DEA Based Algorithm for EU Healthcare Efficiency Evaluation

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Abstract. The problem of efficiency evaluation in healthcare is recently dealt from many perspectives, such as analysis of investment and cost containment, development of country ranking models or designing new indicators for characterizing healthcare status. The article explores the healthcare efficiency in EU countries by applying a DEA (Data Envelopment Analysis) method. The modification of DEA gives several advantages of the proposed model, as it not only computes healthcare efficiency of a country, but it enables to give quantitative characteristics of particular deficiencies which explain differences of efficiency levels; it also. The research results highlight different levels of efficiency of EU healthcare systems determined by hierarchical selection and grouping health-related input characteristics and by comparing them to the financial value of investment. The experimental analysis revealed that DEA-based model allows estimating the limits of increasing efficiency of country healthcare within same expenditure levels.

Keywords: Efficiency evaluation · Healthcare system · Data Envelopment Analysis (DEA) · EU countries

1 Introduction

The concept of efficiency in the healthcare is developed based on the overall goal to achieve maximum quality and effective utilization of the investments made in this sphere. The variety of options and decisions of where to use the expenditures for health care makes this task complicated. Although most EU countries spend similar share of 8–11% of their GDP for healthcare (OECD.org 2017), the financial value of investment and its target areas differ significantly. As a result the research literature and consulting companies propose analysis in the forms of the reports on country rankings according to their efficiency. However, the efficiency evaluation has no standard template; instead it presents vast variety of models used for country rankings. The models not only analyse different groups of countries, but use different data sets for input and output variables, which hinders possibility for validation of findings. The rankings proposed by Bloomberg (Lu and Du 2016) analyse only medium and large countries (over 5M population),

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EU reports focus on statistical data analysis of EU15 and EU28 country sets (Medeiros and Schwierz 2015).

The statistical data and criteria used for healthcare system ranking are defined in different ways. In the research of Bloomberg (Lu and Du 2016) it is based on data of life expectancy; cost of health care per capita (percentage of GDP per capita); and the absolute per capita cost of health care (including costs for preventive and curative services, family planning, nutrition and emergency aid). The report of World Health organization presents 100 indicators, categorized into four main groups of Health status, Risk factors, Service coverage, Health system for monitoring healthcare (World Health Statistics 2016).

The availability of statistical data determines wide usage of indicators, such as life duration at birth, expected life duration after 65 or expected duration of healthy life after 65 for measuring output of healthcare efficiency level. Some indicators denoting subjective patient-reported characteristics are not consistently collected by countries and have limited use in healthcare evaluation in the forms of survey reports, such as Patient safety and quality of care (2013).

The selection of indicators for analysis is partly determined by the methods used for efficiency evaluation. In order to explore efficiency of the healthcare in different EU countries, we proposed to apply DEA (Data Envelopment Analysis) method. This method is selected due to its ability to sort objects described by the set of factors or attributes. DEA is one of the prevailing methods used for efficiency evaluation in healthcare. As it can be observed in summary report (McGlynn 2008), the research literature on healthcare efficiency in USA during 1982–2006 is mainly based on DEA models, overcoming popularity of regression and ratio based methods. We have selected research of Medeiros and Schwierz (2015) for comparative evaluation of our findings. The authors of this report have applied DEA method for evaluation of healthcare in EU countries, however in different settings and with different indicators.

2 Efficiency Evaluation Indicators

Due to selection of the DEA based efficiency evaluation findings for validation of our research (Medeiros and Schwierz 2015) and the availability of statistical data we selected the indicators consistently reported by all EU countries. In general the statistical data of healthcare presents big variety of factors, which potentially have different impact to the efficiency of healthcare. However, there is lack of research works which explore interrelationships and importance of indicators of different origin. The necessity of grouping input variables is also implied by the DEA method selected for analysis, as it has a limitation for the number of included input variables (in respect to the number of research objects – 28 EU countries). As an advantage, grouping of variables is helpful in the cases of missing statistical data in particular countries, where some characteristics within the group can be defined by experts or replaced by aggregated influence of the group.

The other important difference of experimental approach is in application of financial data of healthcare expenditures. Most research works include it into input variable set. For our research we aimed to define healthcare status of the country without using this variable, and making further quality-cost analysis in the second stage of research.

