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THE EUROPEAN UNION IN A TRANSITION ECONOMY

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ABSTRACT. ***A transition economy differs from the economies of well-developed countries of Western. It would be difficult to answer this antagonism in a short text. The aim of this article is rather to bring a model for solving the multi-objective problem underlying this antagonism. As an example, some objectives are chosen by the authors instead of being selected by all the stakeholders interested in the issue. In addition, alternative scenarios are possible: a scenario of welfare economy with a full market mechanism and a scenario of sustainable development. In each of these scenarios admission to EMU and EU are considered, but also secession meant rather prior to than ex-post the European integration. The examples of Lithuania and Poland illustrate the application on transition economies. The hope remains that one day the model will be used for a full-fledged study on the European economic integration of the transition economies of Central and Eastern Europe.***

KEYWORDS: transition economy, multi-objective optimization, the MOORA method, reference point theory, normalized ratios, Lithuania, Poland.

JEL classification: C02, C61, E17, O11, P29.

Introduction

The countries of *Central and Eastern Europe* and *the CIS, China* and *Vietnam* are considered as transition economies. Of this group the *Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia* and *Slovenia* are already members of the European Union. Later, on January 2007, Bulgaria and Romania became member and at that date Slovenia, as the first country from Central and Eastern Europe, became member of the European Monetary Union. For two selected countries, namely Lithuania and Poland, the usefulness of this European integration will be studied on the one side from the point of view of the welfare economy with market economy and of sustainable development on the other. Immediately raises the question if the welfare economy with market economy and sustainable development go together with one another. Welfare economy (the term was invented by professor Pigou, 1920) tries to bring material wealth to the individual by promoting economic growth and full employment (Beveridge, "full employment in a free society", 1944), but also with a touch of social feeling (President Roosevelt and his New Deal, Beveridge, 1942).

In a general well-being economy each individual would have to feel good concerning material wealth, health, education, all kind of security and concerning the environment. Sustainable development is considered as the promoter of the general well-being not only for the actual generation but for all future generations. Welfare economy and sustainable development are treated separately as two different scenarios and simulations are made for these two scenarios. Three alternative solutions are maintained: the European Monetary Union (EMU), the European Union (EU) and Secession. If some amazing conclusions could be drawn, it was only the intention to illustrate the usefulness of a method. Thorough research would still be further necessary in order to provide a working tool for policy makers.

1. Antagonisms in Human Society and Limits to the Research

Already in the definition of economics an antagonism is hidden, namely that scarce means are opposed to many needs. However**,** other antagonisms can be stipulated, such as micro-costs and micro-benefits versus social needs, material welfare (Welfare economy) versus general well-being (Well-being economy and sustainable development). The antagonisms are even present in human beings themselves, meaning that they could have different objectives, sometimes opposite to each other. In fact it concerns a *Hierarchical Objectives Structure* under the form of a pyramid descending with increasing specificity from super-objectives, such as material welfare and general well-being to more specific objectives. The specificity finally boils down to measurability of the objectives under the name of *Attributes*, in sustainable development language called *Indicators*. It is a top-down approach**.** These attributes need to have the consent of all the stakeholders, stakeholders meaning the representatives of all persons interested in the issue (from now on, when the text speaks of "objective" also "attribute" is meant and vice versa).

We tried to enclose all this in a simulation with two Scenarios on the one side of Welfare economy and of Sustainable development on the other. In each scenario objectives are going down to measurement by attributes. Three Alternatives are taken into consideration: membership of the European Union (EU), of the European Monetary Union (EMU) and Secession[†].

[†] Of course, more alternatives could be foreseen such as EU without ERM bis or EU with ERM bis. ERM bis is the waiting room to become member of EMU after two years. The Exchange Rate Mechanism bis (ERM bis) means that the local currency is linked to the EURO at a fixed rate with bands +/-15%. Lithuania and Estonia entered ERM bis on June 2004, Latvia on May 2005 and Slovakia on November 2005. Poland has still a free float of its currency.

However, limits had to be set concerning research, economic theory, certain quality attributes-indicators and the choice of the objectives. *First*, only a limited desk research was undertaken. *Secondly*, economic theory was limited to the consideration of some theories such as: the Balassa-Sameulson effect (Balassa, 1964; Balazs et al., 2002; Samuelson, 1964 and 1994), disembodied Cobb-Douglas (Brauers, 1987a, p. 95) and the nominal group technique (Van De Ven, Delbecq, 1971; Brauers, 1987b; Brauers and Lepkova, 2002; Brauers and Lepkova, 2003; Brauers, 2004, pp. 44-64). In the text quality attributes-indicators are mostly translated into cardinal numbers with the exception of the attitude of politicians and the cultural option. Politicians have their own political logic related to the elections, their own ethics and even their own ideology. In addition, a European cultural space is not taken into consideration (Melnikas, 2005a, 2005b, 2005c; Dick and Payne, 2005; Garsia, 2005).

Finally, instead of having the consent of all stakeholders on the choice of the attributes, the authors have chosen the following set of attributes: minimization of Inflation, minimization of the Increase of the Public Debt (% of GDP), maximization of the Increase in Productivity, minimization of the Deficit in the Public Budget (% of GDP), minimization of Unemployment (in % of labor force), maximization of the Increase in GDP (in % in constant prices) and minimization of the Deficit in the Balance of Payments, current account (in % of GDP). In this way a matrix is composed with the attributes in the columns and the alternatives in the rows, such as shown in *Table 1*.

