the microeconomic aspects, even less the industrial policy. The perverse effects of this therapy on the external balance of these countries[1] resulted mainly from the relative weakness of the international competitiveness of their industries. Consequently, the aim of the model proposed in this paper will be to assess the degree of this competitiveness in each sector, as it could constitute the enhancement for the integration or the serious obstacle to this process. It will be attempted to predict which sectors have the base for survival as the consequence of integration process and which will vanish as completely as the coal industry in Belgium, even though they seemed permanent features of the industrial landscape of particular countries (Dewatripont and Ginsburgh, 1994)

The CEECs industry capability of economic integration to the EU could be defined as the degree of adjustment of industrial sectors and their environment (social issues, infrastructure development, human resources, competition policy, etc.) to the *system* of the Common European Market. As a big "puzzle", more compatible different elements of economic system and of industrial structure in particular are, more realistic and successful the process of integration between two systems seems to be.

However, what does exactly mean the notion of compatibility in our case? As the functioning of the Common Market is based on the free competition rules, sectors willing to join this system should be so competitive in comparison with the European ones so as to be accepted by the market. This means that they should dispose of certain competitive advantages even in the case of being complementary to the industrial system of the EU, as it always exists the threat of third countries products' entry (especially in the perspective of the obligations due to the WTO tariff reductions rounds).

In this paper we would like to evaluate the empirical contents of the hypothesis of our MIREM model and its pertinence to the problem. The logic of this model will follow the way already begun by the research project concerning the privatisation choice in Poland[2] and based on the competitiveness principle. The majority of the criteria constitute its functions. However, in privatisation model it was the Polish Ministry of Industry and Trade (MOIT) who played the role of the decision-maker and followed in general market laws. Now, in the MIREM project, we assume that the "rational decision-maker" is the MARKET itself, furthermore, the competitive market with its rules and failures. It is so, even if sometimes certain institutional, public welfare and defence issues intervene,

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[1] In Poland the trade deficit averaged 0.6 billion of dollars in 1991 and 17 billion in 1998 (according to the data of the National Statistics Office).

[2] "Une méthodologie générale de Politique Industrielle pour le choix entre liquidation, privatisation et restructuration dans les PECO", (Rapport à la DG XII), 1995, F. Condis y Troyano, Project Manager. The project was realised with the precious contribution of B. Roy, V. Mousseau and J.Ph. Naux ( LAMSADE, Université Paris-Dauphine), R. Slowinski and P. Zielniewicz (Poznan University of Technology) as far as MCDM methodology is concerned.

modifying the mechanisms of the Market. In other words, the internal rationality of privatisation choice is assumed to be the same as the internal rationality of the integration process, that is the competitiveness in the Walras market.

Therefore, the privatisation methodology and its results will be presented as the conceptual framework for our integration model in order to illustrate our way of reasoning. Afterwards the hypothesis proper to the integration model will be outlined. Competitiveness concepts will be taken from Porter (1993) Theory, classic and neo-classic International Trade Theory in order to define criteria linked to competitive advantages. However, as the complexity of integration process encompasses this one of privatisation issues, the list of criteria will be completed by factors related to specific requirements of adjustment to the Common Market, as well as political and social issues.

Here beneath we present the privatisation choice model, his principle basis and results.

## 2. Presentation of the Privatisation Model

*A) General Information*

Problems concerning the privatisation of public enterprises are relatively complex. This phenomenon does not simply constitute the inverse nationalisation, as guiding enterprises from the central planning economy to the market one is not an automatic process. Indeed, after the first drafts of privatisation, it appeared that if the nationalisation could have been operated by a simple legislative act depriving the beneficiaries of their property, the return of the private property involves a complicated process of reforms on the legislative, administrative, social and financial level.

The determination of the privatisation policy in the case of a particular enterprise (in the model: 'an alternative') is based on the enterprise characteristics and on the norms of assignment to defined categories. Enterprises are evaluated according to different criteria, which consider certain number of characteristics. Each privatisation policy is represented in the model by the corresponding category. These categories are put in order and differentiated by the profiles, which separate consecutive categories by defining their limits.

The original model sample contains 325 Polish industrial companies[3](list of branches embraced by the research could be found in the Appendix: Table 2). They belonged to 16 industrial sectors (according to the Polish nomenclature of sectors). As the result of the sample division, the following groups were obtained: two not disjoined groups of which one counts 162 companies (considered like small size ones) and the other 223 companies (regarded as big size ones).

[3]Data (1992/1993 years) taken from the list of 343 enterprises selected by the Ministry of Industry and Trade (MOIT) for privatisation purpose.

*B) Definition of Categories*

Types of privatisation process depend on the size of an enterprise, which is assigned for privatisation. In fact the method and stakes of privatisation are not the same in the case of large or small production structures. The social (the impact on employment), political and financial consequences of privatisation in the case of an enterprise engaging up to several thousand of employees differ significantly comparing to the case of a small company.

Therefore, the sample of enterprises was divided in two groups:

– small enterprises ($< 500$ employees),
– large enterprises ($> 300$ employees).

As the limit between small and big enterprises was not precisely defined firms of litigious size (from 300 to 500 employees) were considered being part of two groups simultaneously.

All categories were defined to suit methods and techniques of privatisation elaborated by the Polish government <the techniques of privatisation, pre-privatisation (restructuring) and non-privatisation process (status quo or bankruptcy)>. As we pointed out before, these categories followed the principle of competitiveness as it is the most competitive enterprises which are the first candidates for 'smooth' privatisation (they attract easily potential investors).

*Privatisation of Small Enterprises*

For small enterprises two types of privatisation process were outlined:

- *Bankruptcy* (it means total liquidation) for firms in a very bad financial state[4] or burdened by completely obsolete production equipment. This type of privatisation causes usually important employees redundancies as a given enterprise disappears.