We have divided the healthcare factors into 5 indicator groups (Fig. 1): Infrastructure, Life style, Country general statistics, Service consumption and Subjective healthcare measures.

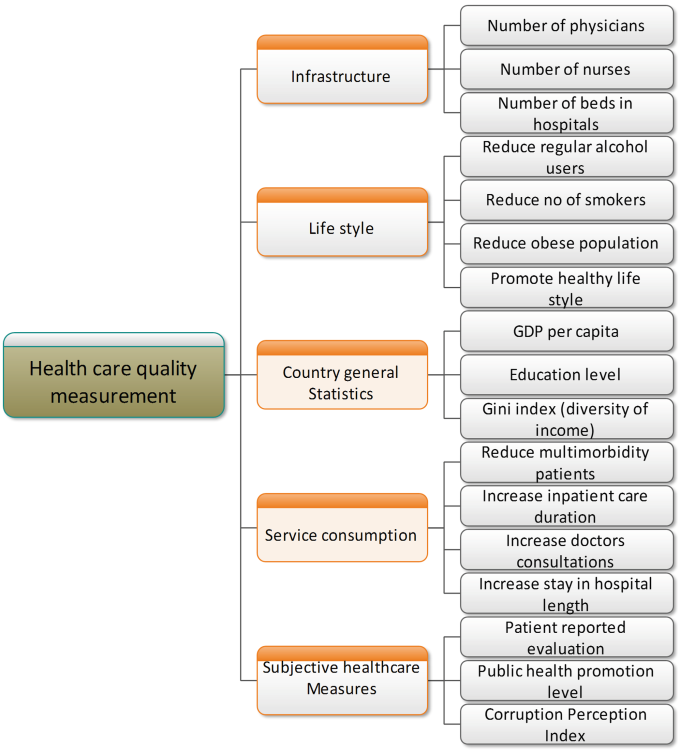

Fig. 1. Factors describing the healthcare quality

The hierarchical structure enables to include subgroups of factors which can affect efficiency of healthcare, and imply costs (as in Fig. 1). The number of indicators can be extended, but for each group we have limited to 3 or 4 factors per group, as the further applied research method is very sensitive to big number of input variables.

The Infrastructure group characterizes the expenditures of the country to the main infrastructural compounds of healthcare, such as hiring professional physicians and nurses, buying equipment for hospitals, increasing number of beds for patients. The medical reforms of EU countries revealed different strategies addressing financing of these indicators aiming to improving efficiency of the overall infrastructure.

The Life style group characterizes general culture of nurturing personal health by people, it also includes preventive measures and treatment priorities to risk groups. The group describes country investments into promoting healthy life style, access to healthy environment, food, and preventive activities to alcohol consumption, also concern about people failing to follow healthy life habits (obesity, smoking).

The assumed dependence of healthcare from general wealth of country is characterized by Country general statistics group. The selected economical characteristic of countries can potentially shape level of healthcare.

The group of Service consumption characterize how frequently and how efficiently the medical services are used by population. It includes number of direct contacts with doctors for consulting, examining and preventive exploration purposes.

The group of Subjective healthcare provides characteristics of countries expressed by patient attitudes. Although the indicators of patient reported healthcare are not readily available on all EU countries, the initiatives are made for surveying the data.

For all the indicators included to the subgroups, we have applied statistical data except for the last two variables (Appendix 1). As the statistical data of *Public health promotion level* and *Corruption Perception index* was not consistently available, it was not included to experimental calculations.

3 Research Methods

The main task of our investigation is efficiency evaluation of healthcare systems by applying proposed model for healthcare of EU countries. As it is intended to explore factors which have different economical origin for characterizing healthcare status, we propose using the hierarchical structure for their research. It enables exploring the importance of separate indicators and of the entire groups for improving healthcare efficiency. The structure and characteristics of factors influencing the level of healthcare are in Sect. 2.

The efficiency evaluation is based on DEA, which is a non-parametric method for efficiency evaluation of the set of decision making units (DMU). DMU is understood as sample set of objects or products for which we want to estimate efficiency. In our case the DMU set consists of 28 EU countries. The aim of experimental analysis is to estimate healthcare efficiency for each corresponding country included to DMU set.