Table 1. A Simulation for a welfare economy in Lithuania (2007-2012)

Yearly	1. inflation (in %) MIN.	2. Δ public debt % GDP MIN.	3. Δ productivity in % MAX.	4. minus public budget % GDP MIN.	5. unemployment (% labor force) MIN.	6. Δ GDP (in%) MAX.	7. deficit. Bal. of.P. curr. acc. % GDP MIN.
EMU	2	3	1.9	3	17	6.88	5
EU	4	1.9	5	1.9	8.3	7	10
Secession	3	1	1.5	1	14.3	5.5	5.7

A matrix of responses of different alternatives on different attributes is obtained represented as:

$$(x_{ij}) \qquad (1)$$

with: x_{ij} as the response of alternative j on attribute i

$i=1,2,...,n$ as the attributes

$j=1,2,...,m$ as the alternatives

2. A New Method: the MOORA Method

MOORA (**M**ulti-**O**bjective **O**ptimization on the basis of **R**atio analysis) starts with the said matrix of responses:

$$(x_{ij})$$

The method goes for a ratio system in which each response of an alternative on an objective is compared to a denominator, which is representative for all alternatives concerning that objective. For this denominator the square root of the sum of squares of each alternative per objective is chosen (Van Delft and Nijkamp, 1977) (*Formula 2*):

$$_N x_{ij} = \frac{x_{ij}}{\sqrt{\sum_{j=1}^{m} x_{ij}^2}} \qquad (2)$$

with: x_{ij} = response of alternative j on objective i

$j = 1,2,...,m$; m the number of alternatives

$i = 1,2,...n$; n the number of objectives

${}_N x_{ij}$ = a dimensionless number representing the normalized response of alternative j on objective i. These normalized responses of the alternatives on the objectives belong to the interval *[0; 1]*. *Dimensionless Numbers* have no specific unit of measurement, but are obtained for instance by deduction, multiplication or division.

For optimization these responses are added in case of maximization and subtracted in case of minimization (*Formula 3*):

$$ {}_N y_j = \sum_{i=1}^{i=g} s_i \, {}_N x_{ij} - \sum_{i=g+1}^{i=n} s_i \, {}_N x_{ij} \qquad (3) $$

with: $i = 1,2,...,g$ as the objectives to be maximized

$i = g+1, g+2, ..., n$ as the objectives to be minimized

${}_N y_j$ = the normalized assessment of alternative j with respect to all objectives.

In this formula linearity concerns dimensionless measures in the interval *[0; 1]*. An ordinal ranking of the ${}_N y_j$ shows the final preference[‡].

The coefficient s_i is introduced as a Significance Coefficient for the i^{th} objective

In MOORA an attribute of an alternative cannot be very much larger than this one of another alternative, as all their ratios are smaller than one. Nevertheless, it may be necessary to stress that some objectives are more important than others. Therefore, to give more importance to an objective its dimensionless numbers are multiplied by a *Significance Coefficient, s_i (Coefficient Method)*.

The *Attribution of Sub-Objectives* represents another solution. The *Attribution Method* is more refined than the Coefficient Method as the attribution method succeeds in characterizing an objective better. For instance, instead of giving a significance coefficient of three to pollution abatement in the simulation, in a hierarchical structure the objective "pollution abatement" is divided into three sub-objectives: 1) the Greenhouse Effect, 2) Energy Consumption and 3) Other Pollution, each with their own characteristics. At the same time the three sub-objectives show the three possible methods of measurement:

1) The Greenhouse effect is directly measured as tonnage of CO_2 emission per capita.
2) The energy consumption for Lithuania is indirectly or alternatively measured by benchmarking on basis of kg oil-equivalent per 1,000€ GDP.
3) "Other Pollution" is measured by a dimensionless number, nevertheless a cardinal number. As the differences may not be too large 2, 3 and 4 are chosen: 3 being 1.5 times 2 and 4 only the double of 2. Distances of other series are mostly too large (Brauers, 2004, p. 97-99).

Why total ratios are not preferred to the square root method in MOORA?

The formula of total ratios replaces *Formula (2):*

$$ {}_N x_{ij} = \frac{x_{ij}}{\sum_{j=1}^{m} x_{ij}} \qquad (4) $$

The normalized responses of the alternatives on the objectives usually belong to the interval *[0; 1]*. Allen (1951) used already this formula, but Voogd (1983) applied it for multi-

[‡] Table 1 column 4 presents another possibility. Indeed, instead of a normal increase in productivity growth a decrease remains possible. At that moment the interval becomes *[-1, 1]*.

objective evaluation. For optimization these responses are added in case of maximization and subtracted in case of minimization (cf. *Formula 3*). The total ratios are smaller than those in the square roots method, but their calculation is less complicated than with the square roots method. However, they will not necessarily lead to the same results[§]. The total ratios method could form a control on the square roots method. Nevertheless, it would be good to have an additional but rather external control on the MOORA methods. Therefore, a Reference Point Theory is chosen.

3. Introduction of Ratios in a Reference Point Theory

This *Reference Point Theory* starts from the already normalized ratios as defined in the MOORA methods, namely *Formulas (2)* or *(4)*.

Next, Reference Point Theory chooses a Maximal Objective Reference Point, which possesses as co-ordinates the highest co-ordinate per objective of all the candidate alternatives. For minimization, the lowest co-ordinate is taken.

In order to measure the distance between the co-ordinates of the alternatives and those of the reference point, the *Min-Max Metric of Tchebycheff* is chosen (Karlin and Studden, 1966, p. 280):

$$\underset{(j)}{Min}\left\{\max_{(i)}/r_i - {}_N x_{ij}/\right\} \tag{5}$$

with: $i = 1, 2,..., n$ as the objectives

$j = 1, 2,..., m$ as the alternatives

r_i = the i[th] co-ordinate of the maximal objective reference point. Each co-ordinate of the reference point is selected as the highest corresponding co-ordinate of the alternatives

${}_N x_{ij}$ = the normalized objective i of alternative j

In the case of a minimum, the distances between the rather low co-ordinate of the reference point and the corresponding co-ordinates of the responses of the alternatives on an objective are negative. Therefore, only absolute values are introduced in the Min-Max metric. Elsewhere it is proved that this Reference Point Theory is the best choice between all reference point theories (Brauers, Zavadskas, 2006, p. 457-459).