- *Liquidation*[5] which means: selling out assets of an enterprise to one or several investors; or integrating them to assets of potential buyer(s) in exchange for the State participation in the capital of a privatised firm; or 'leasing' an enterprise with the option of buy-out' (firms were very often leased to employees).

*Privatisation of Big Enterprises*

In the case of large enterprises the choice is more complex. As the final objective is to eliminate the state enterprises dependence on the budget, several measures are undertaken in order to facilitate their passage to private sector. In perspective of attracting foreign investors and lean public finance in short delays enterprises are not usually restructured before selling offer. As the consequence all the burden of restructuring lays on a potential buyer. This strategy, although being contradictory to that applied in the EU, is undoubtedly the most rapid and the cheapest one.

Big enterprises are assigned to four categories:

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[4]The law article from 25/09/81.
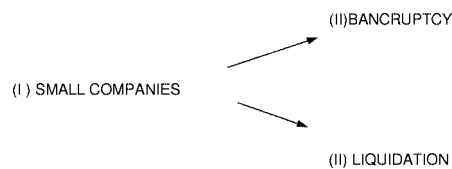[5]The law article from 13/07/90.

- *Status quo*

  An enterprise can be left unchanged (status quo) if there are no possibilities to sell it out and the cost of restructuring is estimated by the State to be too high. However, it is out of question to close it because of possible social resistance or because it is considered as necessary for the economic independence of the country. The status quo is a category the most far away from privatisation process, as the state keeps an enterprise under control without even medium term planning of privatise it.

- *Restructuring/rehabilitation*

  The state could restructure or rehabilitate a firm (before privatisation) increasing in this way its value for potential buyer. The restructuring option is considered as the preliminary stage prior to privatisation.

- *Immediate privatisation*

  - mass privatisation (National Investment Fund)[6]
  - individual capital privatisation (shares/stakes are sold through negotiations with a potential investor; public offering or public written tender).

The criteria generally selected to initiate privatisation of big companies by the method mentioned above are based on *competitiveness principle*, for example healthy base for export, prospects for profitability better than the average of the sector, capital intensive production (heavy investments), etc.

### C) Consecutive Stages of Sorting Process (presented at the Schema)

Division in two groups of small and big enterprises constitutes the first stage of the model sorting. These two groups will be treated separately. At the second and third stage of the sorting the type of privatisation is determined respectively for small and big enterprises according to the categories defined previously. The last stage of sorting will be to distinguish among enterprises to privatise immediately those, which will go through mass and individual capital privatisation. Therefore the category of immediate privatisation is to be divided into two sub-categories.

The categories are put in order going towards more advanced level of privatisation capability (or the most rapid privatisation) [7] in reference to the principle of *competitiveness.*

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                                              (II)BANCRUPTCY

(I) SMALL COMPANIES

                                              (II) LIQUIDATION
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[6]The program of **Massive privatisation.** consisted of distributing parts of the enterprise capital to the Polish national holdings (The National Investment Funds).

[7]This direction of categories is parallel with ascending function of enterprise performance.
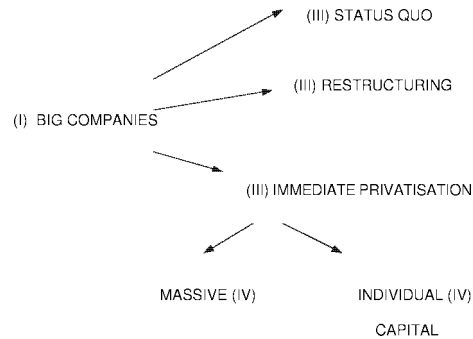
*D) Definition of Criteria and Parameters Applied in the Model*

Twelve *criteria* (presented in the Appendix: Table 1) constitute the bases of privatisation type determination for each enterprise. It should be noted that criteria are the same in different stages of sorting. Their axes of signification are the same, however sense of preference for each criterion could differ. The sense of preference should be indicated for each criterion in each of three stages of sorting. Elements that compose the criteria are the characteristics of enterprises.

There are three different *parameters* applied in the model: weights, thresholds of discrimination and profiles. The determination of the above parameters was based on constant and numerous interactions with the Polish decision-maker. Weights values during different stages of the model are presented in the Appendix (Table 3).

The categories are outlined for each stage of sorting. They are differentiated by one or several *profiles,* which separate the following categories. These profiles are elaborated for each criterion and represent fictive enterprises located on the border between two categories.

The process of defining profiles is of heuristic nature. First, the decision-maker indicates a certain number of companies or potential alternatives (in the model they are called alternatives-examples) characteristics of which help him to establish in a clear and obvious way in which categories they should be arranged. When the assignment of certain alternatives-examples do not seem sufficiently obvious according to the decision-maker, there is left for him any possibility of modifying some characteristics of these alternative-examples so that their arrangement is established in a more certain way.

In order to build the profiles, an analyst disposes of the assignments of alternatives-examples given by the decision-maker as well as of the weights and thresholds of each criterion. However it is needed to find the model of defining profiles conforming to assignments made by the decision-maker. The method 'criterion by criterion' allows for establishing profiles independently for each criterion, neglecting in this way its global dimension. Therefore this method is treated rather as the preliminary stage of the global method application. The second method allows for checking 80% of assignments in a quasi-certain way. Moreover it gives the possibility for manoeuvres as far as the improvement of profiles placement is concerned. There are presented in the Appendix (Table 4)

computing values of profiles and thresholds values obtained as a result of the interactions with the Polish decision-maker:

As far as the profiles are established, an outranking relation is built in order to enable the comparison of each alternative (an enterprise) to the consecutive profiles. After this stage the final two assignment procedures (optimistic and pessimistic) take place.

