

V4 Countries and the Selected Indicators of the Lisbon Criteria

Zlatica Ivaničová

Michaela Chocholatá

Kvetoslava Surmanová

Lisbon Criteria - History

March 2000, Lisbon:

negotiation on the Lisbon criteria (Chairs of government of all EU countries) in order to achieve the competitiveness to the world economics of the USA and Japan by transforming the EU into the „most dynamic and competitive knowledge-based economy in the world“ by 2010,

March 2004, Brusel:

1. analysis of the Lisbon criteria fulfillment – insufficient
2. appointment of the expert group – chief Wim Kok (former Dutch prime minister) – to introduce dynamics into reforms

Spring each year:

Centre for European Reform evaluates the situation in the area of fulfillment of the Lisbon criteria

Main Priorities of the Lisbon Criteria

- general economic background
- employment
- innovation and research
- economic reform
- social cohesion
- environment

Partial Priorities of the Lisbon Criteria

- investment into research and development at the level of 3 % GDP
- reduction of administration documentation and support of entrepreneurially environment
- to increase the employment of the total labour force to the level of 70 % (60 % for women)
- to support IT society, development and research
- acceleration of the structurally reforms process
- investment into human capital
- application of the suitable macroeconomic policy

Data Envelopment Analysis (DEA)

- DEA – non-parametric method for evaluating the relative efficiency of decision-making units (DMUs) on the basis of multiple inputs and outputs
- Basic DEA model – CCR model proposed by Charnes, Cooper and Rhodes in 1978
- CCR input oriented model as a LP problem:

$$\begin{aligned} \max \quad & u y_0 \\ & v x_0 = 1 \\ & -vX + uY \leq 0 \\ & v \geq 0 \quad u \geq 0 \end{aligned}$$

Main Aims of the Presentation

- analysis of the V4 countries (Czech Republic – CZ, Hungary – H, Poland – POL, Slovakia – SR) with respect to the fulfillment of the selected Lisbon criteria using DEA
- using the calculated weights of efficient countries on input and output data of the remaining countries
- sensitivity analysis of calculated weights for efficient countries

Data Used in Analysis

- Labour productivity per person employed (LBPPROD)
- Total employment rate (EMPR)
- Gross domestic expenditure on R&D (R & D)
- Youth education attainment level - total (YTED)
- Business investment (GFCF)

Lisbon Indicator	Variable Name	Data Transformation	Definition
General Economic Background			
Labour productivity per person employed	LBPPROD		GDP in Purchasing Power Standard (PPS) per person employed relative to the EU -25 (EU - 25 = 100).
Employment			
Total employment rate	EMPR	Subtracted from EU objective of 70 % as a benchmark to produce minimum values suitable for CCR-I analysis.	Employed persons aged 15 to 64 as a share of the total population of the same age group.
Innovation and Research			
Youth education attainment level - total	YTED	Subtracted from objective of 100 % as a benchmark to produce minimum values suitable for CCR-I analysis.	The percentage of young people aged 20-24 years having completed at least upper secondary education.
Gross domestic expenditure on R&D	R&D	Subtracted from corresponding annual US level as a benchmark to produce minimum values suitable for CCR-I analysis	As a percentage of the GDP.
Economic Reform			
Business investment	GFCF	Subtracted from corresponding annual US level as a benchmark to produce minimum values suitable for CCR-I analysis	Gross fixed capital formation by the private sector as a percentage of GDP.

Selected Indicators in the V4 Countries - Data

2000	(I)YTED	(I)R&D	(I)EMPR	(I)GFCF	(O)LBPPROD
CZ	91,1	1,23	65	24,7	59,2
H	83,6	0,8	56,3	20,3	60,8
POL	87,8	0,66	55	21,1	50,5
SR	94,5	0,65	56,8	23,1	54,7

2004	(I)YTED	(I)R&D	(I)EMPR	(I)GFCF	(O)LBPPROD
CZ	90,9	1,28	64,2	22,6	72,2
H	83,4	0,96	56,8	19,3	69,4
POL	89,5	0,62	51,7	14,7	59,6
SR	91,3	0,53	57	21,3	59,4

Calculation of the Optimal Weights – DEA

- 2000

No.	DMU	Score	V(1)	V(2)	V(3)	V(4)	U(1)
1	CZ	0,893524	1,10E-02	0	0	0	1,51E-02
2	H	1	3,28E-03	0,252246	4,77E-03	1,26E-02	1,64E-02
3	POL	0,941253	0	1,0371	0	1,50E-02	1,86E-02
4	SR	1	1,43E-03	0,955894	2,07E-03	5,46E-03	1,83E-02

- 2004

No.	DMU	Score	V(1)	V(2)	V(3)	V(4)	U(1)
1	CZ	0,954509	0,011001	0	0	0	1,32E-02
2	H	1	3,24E-03	0,229202	4,57E-03	0,012981	1,44E-02
3	POL	1	6,15E-03	0,521636	1,35E-03	3,84E-03	1,68E-02
4	SR	1	6,17E-03	0,523392	1,36E-03	3,86E-03	1,68E-02

Weighted Input and Output Data

- 2000

No.	DMU	Score	VX(1)	VX(2)	VX(3)	VX(4)	UY(1)
1	CZ	0,893524	1	0	0	0	0,893524
2	H	1	0,274475	0,201797	0,268735	0,254993	1
3	POL	0,941253	0	0,684486	0	0,315514	0,941253
4	SR	1	0,134802	0,621331	0,117796	0,12607	1

- 2004

No.	DMU	Score	VX(1)	VX(2)	VX(3)	VX(4)	UY(1)
1	CZ	0,954509	1	0	0	0	0,954509
2	H	1	0,269864	0,220034	0,259562	0,25054	1
3	POL	1	0,550181	0,323414	6,99E-02	5,65E-02	1
4	SR	1	0,563136	0,277398	7,74E-02	0,082113	1

Using of the Efficient Countries Weights

- 2000

Country	Efficiency		
	DEA weights	H weights	SR weights
CZ	0,893524	0,789115	0,687658
H	1	1	1,000898
POL	0,94125	0,842800	0,937747
SR	1	0,859698	1

- 2004

Country	Efficiency			
	DEA weights	H weights	POL weights	SR weights
CZ	0,954509	0,885091	0,866287	0,863106
H	1	1	1,001243	0,997553
POL	1	0,998912	1	0,997517
SR	1	0,896346	1,001219	1

Using of the Efficient Countries Weights – without Indicator R&D

- 2000

Country	Efficiency	
	DEA weights	H weights
CZ	0,893524	0,843575
H	1	1
POL	0,850224	0,811143
SR	0,891751	0,822459

- 2004

Country	Efficiency		
	DEA weights	H weights	POL weights
CZ	0,954509	0,920322	0,909219
H	1	1	1,000923
POL	1	0,934287	1
SR	0,852905	0,801372	0,792483

Conclusion

- it is possible to show that the DEA weights calculated for efficient DMUs are not unique
- we tried therefore to illustrate what will happen when we use the weights of an efficient country for an inefficient one
- to determine the exact intervals in which the weights can vary in order to guarantee the efficiency of the DMU is not an easy task

References

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