Simulation exercises illustrate the application of the MOORA and Reference Point methods.

4. The Welfare Economy in Lithuania

Welfare economy and sustainable development are treated separately as two different scenarios or super-objectives. For the welfare economy the following attributes are maintained as average yearly figures until 2012: inflation as a % of the general price level, increase in the public debt as a % of the Gross Domestic product (GDP), % increase in productivity, deficit in the public budget as a % of GDP, unemployment as a % of the labor force, % increase of GDP, % deficit on the current account of the balance of payments.

Three alternative solutions are considered: The European Monetary Union, the European Union and Secession. The EMU and the EU are enough known, but the secession solution may ask for some explanations. Instead of full membership in the European Union, a

[§] Moreover, coming back to the productivity example, instead of an increase in productivity growth a decrease is possible. Even if many similar situations such as with the productivity example occur the denominator of the ratio could become positive, negative or even equal to zero. At that moment, the ratio itself could obtain all positive or negative values, or could even be undefined. This represents another disadvantage of this total ratio method.

loose cooperation could be foreseen, for instance under the form of a Free Trade Zone. A status quo ante, more or less comparable with the fluctuations during the years before 2004 when the membership in the EU started, is maintained concerning the main economic indicators. This conservatism will satisfy some parts of the population, which is mostly afraid of changes. The atomic plant is kept in operation and will continue to export electricity to the neighboring countries. *Table 2* shows the alternative solutions facing the different objectives.

Table 2. A Simulation for a welfare economy in Lithuania (2007-2012) by the square roots method of MOORA and by the reference point method[**]

2a - Matrix of Responses of Alternatives on Objectives: (x_{ij})

Yearly	1. Inflation (in %) MIN.	2. Increase Public Debt (% GDP) MIN.	3. Increase Productivity (in %) MAX.	4. Def. Public Budget (% GDP) MIN.	5. Unemploym. (in % labor force) MIN.	6. Increase GDP (in%) MAX.	7. Deficit. B of.P. curr. account. (in % GDP) MIN.
EMU	**2**	**3**	**1.9**	**3**	**17**	**6.88**	**5**
EU	**4**	**1.9**	**5**	**1.9**	**8.3**	**7**	**10**
Secession	**3**	**1**	**1.5**	**1**	**14.3**	**5.5**	**5.7**

2b - Sum of squares and their square roots

EMU	4	9	3.61	9	289	47.3344	25
EU	16	3.61	25	3.61	68.89	49	100
Secession	9	1	2.25	1	204.530859	30.25	32.49
sum of squares	29	13.61	30.86	13.61	562.420859	126.5844	157.49
square roots	5.3851648	03.68917335	5.55517776	3.6891733	23.715414	11.250973	12.54950198

*2c - Objectives divided by their square roots and **MOORA***

								sum	rank
EMU	0.3713907	0.813190	0.34202326	0.8131903	0.71683337	0.61150	0.398422185	**- 2.15950**	**3**
EU	0.7427814	0.515021	0.90006121	0.5150205	0.349983	0.6221684	0.79684437	**- 1.39742**	**1**
Secession	0.5570860	0.271063	0.27001836	0.2710634	0.6030436	0.4888466	0.454201291	**- 1.39759**	**2**

*2d - **Reference Point Theory** with Ratios: co-ordinates of the reference point equal to the maximal objective values*

r_i	0.3713906	0.271063	0.90006121	0.2710634	0.34998	0.62217	0.398422185

2e - Reference Point Theory: Deviations from the reference point

								max.	rank min.
EMU	0	0.54213	0.55803795	0.542127	0.36685	0.01067	0	**0.558038**	**2**
EU	0.3713906	0.243957	0	0.243957	0	0	0.398422	**0.398422**	**1**
Secession	0.1856953	0	0.63004284	0	0.25306	0.13332	0.055779106	**0.630043**	**3**

The explanation of this table is as follows coming back to *Formula (2)*:

$$_N x_{ij} = \frac{x_{ij}}{\sqrt{\sum_{j=1}^{m} x_{ij}^2}}$$

Sub-Table 2a gives the elements of the numerator of the formula. The elements of the denominator are calculated in *Sub-Table 2b*, whereas *Sub-Table 2c* shows the quotients. Also in *Sub-Table 2c,* MOORA adds the maxima and subtracts the minima with the final sums ranked after importance. The MOORA simulation with total ratios produces the same rankings as the square roots approach (details of computation are available from the authors).

In *Sub-Table 2d*, for a maximum, each co-ordinate of the reference point is the highest corresponding co-ordinate of the alternatives. For a minimum, the lowest corresponding co-ordinate is chosen. *Sub-Table 2e* shows the deviations from the reference point. In a minimum case the absolute value is given. Finally, the alternatives are ranked after the lowest value of the highest deviation (see *Formula 5*).

In all simulations the EU solution is preferred above the other, whereas the EMU in MOORA comes last, but second in the Reference Point Method.

Above it was noted that it may be necessary to stress that some objectives are more important than others. Therefore, two methods were proposed, the coefficient method with the introduction of significance coefficients and the attribution method with the attribution of different sub-objectives instead of a single objective. Further research proves that the

[**] The source of the data is given in *Appendix A*.

coefficient method has no sense in MOORA. Let us therefore return to *Table 2* in which we give a significance coefficient of two to a minimization namely increase in the public debt and to a maximization namely increase in GDP. *Table 3* shows the results.