*E. Conclusions*

Here beneath there are presented the results of the model simulation on the example of 223 big enterprises sample. The privatisation model has been already adapted in order to test the integration model MIREM. New categories representing the degree of competitiveness (corresponding to the integration capability) replaced respective privatisation ones, as following:

1. Low competitiveness (instead of 'status quo');
2. Average competitiveness (instead of 'restructuring');
3. High competitiveness (instead of 'immediate privatisation').

As far as the criteria are concerned two of them had to be reinterpreted. The preference sense of the 'Number of employees' criterion could be left unchanged (decreasing) under the assumption that smaller enterprises are more flexible, less resistant to change and innovations necessary for acquiring competitiveness in the integration process. However, the meaning of the 'Cost for the State' criterion (represented by the indebtedness rate) should have been modified. In privatisation model the government was interested in rapid privatisation of heavily indebted enterprises (the sense of this criterion preference was therefore increasing). In the contrary, in the integration model such enterprises should be assigned to the first category of low competitiveness.

Nevertheless, all the criteria weights and parameters like profiles and thresholds were unchanged. The 'pessimistic' procedure of Electre-tri[8] (Roy, 1985) was applied as "the reasoning" of competitive markets is rather of conjunctive nature. Actually, an enterprise is not placed in the category 2 or 3, if it has only very high evaluations according to the first criterion and is very low assessed on the other criteria. It needs to have performances good enough taking under consideration the majority of criteria.

Following this procedure we obtained 28% (62 out of 223) big enterprises belonging to the category 'High competitiveness', 28% (63 out of 223) enterprises in the second category and 44% (98 out of 223) enterprises characterised by the low competitiveness. It means that merely more than a half of big enterprises had the base for being competitive and then to be integrated to the EU. As the data of enterprises in the original model were of the period 1992 and 1993 years this simulation could serve for detecting the industrial sectors having the highest potential for competitiveness improvement in the years to come (it was assumed that their enterprises should belong to 2 or 3 categories). In order to obtain such conclusions the statistical representation of each sector sample of enterprises

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[8]The version of Electre-tri method elaborated and being constantly developed by Prof. Bernard Roy and his team of collaborators from LAMSADE-Paris.

is presented (sufficient ratio of sample sales to the whole sector sales). Afterwards the analysis of categories on each industrial sector level is effectuated. The representation of the sample and results of the simulation are displayed in the Appendix (Table 5). This experiment could give the fundamentals for the inductive approach. We start from the first stage analysing the competitiveness of the sample of enterprises to proceed to the more aggregated level of industrial sectors in the integration model. Furthermore, having completed the construction of the integration model parameters we could introduce not only the actual data concerning industries but also the data characterising the beginning of 90's years. It will allow for results comparison and testing of respective models.

## 3. Epistemological Foundations of Integration Model MIREM

In this section there will be outlined the theoretical basis of the Integration Model MIREM founded on the same rule of *competitiveness* as privatisation one. Nevertheless, criteria that will be proposed differ from the previous model as they had to be adjusted to the nature of the problematic (economic integration process) and they refer to the more aggregated level of units considered in the model (industrial sectors instead of enterprises).

### A. The "a priori" Hypothesis: the Competitiveness Rule

It is essential to explain why the process of economic integration to the European Union is so closely linked to the concept of competitiveness. First of all, the ultimate objective of a successful integration is the creation of welfare and new added value in economies of current members as well as in the candidate countries ones. This means that this process should not provoke the absorbing of new members along with destruction effects on their economies. It should rather give the incentives to the constant progression in candidates' countries.

If the Common Market is treated as the separate system to which will be joined the alien elements; the former ones should converge as closely as possible to its *core rules* as well as to its level of development. First of all they must adapt to the context of the liberal economy and free market conditions on the Common Market where principally competition forces manage the system[9]. It has been already articulated in the theory that sectors developing under competition policy constraints, in low concentration market structure and exposed to foreign competitors (e.g., by strong import penetration) are forced to work on their competitiveness and will endure lesser shock as the consequence of economic integration (Norman, 1991). Consequently, even if till now liberal economies are established in the CEECs countries, the trade in industrial goods is almost liberalised, e.g., between Poland and the European Union and the competition framework is being created, the successful integration of industrial sectors will depend on the competitive

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[9]In the case of their failure, the respective policy of the European Commission is put into action to compensate the possible deviation.

behaviour of respective countries' industries and on the acceptance of their products by the European consumer on the large scale. Consequently, this means that these sectors in order to survive and benefit from integration positive effects on the Common Market must possess "the capability of producing the goods that meet the requirements of international markets while offering to citizens high standard of living which could be preserved for a long time"[10]

Moreover, taking advantage from integration welfare presupposes the intense participation in the 'free flow of goods, services, capital and people', which means for the industry the expansion of foreign trade. The results of the latter for industry is however the reflection of the competitiveness (Antonissen, 1988), being the core of our model. Additionally, the CEECs countries in order to join the main stream of the European trade which is the *intra-industry* one (Rapport du CEPII, 1998) must elaborate the most permanent form of competitiveness based on the quality, differentiation and specialisation.

The reality shows that the last integration (1995) of the EU with 'equal' partners (according to the level of economic development) constituted rather 'smooth' process compared to the previous accession of Greece, Spain or Portugal. Actually, the integration of unequal candidates is not impossible, however requires profound studies to select industrial sectors being the closest to the competitiveness level of the European ones from other categories of sectors risking the failure on the Common Market. As far as industrial policy is concerned, the former ones need incentives for development of their potential, for the latter ones it would be necessary to outline special policy or transitory periods after the accession [11]. This policy should be linked closely to the regional one as the sectors mentioned above risk provoking serious regional imbalances (Balassa, 1975). Till now, the regional problems of the CEECs countries are more acute than in the EU because the extent of distortions and the sheer size of some of the large enterprises non longer competitive have a marked effect on the local economy.