We understand the efficiency in healthcare as an attribute of performance that is measured by examining the relationship between a specific product of the health care system (output) and the resources used to create that product (inputs). We define a country to have efficient healthcare system if it is able to maximize output for a given set of inputs or to minimize inputs used to produce a given output.

The principles of DEA method were introduced by Charnes et al. (1978). By using linear programming method DEA helps to construct a piece-wise surface (or frontier) enclosing the data. Efficiency then is calculated as the distance relative to this surface.

DEA assigns a score of efficiency to DMU equal to 1 only when comparisons with other DMU do not show the inefficiency for any input or output (DMU is placed on the frontier). For the inefficient DMU its efficiency score is less than one. It means that a linear combination of other units could produce the same vector of outputs by using a smaller vector of inputs.

The formal expression of the DEA is as follows (Trick 1998). Let $\{X_i\}$ and $\{Y_i\}$ be the vectors of inputs and outputs of the DMUi. Let $\{X_k\}$ be the inputs and $\{Y_k\}$ be the output vector of DMUk for which we want to determine its efficiency. The measure of efficiency for DMU k is estimated by the following linear program:

$$\begin{aligned} & Find \qquad MinQ: \\ s.t. \quad & \sum \lambda_i X_i \leq Q X_k \\ & \sum \lambda_i Y_i \geq Y_k, \lambda \geq 0 \end{aligned}$$

where λ_i is the weight assigned to DMU i, $Q \leq 1$ is the efficiency of DMU k.

In case of $Q = 1$ we have the efficient DMU unit. The DMU with nonzero λ_i is non-efficient and can be compared with the others DMU units. The differences expressed by $X_k - \sum \lambda_i X_i$ show the inputs which exceed the 'necessary' level, therefore the causes of DMU inefficiency can be explained by over extensive use of corresponding inputs.

The computations of DEA method can be performed by using Solver procedure of MS Excel, but it is not convenient for solving tasks for big DMU sets and numerous input/output variables. We applied the open source software (OSDEA), suitable for different types of DEA problems (http://opensourcedea.org/).

4 Research Results

By applying definition of variables and main concepts of applying DEA principles in Sects. 2 and 3, the efficiency is understood as the ratio of outputs to inputs. The greater efficiency means more output produced per unit of input.

We evaluate the efficiency of healthcare of EU countries by using DEA algorithm as described in Sect. 3. In order to reduce the number of variables, the inputs are selected as groups of quality factors (Fig. 1). The output variable should reflect the level of healthcare system in the country. We applied recommendation of medical authorities to use the Life expectancy at birth/at age 65 or Healthy life expectancy at birth/at age 65, which are determined by high level of healthcare system. Although DEA method allows to use several output variables, we have selected only one - *Healthy life expectancy at age 65* illustrated by country data (Table 1).

Table 1. Healthy life expectancy at age 65 (http://ec.europa.eu/eurostat)

AT	15.3	FI	16.1	MT	16.3
BE	15.8	FR	17.1	NL	17.9
BG	10.4	HR	8.6	PL	10.0
CY	13.3	HU	9.6	PT	10.4
CZ	12.1	IE	18.1	RO	11.6
DE	16.2	IT	13.6	SE	18.1
DK	16.1	LT	7.9	SI	12.7
EE	11.1	LU	16.1	SK	9.0
EL	14.2	LV	9.1	UK	17.9
ES	16.2				

In general, it is recommended that number of items in DMU set is at least twice bigger than number of inputs+outputs. As we have only 28 DMU (EU countries), we estimated the efficiency separately for each input factor group from Level 1 (see Fig. 1): *Infrastructure, Life style, Country general Statistics, Service consumption, Subjective healthcare Measures*. The Fig. 2 shows the OSDEA software tool window for calculation EU countries efficiency for the input of *Subjective healthcare Measures*.