Table 3. A MOORA Simulation for the Lithuanian Welfare Economy (2007-2012) with a significance coefficient of 2 for objectives 2 and 6

3a - Matrix of Responses of Alternatives on Objectives: (xij)

Yearly	1. Inflation (in %) MIN.	2. Increase Public Debt (% GDP) MIN.	3. Increase Productivity (in %) MAX.	4. Deficit Public Budget (% GDP) MIN.	5. Unemploy. (in % labor force) MIN.	6. Increase GDP (in%) MAX.	7. Deficit. Bal. of Paym. curr. acc. (in %GDP) MIN.
EMU	**2**	***6***	**1.9**	**3**	**17.0**	***13.76***	**5**
EU	**4**	***3.8***	**5**	**1.9**	**8.3**	***14***	**10**
Secession	**3**	***2***	**1.5**	**1**	**14.3**	***11.0***	**5.7**
Totals	**9**	***11.8***	**8.4**	**5.9**	**39.6**	***38.76***	**20.7**

3b - Sum of squares and their square roots

Projects							
EMU	4	***36***	3.61	9	289	***189.3376***	25
EU	16	***14.44***	25	3.61	68.89	***196***	100
Secession	9	***4***	2.25	1	204.5309	***121***	32.49
sum of squares	29	***54.44***	30.86	13.61	562.4209	***506.3376***	157.49
square roots	5.385165	***7.3783467***	5.555178	3.689173	23.71541	***22.501947***	12.549502

*3c - Objectives divided by their square roots and **MOORA***

								sum	**rank**
EMU	0.371391	0.813190	0.342023	0.81319	0.716833	0.61150	0.3984222	**-.2.15950**	**3**
EU	0.742781	0.515021	0.900061	0.515021	0.349983	0.622168	0.7968444	**- 1.39742**	**1**
Secession	0.557086	0.271063	0.270018	0.271063	0.603044	0.488847	0.4542013	**- 1.39759**	**2**

*3d - **Reference Point Theory** with Ratios: co-ordinates of the reference point equal to the maximal objective values*

r_i	0.371391	0.271063	0.900061	0.271063	0.34998	0.62217	0.3984222

3e - Reference Point Theory: Deviations from the reference point

								max.	**rank min.**
EMU	0	0.54213	0.558038	0.542127	0.36685	0.01067	0	**0.542127**	**2**
EU	0.371391	0.243957	0	0.243957	0	0	0.398422	**0.398422**	**1**
Secession	0.185695	0	0.630043	0	0.25306	0.13332	0.0557791	**0.630043**	**3**

Table 3 proves that the coefficient method cannot be applied in MOORA. *Sub-Tables 3c*, *3d* and *3e* are identical to the corresponding sub-tables of *Table 2*. Consequently, *Formula (3)* is changed to:

$$N y_j = \sum_{i=1}^{i=g} N x_{ij} - \sum_{i=g+1}^{i=n} N x_{ij} \qquad (6)$$

In addition, the table shows that also with reference point not the coefficient but only the attribution method can be applied. It will be done later for pollution where instead of a significance coefficient of 3, pollution is substituted by three sub-objectives of pollution.

5. Sustainable Development in Lithuania

Sustainable Development is the second scenario under consideration. Productivity pressure is considered as a main reason for stress of the active population in industrialized countries. Therefore in the sustainable scenario productivity growth is rather minimized, but with a bottom of at least 1%. Additionally, to take away stress, employees will have the choice between a higher salary and more leisure time. Salary in Euro per working hour will be the unit for salary. Minimization of the time in weekly hours present on the job (shop time) is considered to measure the maximization of leisure time. In this way, in a stakeholder society, the aspirations of the working class are considered better. Measurement of pollution

abatement was already explained above. *Table 4* shows this simulation of sustainable development in Lithuania.

Table 4. Simulation of Lithuanian Sustainable Development (2007-12) by the square roots of MOORA and by the reference point method

4a - Matrix of Responses of Alternatives on Objectives: (x_{ij})

Yearly	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
EMU	**2**	**3**	**3**	**17**	**3**	**38**	**1.9**	**6.88**	**7.3**	**8.53**	**2**
EU	**4**	**1.9**	**1.9**	**8.3**	**1**	**40**	**5**	**7**	**7.3**	**8.53**	**2**
Secession	**3**	**1**	**1**	**14**	**2**	**40**	**1.5**	**5.5**	**0.5**	**5.20**	**4**

4b - Sum of squares and their square roots

EMU	4	9	9	289	9	1444	3.61	47.33	53.29	72.69	4
EU	16	3.61	3.61	68.89	1	1600	25	49	53.29	72.76	4
Secession	9	1	1	204.5	4	1600	2.25	30.25	0.25	27.04	16
sum of squares	29	13.61	13.61	562.4	14	4644	30.86	126.6	106.8	172.5	24
square roots	5.385	3.689	3.689	23.71	3.742	68.15	5.555	11.25	10.34	13.13	4.899

4c - Objectives divided by their square roots and MOORA												**sum**	**rank**
EMU	0.371	0.813	0.813	0.717	0.802	0.558	0.342	0.6115	0.706	0.649	0.408	**-2.552**	**1**
EU	0.743	0.515	0.515	0.3500	0.267	0.587	0.9	0.622	0.7063	0.649	0.408	**-3.072**	**3**
Secession	0.557	0.271	0.271	0.603	0.535	0.587	0.27	0.489	0.048	0.396	0.816	**-2.700**	**2**

4d - Reference Point Theory with Ratios: co-ordinates of the reference point equal to the maximal objective values

r_i	0.371	0.271	0.271	0.3500	0.802	0.558	0.27	0.6222	0.706	0.396	0.408

4e - Reference Point Theory: Deviations from the reference point												**max.**	**rank min.**
EMU	0	0.5	0.542	0.3669	0	0	0.072	0.0107	0	0.253	0	**0.54213**	**1**
EU	0.371	0.244	0.244	0.0000	0.535	0.029	0.63	0	0	0.254	0	**0.63000**	**2**
Secession	0.186	0	0	0.2530	0.267	0.029	0	0.1333	0.658	0	0.408	**0.65790**	**3**

Explanation of Columns: 1) MIN. Inflation as a % increase in the general price level, 2) MIN. Increase Public Debt (% GDP), 3) MIN. Deficit Public Budget (% GDP) 4) MIN. Unemployment (in % labor force), 5) MAX. Increase in real wages in %, 6) MIN. Shop time (in weekly hours), 7) MIN. Productivity growth, 8) MAX. Increase GDP (in%), 9) MAX. of diminution % of Energy consumption compared by benchmarking on basis of kg oil equivalent per 1,000€ GDP, 10) MIN. of CO_2 ton/cap. (greenhouse effect), 11) MIN. of other Pollution (radioactivity, SO_2, CO, NO_x, particulates, hydrocarbons etc.).