Under all the assumptions mentioned above the integration of industrial sector will depend fundamentally on three selective factors:

- *Intrinsic comparative advantages of a sector*;
- *Rationality (coherence) of a market to be integrated*;
- *Respect of these forces (loyalty) by the States concerned*.

The proposed integration model is founded on the basic postulate that integration, as being the complex phenomenon in the time and space, could be achieved only by the sequential stages in the adaptive and continuing way (it means like in the biological selection manner in the case of live species[12] and depending on internal and external characteristics (criteria).

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[10]The definition of competitiveness formulated by The Competitiveness Policy Council of the European Union (1992).

[11]These problematic requires concerted actions of industrial policy of the Commission Union and the respective countries' governments.

[12]The reader will see here the analogy of Walras law of "competition" with the Darwin law of "natural selection".

We assumed also as the axiom that *'THE MARKET'* is rational in its selection of competitive sectors and its actual choices are coherent with the previous ones. It is acting in function of limited information concerning economic environment, political power, external pressure, etc. In sum, it is acting exclusively considering volumes offered and bought by economic agents; as 'invisible hand' it applies the law of supply and demand.

Consequently, criteria that it applies in its CHOICE OF SELECTION AND ADAPTATION refer exclusively to objectives of economic efficiency. However, even if the Market is in the long term the principal decision-maker in this selection, different institutional actions resulting from political as well as social issues modify its decisions. Therefore there are defined "a priori" the family of 12 economic criteria reflecting these two sides of the integration selection process.

### B. The Basis of Criteria Family

#### B.1. First sub-family of criteria

The analysis has its foundations in the classic and neo-classic paradigm[13] of International Trade and in the concept of 'Competitive Advantage' of nations defined by Porter (1993). Consequently one of the direction in creating the family of criteria was to group them around several 'competitive bunches' (presenting themselves the sources of competitiveness) as following:

  a. Competitive advantage relative to the structure of domestic market
  b. Competitive advantage relative to the access to raw materials.
  c. Competitive advantage relative to the technology
  d. Competitive advantage relative to the quality of human resources
  e. Competitive advantage relative to the demand on the domestic market

It should be noted that points b., c. and d. make reference to the same determinant of the competitive advantage: factors of production. However they refer to different kinds of these factors embracing elementary ones (contributing to the effect of competitiveness to the lesser extent) in point b. as well as complex and specialised ones (enhancing the most strongly the competitiveness) in points c. and d.

Nevertheless, the factors listed above could help only partially to find the actual competitiveness of industrial sectors (for example certain structure of domestic market could enhance competitiveness but does not guarantee the competitive behaviour of enterprises in economic reality). It means that Porter gives more importance to *UPSTREAM* analysis of factors-determinants creating favourable framework for developing the competitiveness of industrial sectors. This approach is based on the idea that the competitiveness also depends strongly on such factors like the solidarity and efficiency of productive structure of national economy, or the quality of its technical infrastructure that shape together 'extern' advantages being the support for industries (Antonissen, 1988)

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[13]The Smith-Ricardo Paradigme, the Hecksher-Ohlin model, etc.: the basic postulate is the 'comparative advantage' of nations.

*B.2. Second sub-family of criteria*

Therefore, in order to obtain more realistic competitiveness evaluation of industrial sectors, *DOWNSTREAM* analysis of the industrial sector performance (rather than sources of it) should be added. In this sense, selected foreign trade indicators could constitute the most synthetic picture of *international competitiveness*. Moreover, the choice of criteria in reference to trade of Poland with the European Union and applying of Balassa (1993) indicators will help to measure the capability to compete and integrate with a given foreign market, which is the Common Market.

As far as the *internal* dimension of *competitiveness* is concerned, the criterion representing financial results of industrial sectors will complete downstream analysis.

*B.3. Third sub-family of criteria*

Finally, the criteria reflecting political, institutional and social constraints, which normally modify the efficiency of Market Forces, should be taken into consideration.

> Therefore it could be concluded that the order of categories is coherent with the logic of perfect competition market which could be found in the process of Regional European Itegration.

The three families of criteria[14] mentioned above with their axes of signification are presented in the Appendix (Table 6).

*C. The Problematic of the Multicriteria Method in the Model MIREM*

The issue of the integration of CEECs industrial sectors to the Common Market constitutes the typical Sorting Problematic ($\mathbf{P}\beta$) in multicriteria decision making as it is important for governments of these countries to obtain several categories which differentiate sectors in function of their capability of integration. With such results, it seems easier for these authorities to plan the 'integration industrial' policies for groups of sectors than for particular cases separately. As each industrial policy requires the recommendations rather on the aggregate level in order to formulate actions in the most horizontal way, our analysis focuses on the ' industrial sector' notion in the MCDM method. However, as the result, we can obtain the 'average' evaluations of sectors hiding enterprises scattered on the extremes of the competitiveness scale. In order to find the compromise between the requirements of industrial policy and the necessity of approaching the reality in the evaluation of sectors, we will consider the most desegregated as possible activities of production (3-digit level of the NACE nomenclature) as 'alternatives' in Electre Tri method. Afterwards, basing on these results we will make conclusions for the sectors defined in the most aggregated sense.

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[14]In the case of several criteria, privatisation model constituted the base for the definition of family criteria in the MIREM model.