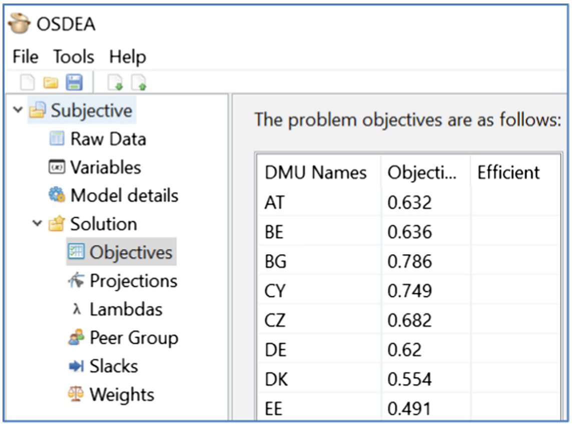

Fig. 2. Example of OSDEA program window

Using the OSDEA software we calculate the efficiency ratios for *Infrastructure, Life style, Country general Statistics, Service consumption, Subjective healthcare Measures* as input variables and *Healthy life expectancy at age 65* as output variable. In Table 2 we combine the efficiency ratios for all countries and all input factors of Level

Table 2. The efficiency ratios for EU countries

	Infrastructure	Life style	Country general	Service consumption	Subjective quality measures	**Average all factors**
AT	0.72	0.79	0.80	0.67	0.63	0,72
BE	0.81	0.87	0.88	0.91	0.64	0,82
BG	0.74	0.90	1.00	0.75	0.79	0,84
CY	1.00	0.85	0.75	0.76	0.75	0,82
CZ	0.62	0.69	0.82	0.59	0.68	0,68
DE	0.70	0.85	0.83	0.62	0.62	0,72
DK	0.73	0.82	0.87	1.00	0.55	0,79
EE	0.68	0.72	0.78	0.46	0.49	0,63
EL	1.00	1.00	0.89	0.88	1.00	0,95
ES	1.00	0.87	0.88	0.95	0.87	0,91
FI	0.92	0.82	0.92	0.63	0.56	0,77
FR	0.92	1.00	0.92	1.00	0.77	0,92
HR	0.61	0.50	0.70	0.43	0.54	0,56
HU	0.62	0.45	0.73	0.38	0.62	0,56
IE	1.00	0.95	0.88	1.00	0.77	0,92
IT	0.78	0.96	0.72	0.79	0.90	0,83
LT	0.44	0.58	0.57	0.36	0.41	0,47
LU	0.88	0.81	0.84	1.00	0.62	0,83
LV	0.69	0.53	0.73	0.39	0.49	0,57
MT	1.00	1.00	1.00	0.86	0.92	0,96
NL	1.00	1.00	0.99	0.78	0.67	0,89
PL	0.79	0.66	0.76	0.49	0.50	0,64
PT	0.70	0.73	0.73	0.48	0.52	0,63
RO	0.91	1.00	1.00	0.86	0.75	0,90
SE	1.00	1.00	1.00	1.00	0.64	0,93
SI	0.82	0.69	0.86	0.63	0.65	0,73
SK	0.59	0.55	0.65	0.44	0.55	0,56
UK	1.00	0.95	0.93	0.91	0.68	0,89

1. The input-oriented model is calculated, which shows how the inputs are used for achieving given level of output. In Table 2 the 7 most inefficient EU countries in healthcare under each input factor are highlighted.

The last column of Table 2 is average of all efficiency ratios under each input factor and indicate the overall level of healthcare system in selected country. From this point of view the most inefficient countries are Lithuania (LT), Latvia (LV), Slovakia (SK), Hungary (HU) and Croatia (HR).

This table also shows which input factors can be improved. As an example, Lithuania, Latvia, Slovakia, and Croatia should improve all the input factors, for Greece it is enough to change *Country general* and *Service consumption*. Similar findings can be done for other EU countries. The Appendix 2, discloses possible reduction of all income factors to fix output factor values to the present values.

As the second step, the Efficiency/Expenditure ratio for EU countries is explored. For this purpose we use the calculated healthcare efficiency estimate and the data of Expenditures (Appendix 1). The Fig. 3 presents scaterplots of efficiency vs. expenditures of EU countries.