As it was indicated earlier, in order to give more importance to pollution it is replaced by three sub-objectives of pollution. Once again the MOORA simulation with total ratios produces the same rankings as the square roots approach (details of computation are available from the authors). In all simulations the EMU solution is preferred above the other, whereas the EU in MOORA comes last, but second in the *Reference Point Method*.

Anyway, if the EU solution is preferred in a welfare economy, the EMU is ranking above the others in the sustainable development scenario. Is it generally true that market economy in a welfare economy does differ from a policy of sustainable development? Hasty conclusions have not to be drawn from a study, which only aims to demonstrate an approach to solve in an optimal way a problem with different, independent objectives. For policy making a lot of preliminary inquiries and other forms of thorough desk research would be necessary.

Other researchers use methods not based on a model of multiple objectives. They rather bring together a lot of heterogeneous information. Concerning Lithuania they arrive to contradictory conclusions. Deutsche Bank Research (2006) for instance concludes, compared to the EMU-12, "that even a vigorous catching-up process is likely to take decades rather than years" (p.1). On the contrary KBC bank (2006), with many branches in Central Europe, predicts for Lithuania an €-entry in 2007-2008 (p. 10).

To broaden the discussion a similar research is brought for Poland. The KBC study is not so mild for Poland with an €-entry only in 2012 (p.10).

6. Sustainable Development in Poland

Here also, welfare economy and sustainable development are treated separately as two different scenarios. First the welfare economy is discussed as demonstrated in the following *Table 5*.

Table 5. A MOORA Simulation for the Polish Welfare Economy (2007-2012)[††]

5a - Matrix of Responses of Alternatives on Objectives: (xij)

Yearly	1. Inflation (in %) MIN.	2. Increase Public Debt (% GDP) MIN.	3. Increase Productivity (in %) MAX.	4. Def.Public Budget (% GDP) MIN.	5. Unemploy. (in % labor force) MIN.	6. Increase GDP (in%) MAX.	7. Deficit. Bal. of Payments Curr. Account (in % GDP) MIN.
EMU	**2**	**3**	**1**	**3**	**22.0**	**1**	**10**
EU	**3.5**	**5.0**	**2.5**	**5**	**18.0**	**5.2**	**2**
Secession	**6.6**	**3.1**	**2.5**	**3.1**	**15.7**	**3.7**	**4.2**

5b - Sum of squares and their square roots

EMU	4	9	1	9	484	1	100
EU	12.25	25	6.25	25	324	27.04	4
Secession	43.56	9.61	6.25	9.61	246.49	13.69	17.64
sum of squares	59.81	43.61	13.5	43.61	1054.49	41.73	121.64
square roots	7.733693	6.6037868	3.674234614	6.6037868	32.472912	6.4598762	11.0290525

*5c - Objectives divided by their square roots and **MOORA***

								sum	**rank**
EMU	0.258609	0.454285	0.272165527	0.4542848	0.6774878	0.15480	0.9066962	**- 2.32439**	**3**
EU	0.452565	0.757141	0.680413817	0.7571413	0.554308	0.804969	-0.1813392	**- 0.85443**	**1**
Secession	0.853409	0.469428	0.680413817	0.4694276	0.4834799	0.5727664	0.3808124	**- 1.40338**	**2**

*5d - **Reference Point Theory** with Ratios: co-ordinates of the reference point equal to the maximal objective values*

r_i	0.258609	0.454285	0.680413817	0.4542848	0.48348	0.80497	-0.1813392

5e - Reference Point Theory: Deviations from the reference point

								max.	**min rank**
EMU	0	0	0.40824829	0	0.19401	0.65017	1.08803544	**1.088035**	**3**
EU	0.193957	0.302857	0	0.3028565	0.070828	0	0	**0.302857**	**1**
Secession	0.5948	0	0	0	0	0.23220	0.56215164	**0.594800**	**2**

In all simulations the EU solution is preferred above the other, with secession ranked second, whereas the EMU comes last. In addition, the MOORA simulation with total ratios for the Polish Welfare Economy produces the same rankings as the square roots approach (details of computation are available from the authors).

Sustainable Development is the second scenario under consideration for Poland. The following *Table 6* presents the results.

Table 6. A MOORA Simulation for Polish Sustainable Development (2007-2012)

*6a - Matrix of Responses of Alternatives on Objectives: **(x_{ij})***

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
EMU	**2**	**3**	**3**	**22**	**0.5**	**38**	**1**	**1**	**0.5**	**8.2**	**3**
EU	**3.5**	**5.0**	**5.0**	**18.0**	**1.5**	**38**	**2.5**	**5.2**	**0.5**	**8.2**	**3**
Secession	**6.6**	**3.1**	**3.1**	**15.7**	**0.6**	**43.3**	**2.5**	**3.7**	**0.25**	**8.4**	**4**

6b - Sum of squares and their square roots

EMU	4	9	9	484	0.25	1444	1	1	67.24	0.25	9
EU	12.2	25	25	324	2.25	1444	6.25	27.04	67.24	0.25	9
Secession	43.5	9.61	9.61	246.5	0.36	1875	6.25	13.69	70.56	0.09	16
sum of squares	59.8	43.61	43.61	1054	2.86	4763	13.5	41.73	205.04	0.59	34
square roots	7.73	6.604	6.604	32.47	1.691	69.01	3.674	6.46	14.319	0.768	5.831