This approach creates also the possibility for the consecutive research. Consequently, the activities of production belonging to each category could be the subject to comparative analysis which would refer to the Choice ($\mathbf{P}\alpha$) or Ranking ($\mathbf{P}\gamma$) MCDM problematic. Moreover, we could verify the results concerning each sector by proceeding to the more detailed level analysis. The criteria of the model could be adapted (e.g., following the pattern of privatisation choice model described above) in order to assign the enterprises belonging to one sector to corresponding categories. In this way the results of the analysis on the very aggregate level could be compared and verified by the results on less aggregate one.

The Sorting problematic seems also to be the most pertinent for the MIREM Model because of its particularity. The assignment of the potential alternative to respective category is determined only by its intrinsic characteristics (therefore it is independent of other alternatives evaluation). Actually, the capability of integration of a given sector to competitive Common Market is a *priori* independent of other sectors integration. According to the Economic Theory of *Competitive* Market these two processes could not be mutually blocked.

Industrial sectors will be assigned to five categories according to their virtual capability of integration to the Common Market (this assignment will constitute the base for recommendation of the Model for a given sector). Fundamental hypothesis for this classification follows the one of the privatisation model, as it is the competitiveness degree that creates the order of preference of categories. Categories are defined as stated beneath: the Market will accept the total integration of sectors belonging to the 5 category (VERY COMPETITIVE), rather than those of 4 category (COMPETITIVE), and those entering to 3 category (MEDIUM COMPETITIVENESS); finally there will be the most serious doubts concerning the last two categories: 2 (LOW COMPETITIVENESS) and 1 (NON COMPETITIVE).

## 4. Conclusions

In this paper it was attempted to show the analogy between the methodology of privatisation choice model and the new integration model MIREM. Not only they are close in applying of multicriteria method and the MCDM problematic of sorting. The main correlation results from the same epistemological foundations of competitiveness concept however under the assumption based on the Economic Theory that the integration of industrial sectors is closely based on its good performance having in its turn the source in competitiveness.

This analogy allows to treat the privatisation model as the reference for the MIREM one (as it has been illustrated in the simulation) from the conceptual and MCDM method point of view (creating the criteria, defining the parameters) till now and in the following stages of this research project.

## 5. Appendix

Table 1

The definition of the criteria applied in the privatisation choice model

| Criterion | Indicators | Axe of signification | Sense of preference |
|---|---|---|---|
| 1. Market Share | $\dfrac{(S_{ij})_t - (X_{ij})_t}{(S_j)_t - (X_j)_t + (M_j)_t}$ | Criterion important for a potential investor to evaluate perspectives of an enterprise on the internal market | High value: the recommendation for immediate privatisation (BE); for liquidation (SE) |
| 2. Degearing | $\dfrac{\frac{(E_{ij})_t - (E_{ij})_{t+1}}{(E_{ij})_t}}{\frac{(E_j)_t - (E_j)_{t+1}}{(E_j)_t}}$ | Criterion compares the level of an enterprise degearing to the one of the whole sector | High value: the base for immediate privatisation (BE); for liquidation (SE) |
| 3. Competitiveness | $\dfrac{\frac{(S_{ij})_t - (S_{ij})_{t+1}}{(S_{ij})_t}}{\frac{(S_j)_t - (S_j)_{t+1}}{(S_j)_t}}$ | Criterion compares the dynamic of the competitiveness level of an enterprise to the one of the whole sector | High value: the base for immediate privatisation (BE); for liquidation (SE) |
| 4. Exports volume level | $\dfrac{(X_{ij})_t / (S_{ij})_t}{(X_j)/(S_j)_t}$ | Criterion complementary to (1) one, as it reveals an enterprise performance from the export capacity perspective | High value: an enterprise possesses clients and important market share abroad; the recommendation for immediate privatisation (BE); for liquidation (SE) |
| 5. Profit | $\dfrac{(P_{ij})_t + (P_{ij})_{t+1}}{(S_{ij})_t + (S_{ij})_{t+1}}$ | Criterion shows the dynamism of an enterprise and its capacity of generating capital necessary for investments | High value: the recommendation for immediate privatisation (BE); for liquidation (SE) |
| 6. Financial performance | $\dfrac{(E_{ij})_t}{(liabilities_{ij})_t}$ | Criterion considers the global financial performance of an enterprise | High value: encouragement for restructuring or status quo (BE); for bankruptcy (SE) |
| 7. Technology coefficient | $\dfrac{(N_{ij})_t / (S_{ij})_t}{(N_j)_t / (S_j)_t}$ | Indicator of the technologic development of an enterprise (the state of equipment: modern or obsolete) | High value (>1) means weak adaptation to technological progress; recommendation for restructuring or status quo (BE); for bankruptcy (SE) |
| 8. Social resistance to privatisation | $(H_r)_t * e^{\alpha * ((L_{ij})_t)^\beta}$ | It represents the potential resistance of population, labour unions, politics parties to privatisation and changes in an enterprise in function of such factors | High value: the base for status quo (BE); for bankruptcy (SE) |

To be continued

| Criterion | Indicators | Axe of signification | Sense of preference |
|---|---|---|---|
| | | like the scale of employment or labour market characteristics in a region of an enterprise location | |
| 9. Productivity | $\dfrac{\frac{(S_{ij})_{t+1}}{(L_{ij})_{tt}}+\frac{(S_{ij})_{tt}}{(L_{ij})_t}-\frac{(S_j)_{t+1}}{(L_j)_{t+1}}-\frac{(S_j)_t}{(L_j)_t}}{\frac{(S_j)_{t+1}}{(L_j)_{t+1}}+\frac{(S_j)_t}{(L_j)_t}}$ | Criterion compares an enterprise productivity to the one of the whole sector; indicator value 0 means equality of parameters mentioned above | High value: the recommendation for immediate privatisation (BE); for liquidation (SE) |
| 10. Investment | $\dfrac{(I_{ij})_{t+1}+(I_{ij})_t-(D_{ij})_{t+1}-(D_{ij})_t}{(D_{ij})_{t+1}+(D_{ij})_t}$ | Criterion represents the investment realised by an enterprise relatively to the depreciation of its capital; the value –1 constitutes the minimum of its indicator (it corresponds to an enterprise that did not invest at all during this two years period); the value 0 represents the case of an enterprise that invested the equivalent of its capital depreciation | High value: the recommendation for immediate privatisation (BE); for liquidation (SE) |
| 11. Employment level | $(L_{ij})_t$ | Criterion considers the decision-maker responsibility which is higher as the number of employed people increases | High value: the recommendation for status quo (BE); for liquidation (SE) |
| 12. Cost for the State | $\dfrac{(E_{ij})_t+(E_{ij})_{t+1}}{2}$ | Criterion reflects the cost of an enterprise conservation by the State. It is often in opposition with several other criteria | High value: the recommendation for immediate privatisation (BE); for bankruptcy (SE) |