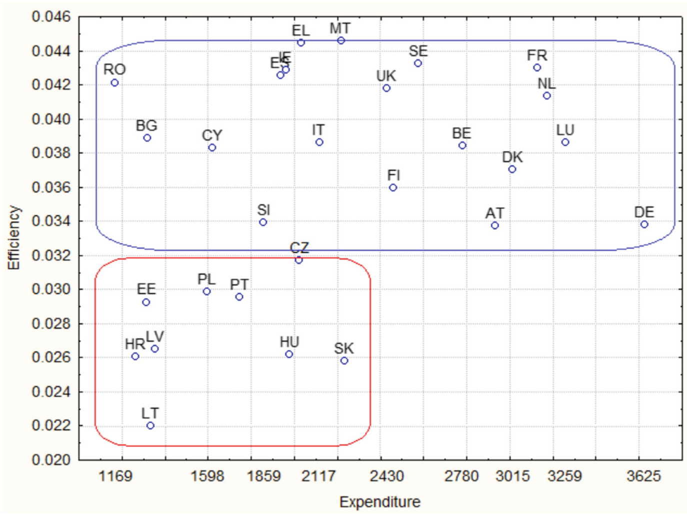

Fig. 3. The scatterplot of EU countries healthcare Efficiency vs Expenditure

On the Fig. 3 we have selected two groups of EU countries – with low and high efficiency. It is interesting to notice that low expenditure countries can be rather efficient in healthcare, but high level of expenditures can secure high efficiency.

The application of output-oriented DEA model enables us to estimate what is the optimal value of *Healthy life expectancy at age 65* in case the input factors are fixed to present value. It shows, how the output can be improved by efficiently using given inputs. The estimated optimal number of healthy years after 65, average value and current value of healthy years after 65 are calculated in Table 3.

In Table 3 we can notice that Lithuania (LT), Slovakia (SK) and Croatia (HR) can potentially double the expected healthy life after 65. They just need to optimally utilize the input factors.

Table 3. Optimal values of *Healthy life expectancy at age 65* in case of fixed input factors.

	Infrastructure	Life style	Country general	Service consumption	Subjective quality measures	Average	Today Situation
AT	21	21	38	25	24	26	15.3
BE	19	20	33	35	25	27	15.8
BG	14	10	10	10	13	12	10.4
CY	13	18	23	20	18	18	13.3
CZ	20	19	26	31	18	23	12.1
DE	23	25	35	23	26	26	16.2
DK	22	16	35	16	29	24	16.1
EE	16	19	21	11	23	18	11.1
EL	14	14	18	25	14	17	14.2
ES	16	18	16	20	19	18	16.2
FI	18	29	35	16	29	25	16.1
FR	19	17	31	17	22	21	17.1
HR	14	15	16	30	16	18	8.6
HU	16	10	18	27	15	17	9.6
IE	18	18	29	18	24	21	18.1
IT	17	19	21	35	15	21	13.6
LT	18	15	8	26	19	17	7.9
LU	18	16	40	38	26	28	16.1
LV	13	16	17	17	18	16	9.1
MT	16	16	16	31	18	20	16.3
NL	18	21	36	25	27	25	17.9
PL	13	18	20	20	20	18	10.0
PT	15	13	10	17	20	15	10.4
RO	13	12	12	37	15	18	11.6
SE	18	32	37	18	28	27	18.1
SI	16	22	26	22	20	21	12.7
SK	15	17	24	25	16	20	9.0
UK	18	18	28	20	26	22	17.9

In Appendix 2 we introduce the table calculated by using input-oriented DEA method. It shows the possible cutting level of input variables to keep the same *Healthy life expectancy at age 65*. From this table we can identify the factors which potential are insufficiently utilized.

5 Conclusions and Main Results

The efficiency testing procedures by using DEA method were applied for exploring efficiency of healthcare. The methodology includes proposed hierarchical grouping of the variable data by applying input- and output-oriented computation methodologies of DEA and comparing them to evaluation outcome (*Healthy life expectancy at age 65*). The experimental evaluation was applied for 28 countries of EU by using statistical data of 2013–2015.

The research revealed that the healthcare systems of EU countries are in very diverse positions by their efficiency. The ‘old’ EU countries allocate the considerable amount of GDP to this sector and manage to secure high level of healthcare efficiency. At the same time the healthcare quality outcomes (*Life expectancy, Healthy life expectancy*) are higher than in other EU countries.