*6c - Objectives divided by their square roots and **MOORA***

												sum	**rank**
EMU	0.25	0.454	0.454	0.6774	0.296	0.551	0.272	0.1548	0.667	0.573	0.514	**-2.637**	**2**
EU	0.45	0.757	0.757	0.5543	0.887	0.551	0.680	0.805	0.6667	0.573	0.514	**-2.481**	**1**
Secession	0.85	0.469	0.469	0.483	0.355	0.627	0.680	0.573	0.333	0.587	0.686	**-3.595**	**3**

*6d - **Reference Point Theory** with Ratios: co-ordinates of the reference point equal to the maximal objective values*

r_i	0.25	0.454	0.454	0.4835	0.887	0.551	0.272	0.8050	0.667	0.573	0.514

6e - Reference Point Theory: Deviations from the reference point

												max.	**rank min.**
EMU	0	0	0	0.1940	0591	0	0	0.6502	0	0	0	**0.6502**	**3**
EU	0.19	0.303	0.303	0.0708	0	0	0.408	0	0	0	0	**0.4082**	**1**
Secession	0.59	0.015	0.015	0	0.532	0.077	0.408	0.2322	0.333	0.014	0.171	**0.5948**	**2**

Explanation of Columns: 1) MIN. Inflation in %, 2) MIN. Increase Public Debt (% GDP), 3) MIN. Deficit Public Budget (% GDP) 4) MIN. Unemployment (in % labor force), 5) MAX. Increase in real wages in %, 6) MIN. Shop time (in weekly hours), 7) MIN. Productivity growth, 8) MAX. Increase GDP (in%), 9) MAX. of diminution % of Energy consumption compared by benchmarking on basis of kg oil equivalent per 1,000€ GDP, 10) MIN. of CO_2 ton/cap.(greenhouse effect), 11) MIN. of other Pollution (radio-activity, SO_2, CO, NO_x, particulates, hydrocarbons etc.). The source of the data is given in appendix A.

[††] The resource of the data is presented in *Appendix A*.

The MOORA simulation with total ratios produces the same rankings as the square roots approach (here also, details of computation are available from the authors).

For Poland, in all simulations the EEU-solution is preferred above all the other, whereas the EMU comes last for the welfare scenario and for the sustainable development scenario of the Reference point simulation. Only in the MOORA simulation of sustainable development the EMU ranks second. Similar as for Lithuania, the sustainable scenario and the market economy of the welfare scenario ask for different solutions.

General Conclusions

At least until 2012 in all scenarios, Poland prefers the European Union (EU) above the European Monetary Union (EMU), a statement confirmed by other research. In Lithuania, for the market economy of the welfare economy, the EU is ranked first, but for sustainable development the EMU comes first. This distinction is perhaps understandable. Indeed, the EU promotes a market economy, whereas the EMU limits the growth for an economy in transition by ceilings on deficit spending, on public debt increase and on inflation. Consequently, the question may be posited if EMU is not rather designed for the very developed countries of Western Europe and less for economies in transition? In a country like Lithuania with a public debt of only 18.7%, much less than the maximum accepted 60%, is more deficit spending than 3% of GDP not allowed? Belgium took profit of such compensation, though in the other direction. Indeed, at the moment of the Maastricht norm of 1997, Belgium got the permission to enter the EMU with a public debt of 122.2% of GDP on condition that budget surpluses would occur in the following years. Promoting deficit spending does not mean that it would be used for consumption expenditures, or for decreasing taxes, but rather, e.g., for public works (for different opinions on the budget deficit, see Yellen, 1989).

In addition, the new member states of EU promised, but only with a temporary derogation, to participate fully in EMU and adopt the EURO. Previously, an opt-out clause gave the right to the United Kingdom and Denmark to remain outside EMU. On the other side, Sweden remains outside ERM-bis and EMU without complaints from the other members until now. Also for transition economies some authors are critical about the adoption of the EURO (cf., Mikecz, 2005).

Is it generally true that market economy in a welfare economy does differ from a policy of sustainable development? Hasty conclusions have not to be drawn from a study, which only aims to demonstrate an approach to solve in an optimal way a problem with different, independent objectives. For policy making a lot of preliminary inquiries and other forms of thorough desk research would be necessary. Such research could be estimated per country for approximate 18 person months plus the necessary operational costs. Nevertheless some basic research was already started: statistical data over ten years, the use of a disembodied Cobb-Douglas production function, the Nominal Group Technique and taking into consideration the Balassa-Samuelson effect. Anyway, from all research it seems to be clear that secession has no great chances anymore.

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Appendix A

Data were mostly based on EUROSTAT by Internet (2006), Ginevicius et al. (2005), Blomme (2006), Deutsche Bank (2006) and KBC bank (2006). Many articles in newspapers and periodicals were published before May 1, 2004, the day of acceptance of the ten new countries in the EU.

Indicators for Lithuania (2007-2012)

The European Monetary Union (EMU)