In the table there are given the examples of preference sense in the case of the second (the division of small enterprises) and the third stage of the sorting process (the first division of big enterprises).

Characteristics applied in the indicator composition:

$D$ – depreciation of capital; $E$ – indebtedness;

$i$ – an analysed enterprise; $j$ – sector an analysed enterprise belonged to;

$Hr$ – the unemployment rate in the voivodeship of an analysed enterprise location;

$I$ –investments; $L$ – number of employees;

$M$ – value of imports; $N$ – expenditures on energy and raw materials;

$P$ - profit; $S$ - sales; $X$ – value of exports;

$t-1, t, t+1$ – years of the analysis; BE – big enterprises;

SE – small enterprises.

Table 2

The list of industrial sectors of MOIT sample[15]

| | |
|---|---|
| Non-ferrous metal sector (05) | Glass industry sector (15) |
| Iron and steel industry sector (06) | Ceramic industry sector(16) |
| Machines industry sector (07) | Wood industry sector (17) |
| Construction sector (08) | Pulp and paper industry sector(18) |
| Precision industry sector (09) | Industry of the spinning mill (19) |
| Electronic and electric industry sector (11) | Textile industry sector (20) |
| Chemical industry sector (12-13) | Clothes industry sector (21) |
| Building materials industry sector (14) | Leather goods industry sector (22) |

Table 3

Weights of the criteria obtained during interactions with the Polish decision-maker

| Weights determined by decision-maker List of criteria | Weights for SSE | Ratio *SSE | Weights SBE | Ratio *SBE | Weights SEIP | Ratio *SEIP |
|---|---|---|---|---|---|---|
| C1, Market Share | 55 | 15.4% | 100 | 23.5% | 100 | 24.3% |
| C2, Degearing | 10 | 2.8% | 50 | 13.3% | 50 | 12.2% |
| C3, Competitiveness | 36 | 10.1% | 40 | 10.6% | 10 | 2.4% |
| C4, Exports level | 45 | 12.6% | 20 | 5.3% | 12 | 2.9% |
| C5, Profit | 15 | 4.2% | 15 | 4.0% | 90 | 21.9% |
| C6, Financial performance | 60 | 16.8% | 60 | 15.9% | 20 | 4.9% |
| C7, Technology coefficient | 5 | 1.4% | 7 | 1.9% | 7 | 1.7% |
| C8, Social resistance | 6 | 1.7% | 25 | 6.6% | 40 | 9.7% |
| C9, Productivity | 29 | 8.1% | 18 | 4.8% | 25 | 6.1% |
| C10, Investment | 8 | 2.2% | 12 | 3.2% | 7 | 1.7% |
| C11, Number of employees | 63 | 17.6% | 25 | 6.6% | 35 | 8.5% |
| C12, Cost for the State | 25 | 7.0% | 5 | 1.3% | 15 | 3.6% |
| *Total* | 357 | 100.0% | 377 | 100.0% | 411 | 100% |

SSE: Sorting of small enterprises

SBE : Sorting of big enterprises

SEIP: Sorting of enterprises for immediate privatisation

Ratio *SSE: Percentage of the given criterion weight to weight sum of all the criteria for SSE

Ratio *SBE, Ratio SEIP: analogues values for SBE and SEIP

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[15]MOIT was reluctant to provide data concerning the following sectors: 01 (coal mining), 02 (petrol), 03 (energy) and 04 (metallurgy). As there were no enterprises in the sector 10 (transport) selected for privatisation, we obtained the sample embracing 16 industrial sectors.

Table 4

Profiles and thresholds values obtained during interactions with the Polish decision-maker

| Thresholds and evaluations constructed with help of heuristic method<br><br>List of criteria | Threshold SSE | Profile Value SSE | Threshold SBE First profile | First Profile Value SBE | Threshold SBE Second Profile | Second Profile Value SBE | Threshold SEIP | Profile Value SEIP |
|---|---|---|---|---|---|---|---|---|
| C1, Market share | 0.02% | 0.13% | 0.2% | 0.7% | 0.2% | 0.9% | 0.5% | 2.1% |
| C2, Degearing | 7.5 | 17 | 1 | 12 | 0.5 | 20 | 0.5 | 11 |
| C3, Competitiveness | 5 | -12 | 3.5 | -8 | 3 | 0 | 3 | 8 |
| C4. Exports level | 0.3 | 0.5 | 0.05 | 0.06 | 0.05 | 0.2 | 0.05 | 0.29 |
| C5, Profit | 0.05 | -0.15 | 0.05 | -0.7 | 0.05 | -0.15 | 0.05 | 0.09 |
| C6, Financial Performance | 0.17 | 0.85 | 0.1 | 1.6 | 0.1 | 1 | 0.05 | 0.012 |
| C7, Technology Coefficient | 0.2 | 1.3 | 0.1 | 1.8 | 0.1 | 1.3 | 0.1 | 1.05 |
| C8, Social resistance | 0.05 | 0.3 | 0.2 | 2.7 | 0.2 | 1.9 | 0.5 | 1.8 |
| C9, Productivity | 0.05 | -0.55 | 0.05 | -0.45 | 0.1 | -0.25 | 0.1 | 0.25 |
| C10, Investment | 0.1 | -0.8 | 0.1 | -0.9 | 0.1 | -0.7 | 0.1 | -0.9 |
| C11, Number of employees | 50 | 149 | 500 | 5700 | 500 | 4300 | 500 | 2000 |
| C12, Cost for the State | 60000 | 285000 | 50000 | 60000 | 75000 | 240000 | 50000 | 110000 |