The research also showed that number of countries with the low healthcare budget are capable to achieve high value of the long *Healthy life expectancy* factor, but this effect cannot be directly explained by the input variables applied for research. It can be assumed that the model should be amended by more variables characterizing other peculiarities of countries, such as good climate, healthy food, and no-stress living conditions.

The results obtained by our research can assist the healthcare authorities to identify the shortages in country healthcare system and invite for action for improving healthy life expectancy for all EU population.

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Appendix 1. Data Set of Healthcare Quality Factors

		Infrastructure			Life style				Country general			Service consumption				Subjective quality measures		
	Total health expenditure per capita, in PPP	Physicians per 100000 population	Nurses per 100000 population	Beds per 1000 population	Alcohol cons umption in litres per capita	Regular smokers, % of population aged 15+	Population with Body mass index >=30, in %	People taking care on health-enhancing in %	GDP per capita, in PPP	Education	Gini	Multimorb idity patients, in %	Inpatient care duration	Doctors consultati ons (in all settings)	Average length of stay in hospitals	Corruption Perception Index	Patient reported evaluation	Public health promotion level
AT	2935	4,8	7,9	7,6	13,8	27,7	8,8	74,9	31588	77,1	27,2	35,8	8,2	6,8	9,8	75		
BE	2780	2,9	15,4	6,3	11	28,1	11,5	51,2	29520	68,1	26,2	24,9	8	6,4	8,4	77		
BG	1319	3,7	4,7	6,4	10	33,7	12,4	17,3	11259	76	37	20,5	8	6,4	5,4	41		
CY	1619	3	4,9	3,5	9,2	30,7	12,3	39,8	23133	71,7	33,6	32	8	6,4	5,8	55		
CZ	2025	3,6	8,5	6,8	11,7	25,4	12,9	52,6	20094	86,1	25	31,5	9,4	6,4	9,4	55		
DE	3625	3,8	11,6	8,2	11,2	24,5	12,2	71,2	30172	81,6	30,1	38,7	9	9,9	9	81		
DK	3015	3,5	15,7	3,5	12,2	35	8,6	81,3	31405	69,3	27,4	28	8	4,5	5,5	90		
EE	1315	3,3	6,5	5,3	7,3	31,6	13,3	47,7	17218	82,3	34,8	45,8	7,6	6,3	9,2	70		
EL	2032	6,1	3,3	4,9	10	38,2	10,7	25,9	20159	62,9	34,2	23,9	8	6,4	6,1	44		
ES	1937	4,1	5,5	3,1	11,9	31,8	11,3	49,0	23793	53	34,6	29,6	8	6,4	5,7	58		
FI	2461	2,7	10,7	5,5	8,8	24,1	10,1	77,0	28560	77,1	25,2	45,9	10,6	4,2	10,5	89		
FR	3127	3,1	9	6,4	14,8	28,1	7,3	51,0	27812	68,9	29,2	37	8	6,3	5,6	69		
HR	1266	2,8	5,7	5,8	12,9	27,4	11	41,4	14703	74,7	30,6	30,6	8	6,5	9,6	49		
HU	1978	3	6,4	7,2	12,8	34,9	18,5	56,6	16433	76,2	28,2	37	9,5	11,8	9,5	48		
IE	1962	2,7	12,6	2,9	12,6	29,3	13	51,2	31933	70,3	32	27,1	6	6,5	6,1	73		
IT	2117	4,1	6,6	3,4	9,5	25,2	8,4	35,0	25380	54,6	32,4	24,7	8	6,5	7,8	47		
LT	1335	3,7	7,2	7,4	7,1	28,6	16	36,3	16413	84,1	37,9	32,3	8	8,7	7,7	59		
LU	3259	2,8	11,6	5,4	14,9	28,3	16,5	63,5	63892	70,9	28,5	22,6	8,8	5,9	8,4	81		
LV	1352	2,9	4,9	5,9	8,7	32,3	15,5	48,6	14439	80,5	35,4	40,6	8,3	5,8	8,5	57		
MT	2218	3,1	6,8	4,5	6,4	25,2	23	52,7	21524	41,1	28,1	28,1	8	6,5	7,9	55		
NL	3172	3	8,6	4,7	9,9	34,1	7,8	51,2	31853	68,3	26,7	34,8	8	8	9	83		
PL	1598	2,2	5,8	6,5	8,4	34,9	11,4	41,2	16092	82,5	30,6	33,9	6,9	7,2	6,9	62		
PT	1748	3	6,3	3,4	13,7	22	12,2	37,2	19500	35,8	34	40,3	8,9	6,5	7,5	62		
RO	1169	2,4	5,4	6,1	10,8	21,7	8,6	15,6	12742	70,6	37,4	18,9	7,4	6,5	7,5	48		
SE	2578	3,9	11,1	2,7	6,3	21,3	8,9	75,4	30807	75,6	25,2	32,5	5,7	2,9	7,1	88		
SI	1859	2,5	8,4	4,6	11,8	25,8	12,3	61,0	20695	80,3	24,5	32,2	6,9	6,6	6,9	61		
SK	2232	3	6,3	6,1	10,5	23,3	16,8	52,3	18777	84,3	23,7	30,3	7,3	11,3	7,3	51		
UK	2430	2,8	10,3	2,9	10	27,4	18,3	58,8	26206	76,2	32,4	34,2	7,1	5,7	6,9	81		