1) the EMU-norms
   - Inflation: 2%
   - Deficit Public Budget: 3%
   - Public Debt smaller than 60% of GDP
     Yearly increase Public Debt equal to deficit 3% if the deficit of the public budget includes interest payments on the public debt and if no public goods are sold.
     Public debt 2005: 18.7% of GDP
2) Monthly Real Wages (exogenous):
   2001 Lithuania: 274€ (cost of living 77.5% with 100% for UK, USA, D and F).
   Poland : 562€ (cost of living 67.8%)
   Catch up with Poland yearly increase of 3%
3) Nominal Wages (endogenous): increase real wages + inflation = 5%
4) Capital Cost (endogenous): if labor cost is 60% then capital cost is estimated at least as 40% in transition economies, due to the low wage level. If Δ Lithuania real wages 3% then capital cost Δ: 2%.
5) GDP (exogenous); average increase over 9 past years: 5.96%.
   Research Deutsche Bank; 20% increase over 20 years → compounded: 0.92% per year
   Total per year: 5.96 + 0.92 = 6.88%
6) Multifactor productivity (endogenous): → disembodied Cobb Douglas (cf. Timmer et al., 2007).
   Δ productivity = Δ GDP – Δ wages – Δ capital cost (if labor force remains approximately constant)
   = 6.9 – 3 – 2 = 1.9%.
7) Unemployment (exogenous): very, very high: 17% → why:
   a) Balassa-Samuelson effect: due to high nominal wages in international sectors international non-tradable goods sectors have to move out of business.
   b) West-European experience: EMU-norms lead to high unemployment in devastated areas.
8) Deficit Current Account Balance of Payments (exogenous):
   Deficit last 6 years: average 6%
   Export/ Import last 6 y.: average 0.70
   Perhaps deficit a bit better (more exports to Western Europe): 5%
   As not to be considered too negative: "it makes little sense to talk of a current accounts deficit being "good or "bad": Deficits reflect underlying economic trends, which may be desirable or undesirable for a country at a particular point of time" (Ghosh and Ramakrishnan, 2006, p. 45).
9) Total Shop Time (exogenous): average last 8 years: 39.7 hours
   European norm: 38 hours.
10) Pollution
   a) Energy consumption (exogenous)
   diminution % of Energy consumption compared by benchmarking on basis of kg oil equivalent per 1,000€ GDP,
   2003: 1321 kg oil-equivalent per 1000€ GDP
   (cf. Belgium 228; EU-15: 194)
   Perhaps less waste in future: level of Poland after 7 years,
   per year (1321 – 643 of Poland) :7 = 96.86 or 7.3% diminution.
   Secession: nearly status quo: 0.5 % diminution.
   b) Greenhouse effect: CO_2 ton/cap.

Secession: status quo: 5.2 ton/cap (2003).
Atomic plant remains in operation.
EMU and EU: deterioration by substituting atomic plant: cf. average level of other Baltic States: 8.53 ton/cap.

c) Other Pollution (radioactivity, SO_2, CO, NO_x, particulates, hydrocarbons etc.) is measured by a dimensionless number, nevertheless a cardinal number.
Heavy for secession: atomic plant remains in operation: 4 (see above).
Moderate in comparison for EMU and EU: satisfactory: 2 (see above).

The European Union (EU) with no more obligation to be linked to ERM-bis

1) Inflation (exogenous)
Since part of EU 2004: 2.9%
2005: 3%
+ Balassa-Samuelson effect: the productivity will increase in the international traded sectors with an increase in wages. The more national services have to raise their wages too, without an increase of productivity of the same size. This increase in wages will have an inflationary effect. Consequently, the national traded sectors have to increase their prices: effect on the inflation estimated at 1% increase.
Total inflation: 3% + 1% = 4 %.
2) Unemployment (exogenous)
Under these circumstances unemployment will remain on the 2005 level: 8.3%.
3) Budget Deficit and Public Debt (exogenous)
Lithuania average 6 years: - 1.55% of GDP
EU-15: - 1.9% of GDP
Public Debt: + 1.9% of GDP per year
4) Wages (exogenous): a yearly increase of 5% in nominal wages is at least necessary.
Real wages = nominal wages – inflation = 5% - 4% = 1%.
5) GDP (exogenous)
Average over the last 9 years: 5.96%
Increase for EU higher than for EMU (estimate Deutsche Bank: + 1.04% per year:
5.96%+ 1.04% = 7%.
6) Multifactor productivity (endogenous)→ disembodied Cobb Douglas
Δ productivity = Δ GDP – Δ wages – Δ capital cost (if labor force remains approximately constant)
= 7 – 1 – 1 = 5%
Here: Δ capital cost = Δ wages → more investment intensive
7) Current Account Balance of Payments
Average yearly deficit since membership EU: 7.5% → on the rise average 4 previous years: 5.5%.
Will increase even more: 1) more imports energy, due to closing up the atomic plant
2) in a first stage more imports due to the important rise in GDP.
Estimation 10% deficit
8) Shop time: 40 hours (less social pressure from EMU)
9) Pollution: similar as for EMU.

Scenario for Secession

As said earlier, a status quo ante, more or less comparable with the fluctuations during the years before 2004, when the membership in the EEU started, is maintained concerning the main economic indicators.

Especially has to be mentioned:
Annual GDP change (average over the years1998-2003): 5.5 % (exogenous)
Annual increase in real wages (idem): 2% (exogenous)
Multifactor productivity (endogenous)→ disembodied Cobb Douglas
Δ productivity = Δ GDP – Δ wages – Δ capital cost (if labor force remains approximately constant)
= 5.5 – 2 – 2 = 1.5%
Here: Δ capital cost = Δ wages.

Indicators for Poland (2007-2012)

The European Monetary Union (EMU)

1) the EMU-norms
   a. Inflation: 2%
   b. Deficit Public Budget: 3%
   c. Public Debt smaller than 60% of GDP
      Yearly increase Public Debt equal to deficit 3% if deficit public budget includes interest payments on public debt and if no public goods are sold.
      Public debt 2005: 42% of GDP
      Public debt 2012: 42% + 7 times 3% = 63% of GDP. A warning!
2) Unemployed: before EU: 19.3% (2003)
   2004: 19.5%
   Total employment growth is negative (2004)
   Unemployment (exogenous): very, very high: 22% → why?
   a) Balassa-Samuelson effect: due to high wages sectors with international non-tradable goods have to move out of business.
   b) West-European experience: EMU-norms lead to high unemployment in devastated areas.
   c) The government has few extra means e.g. for aid to the large sector of agriculture.
3) due to 1) and 2) Δ GDP only 1%.
4) Multifactor productivity increase: the minimum of 1%
5) Current Account Balance of Payments (exogenous).
   Will increase: in a first stage more imports.
   Estimation 10% deficit
6) Monthly Real Wages (exogenous)
   Δ Nominal wages: stagnation (2001-2004) now estimated at 2.5%
   Real wages: nominal - inflation = 0.5
7) Total Shop Time (exogenous): European norm: 38 hours.
8) Pollution
   a) Energy consumption (exogenous)
      diminution % of energy consumption compared by benchmarking on basis of kg oil equivalent per 1,000€ GDP,
      2003: 643 kg oil-equivalent per 1000€ GDP
      (cf. Belgium 228; EU-15: 194)
      Diminution limited to 0.5% per year as there is too much coal consumption and ineffective metal works.
      Less effort for secession: 0.25% per year.
   b) Greenhouse effect: CO_2 ton/cap.: 8.7 ton per capita
      Diminution limited to 0.5 ton/cap per year as there is too much coal consumption and ineffective metal works
      EU: the same
      Secession: even worse no pressure from EMU: 0.3 ton/cap per year.
   c) Other Pollution (radioactivity, SO_2, CO, NO_x, particulates, hydrocarbons etc.)
      is measured by a dimensionless number, nevertheless a cardinal number.
      Heavy for secession: 4
      More moderate for EMU and EU: 3.