SSE: Sorting of Small Enterprises;     SBE: Sorting of Big Enterprises;

SEIP: Sorting of Enterprises for Immediate Privatisation

Table 5

The representation of the sample and results of the simulation

| Industrial sector | Number of sample enterprises / number of the whole sector enterprises | Share of sample enterprises sales in the whole sector sales | Percentage of 2 or 3 categories' enterprises in the sample |
|---|---|---|---|
| Non-ferrous metal sector (05) | 0.41 | 0.28 | 89 |
| Iron and steel industry sector (06) | 0.05 | 0.27 | 67 |
| Machines industry sector (07) | 0.07 | 0.14 | 54 |
| Construction sector (08) | 0.09 | 0.09 | 29 |
| Precision industry sector (09) | 0.08 | 0.18 | 90 |
| Electronic and electric industry sector (11) | 0.08 | 0.3 | 58 |
| Chemical industry sector (12-13) | 0.01 | 0.31 | 55 |
| Building materials industry sector (14) | 0.03 | 0.13 | 67 |
| Glass industry sector (15) | 0.07 | 0.17 | 50 |
| Ceramic industry sector(16) | 0.06 | 0.33 | 100 |
| Wood industry sector (17) | 0.01 | 0.07 | 71 |
| Pulp and paper industry sector(18) | 0.02 | 0.03 | 100 |
| Industry of the spinning mill (19) | 0.06 | 0.04 | 18 |
| Textile industry sector (20) | 0.01 | 0.02 | 33 |
| Clothes industry sector (21) | 0.008 | 0.04 | 60 |
| Leather goods industry sector (22) | 0.01 | 0.06 | 75 |

Table 6

The family of criteria in the MIREM model

| Criterion | Indicator; Min and Max | Axe of signification | Sense of preference |
|---|---|---|---|
| *First sub-family of criteria based on:* | | | |
| a. Competitive advantage relative to structure of domestic market | | | |
| 1. Concentration of production | $\dfrac{(\mathrm{Pr}_{ip}^t)^4}{\mathrm{Pr}_{ip}^t}$; $<0;1>$ | Criterion presents the degree of competition and rivalry inside the sector as they are inversely correlated with the concentration level | In general low concentration enhances competitiveness. However, too low concentration could be the obstacle to generating profit sufficient for technological progress. This two sides effect should be considered while defining profile limits of categories |
| b. Competitive advantage relative to the abundance of raw materials | | | |
| 2. Abundance of raw materials for production | $\dfrac{X_{sip}^t}{M_{sip}^t}$; $<0;+\infty>$ | Criterion measures the sector independence of imported raw materials | Abundance of raw materials in the country of origin could be the base for competitiveness (reduction of production and transport costs) and for foreign trade stimulation (Heckscher, 1991); thus improving overall competitiveness |
| c. Competitive advantage relative to the technology | | | |
| 3. Technology "input using" (energy, raw materials) | $\dfrac{N_{ip}^t/S_{ip}^t}{N_{jp}^t/S_{jp}^t}$ $<0;+\infty>$ | Criterion compares the degree of energy and raw materials consumption in relation to sales with the value of the whole industry | Value of this indicator is inversely proportional to 'the level' of the competitiveness |
| d. Competitive advantage relative to the demand on domestic market | | | |
| 4. Saturation of domestic market | $\dfrac{O_{ip}^{t+1}-O_{ip}^t}{O_{ip}^t} - \dfrac{D_{ip}^{t+1}-D_{ip}^t}{D_{ip}^t}$; $<-\infty;+\infty>$ | Criterion shows relation between offer and demand in a sector. The saturation of the market implies strong internal competition and creates incentives to gain foreign markets | Positive and high value of indicator (rate of supply variation – rate of demand variation) enhances competitiveness |

e. Competitive advantage relative to the quality of human resources

| Criterion | Indicator; Min and Max | Axe of signification | Sense of preference |
|---|---|---|---|
| 5. Labour productivity | $$\frac{\left(\frac{S_{ip}^t}{L_{ip}^t}+\frac{S_{pi}^{t+1}}{L_{ip}^{t+1}}\right)-\left(\frac{S_{jp}^t}{L_{jp}^t}+\frac{S_{jp}^{t+1}}{L_{jp}^{t+1}}\right)}{\left(\frac{S_{jp}^t}{L_{jp}^t}+\frac{S_{jp}^{t+1}}{L_{jp}^{t+1}}\right)};$$ $<--1et+\infty>$ | Criterion compares the labour productivity of a sector with the one of the whole industry | Value of the indicator is positively correlated with the competitiveness notion |
| *Second sub-family of criteria:* | | | |
| 6. Foreign trade growth | $\frac{X_{ip}^t}{X_{ip}^o * r}, r = \frac{M_{iUE}^t}{M_{iUE}^o}; <0; +\infty>$ based on the indicator of hypothetical exports of K. W. Rotschild (Pawlas, 1999) | Criterion represents the growth of Polish sector exports in comparison to the EU imports growth | If the ndicator value exceeds 1, the competitiveness improved during the analysed period as the rate of exports growth intensified more than imports growth of the Common Market (integration objective) |
| 7. Relative share in the Common Market imports | $\frac{\left(X_{ip}^t\right)^{UE}}{\left(X_{jp}^t\right)^{UE}} : \frac{\left(X_{jp}^t\right)^{UE}}{\left(x_{jm}^t\right)^{UE}}; 0 \; et + \infty$ M. Panic et A.H. Rajan indicator (Pawlas, 1999) | Criterion constitutes relative share (in comparison with other commercial partners) of a sector in imports of the Common Market | If indicator value exceeds 1, the analysed country has the competitive advantage in a given sector. Its high value will suggest intensive trade exchanges inside future potential enlarged Common Market; thus smooth integration process |
| 8. Relative external specialisation | $\left(\frac{X_{ip}^t}{X_{jp}^t} - \frac{X_{iUE}^t}{X_{jUE}^t}\right) - \left(\frac{M_{ip}^t}{M_{jp}^t} - \frac{M_{iUE}^t}{M_{jUE}^t}\right)$ (Mathis, 1988); High specialisation (%): 10–6; Average specialisation: 6 – (-2); Low specialisation: (-2)–(-10) | Criterion measures the degree of relative external specialisation of a given sector compared to the Common Market specialisation | High indicator value (the difference between specialisation in exports and dependence on imports) means high capacity of competing on the Common Market |

| Criterion | Indicator; Min and Max | Axe of signification | Sense of preference |
|---|---|---|---|
| 9. Intra-industry commerce | $\dfrac{\left|\left(X_{ip}^t\right)^{UE}-\left(M_{ip}^t\right)^{UE}\right|}{\left(X_{ip}^t\right)^{UE}+\left(M_{ip}^t\right)^{UE}};<0,1>$ <br> (Balassa 1989) | Criterion shows the degree of specialisation in intra-industrial commerce between analysed sector and the Common Market. This kind of trade constitutes the major trend in commercial exchanges among developed countries | The indicator value is positively correlated with competitiveness improvement. Its value 1 signifies the lack of intra-industrial specialisation; value 0 means max specialisation |
| 10. Economic profile | $\dfrac{P_{ip}^t+P_{ip}^{t+1}}{S_{ip}^t+S_{ip}^{t+1}};<-\infty,+1>.$ | Criterion represents the ratio: accumulated profit in relation to sales volume | The high value of indicator proves the dynamism and the competitiveness of a given sector through its capacity to generate profit on sales |
| *Third sub-family of criteria:* | | | |
| 11. Regional social resistance to changes | $(H_{ivp})_t * \dfrac{L_{ivp}^t}{L_{jvp}^t};<0 et +\infty>$ | Criterion shows the social resistance to changes (necessary to enhance the competitiveness) in regions marked by strong concentration of production in a given industry. Its indicator constitutes the function of unemployment rate in concerned regions and the weight of sector labour in regional employment | The indicator is inversely proportionate to the competitiveness. Consequently its high value means potential social constraints which could delay the reconstruction or the application of innovations in a given sector; thus jeopardising the competitiveness and potential integration of a given sector to the Common Market |
| 12. Political and strategic dependence | Qualitative criterion | Criterion considers political and strategic importance of a given sector to the national economy. In such a case the competitiveness of a given sector is hardly comparable as it will be excluded to some extent from free competition; as far as the integration is concerned certain transitory adaptation periods are bound to be negotiated with the European Commission | The existence of such dependence determines the application of veto threshold |

Characteristics applied in the indicators are nearly the same as in the privatisation model. Differences and explanations are the following:

- $D$ – depreciation of sector capital;
- $Di$ – demand defined for each sector, e.g., in the case of steel industry it embraces the production of steel + the consumption of iron in the rolling mills + exports – imports + (–) variation of stocks (in steel factories and sellers');
- $i$ – an analysed industrial sector;
- $j$ – all the industry;
- $o$: reference period;
- $Oi$ – supply defined for each sector, e.g., in the case of steel industry it embraces the production of steel brut + steel imports;
- $p$ – analysed country (in this case: Poland);
- $P$ – average profit;
- $Pr$ – production of a sector;

$\left(Pr_{ip}^t\right)^4$ – | production of 4 the first (according to the production volume) national enterprises of an analysed sector |

- $t-1,\ t,\ t+1$ – years of the analysis;
- $v-3$ voivodeships marked by the strongest concentration of production in a given industrial sector;
- $X_{ip}$: exports of Poland ($p$) in the sector $i$;
- $X_{iUE}$: exports of the European Union in the sector $i$;
- $M$: analogue characteristics in the case of imports;

$(X_{ip}^t)^{UE}$ – | $UE$ – means that exports is directed towards the countries of the European Union; analogue characteristics in the case of imports ($M$) |

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# Pramoninių Centrinės ir Rytų Europos šalių sektorių konkurencingumas kaip pagrindas jų sėkmingai integracijai į Europos Sąjungą

Francis Condis y TROYANO, Aleksandra BAT

Šiame straipsnyje apžvelgiama MIREM (Multicriteria Industrial and Regional Economic Model) modelio metodologija kaip empirinė priemonė pramoninei politikai įgyvendinti integruojantis CREŠ į ES. Epistemologinis pagrindimas remiasi M. Porter konkuravimo privalumų ir B. Balassa ekonominės integracijos teorijomis, skiriant pagrindinį dėmesį konkurencingumo koncepcijai. Integracijos problematikai nagrinėti taikoma metodologija, pagrįsta daugiakriteriniu metodu ELECTRE-III, kriterijų aibės tyrimu ir modeliavimu MIREM analoginių modelių priemonėmis.