The European Union (EU) with no more obligations to be linked to ERM-bis

1) Inflation (exogenous).
   Since EU 2004: 3.6 %
   2005: 2.2%
   Due to Balassa- Samuelson effect estimated at 3.5%
2) Yearly increase Public Debt: 5% (cf. estimation KBC 22/4/06: 4.8%)
   equal to deficit 5% if deficit public budget includes interest payments on public debt and if no public goods are sold (exogenous).
3) Unemployed (exogenous).

Since EU 2004: 19.5 %
2005: 18.2%
Amelioration: estimated at 18%

4) Current Account Balance of Payments (exogenous).
Since EU 2004: -3.9 %
2005: -2.5%
Amelioration: estimated at -2%
Due to: income workers abroad
beginning of income foreign firms in Poland

5) Δ GDP (exogenous).
Since EU 2004: 5.4 %
2005: 5.1 %
2006, forecast 5.2%
Estimation: 5.2%

6) Monthly Real Wages (exogenous)
Δ Nominal wages: 2005: Δ 6%
Estimation: 5%
Real wages: nominal - inflation = 5 – 3.5 = 1.5%

7) Multifactor productivity (endogenous): → disembodied Cobb Douglas
Δ productivity = Δ GDP – Δ wages – Δ capital cost (if labor force remains approximately constant)
Capital Cost (endogenous): if labor is 60% then capital cost is estimated 40% in transition economies: Poland wages 1.5% then capital cost 1%.
= 5 – 1.5 – 1 = 2.5%

8) Hours worked: European norm: 38 hours

9) Pollution
See EMU

Secession a status quo ante, more or less comparable with the fluctuations during the years before 2004 when the membership in the EEU started, is maintained concerning the main economic indicators.

1) Inflation: average of the pre-2004 years (1997-2003): 6.6%.
2) Yearly increase Public Debt: equal to deficit if deficit public budget includes interest payments on public debt and if no public goods are sold (exogenous).
Average of the pre-2004 years (1997-2003): 3.1%
3) Unemployment: average of the pre-2004 years (1997-2003): 15.7 %
4) Current Account Balance of Payments (exogenous):
average of the pre-2004 years (1997-2003): - 4.2 %
4) GDP
average of the pre-2004 years (1997-2003): 3.7 %
5) Monthly Real Wages (exogenous)
Δ nominal wages: peak previous years compared to 2004: 7.2%
Δ real wages: 7.2% - 6.6% (inflation) = 0.6%
6) Multifactor productivity (endogenous): → disembodied Cobb Douglas
Δ productivity = Δ GDP – Δ wages – Δ capital cost (if labor force remains approximately constant)
= 3.7 – 0.6 – 0.6 = 2.5%
Capital Cost (endogenous): Here: Δ capital cost = Δ wages → more investment intensive than normal
7) Hours worked: average of the pre-2004 years (2001-2003): 43.3 hours per week
8) Pollution : see EMU.

EUROPOS SĄJUNGA PEREINAMOJOJE EKONOMIKOJE

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SANTRAUKA

Pereinamosios ekonomikos šalių įstojimo į Europos ekonominę sąjungą bei į Europos pinigų sąjungą galimybės ir mechanizmas skiriasi nuo aukšto išsivystymo lygio Vakarų Europos šalių. Trumpoje studijoje sudėtinga išsamiai išnagrinėti šį antagonizmą. Šio straipsnio tikslas yra parengti modelį daugiatikslei problemai, apimančiai minėtus prieštaravimus, spręsti. Norėdami iliustruoti modelio taikymą, autoriai parinko keletą rodiklių, kurie būtų aktualūs problemą sprendžiančioms suinteresuotoms šalims. Be to, nagrinėjami du alternatyvūs scenarijai: gerovės ekonomikos scenarijus su pilnu rinkos mechanizmu ir darnaus vystimosi scenarijus. Abiejuose minėtuose scenarijuose analizuojamas įstojimas į Europos ekonominę sąjungą ir į Europos pinigų sąjungą bei pasitraukimo galimybė kaip priešprieša Europos integracijai. Scenarijai parengti ir modeliavimas atliktas 2007 – 2012 metų laikotarpiui. Scenarijams įvertinti taikomas autorių pasiūlytas daugiatikslių sprendimų priėmimo metodas. Siūlomo modelio taikymas pereinamosios ekonomikos šalims iliustruotas Lietuvos ir Lenkijos pavyzdžiais. Šis modelis yra universalus ir yra galimybė, jog jis būtų naudojamas praktikoje sprendžiant kitų Centrinės ir Rytų Europos pereinamosios ekonomikos šalių ekonominio integravimo klausimą.

REIKŠMINIAI ŽODŽIAI: pereinamoji ekonomika, daugiaobjektinis optimizavimas, MOORA metodas, darnus vystymasis, Lietuva, Lenkija.