Own calculations based on Eurostat, OECD, Heijink et al. (2015).

Appendix 2. Result Table of Possible Cutting Level of Input Variables to Keep the Same *Healthy Life Expectancy at Age 65*

	Infrastructure			Life style				Country general			Service consumption				Subjective quality measures		
	Physicians per 100000 population	Nurses per 100000 population	Beds per 1000 population	Alcohol consumption in litres per capita	Regular smokers, % of population aged 15+	Population with Body mass index >=30, in %	People taking care on health-enhancing in %	GDP per capita, in PPP	Education	Gini	Multimorbidity patients, in %	Inpatient care duration	Doctors consultations (in all settings)	Average length of stay in hospitals	Corruption Perception Index	Patient reported evaluation	Public health promotion level
AT	28.4	28.4	47.0	27.7	27.7	27.7	27.7	59.4	59.4	59.4	38.9	38.9	38.9	38.9	36.8		
BE	18.7	28.6	59.8	21.6	33.5	21.6	21.6	52.5	52.5	52.5	55.2	55.2	55.2	55.2	36.4		
BG	26.2	26.2	67.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.4		
CY	0.0	0.0	0.0	24.6	48.0	24.6	24.6	42.4	42.4	42.4	34.8	34.8	34.8	34.8	25.1		
CZ	38.2	38.2	51.5	36.9	53.6	36.9	36.9	54.3	54.3	74.5	61.2	61.2	61.2	61.2	31.8		
DE	29.7	29.7	52.9	34.1	34.1	34.1	34.1	53.9	53.9	53.9	29.5	29.5	45.6	29.5	38.0		
DK	27.0	29.8	27.0	0.0	0.0	0.0	0.0	54.3	54.3	54.3	0.0	0.0	0.0	0.0	44.6		
EE	31.8	31.8	43.2	42.9	42.9	42.9	42.9	46.4	46.4	46.4	0.0	0.0	0.0	0.0	50.9		
EL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.9	21.9	21.9	43.9	43.9	43.9	43.9	0.0		
ES	0.0	0.0	0.0	11.5	11.5	11.5	11.5	0.0	0.0	0.0	19.1	19.1	23.2	19.1	13.5		
FI	8.0	8.0	52.7	44.4	44.4	44.4	44.4	54.2	54.2	54.2	0.0	0.0	0.0	0.0	43.9		
FR	7.8	7.8	31.1	0.0	0.0	0.0	0.0	44.0	44.0	44.0	0.0	0.0	0.0	0.0	23.2		
HR	38.9	38.9	59.5	44.4	46.1	44.4	44.4	44.7	44.7	82.7	71.6	71.6	71.6	71.6	45.6		
HU	38.1	38.1	63.3	0.0	0.0	0.0	0.0	48.0	48.0	79.0	64.6	64.6	75.3	64.6	38.0		
IE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.2	38.2	38.2	0.0	0.0	0.0	0.0	23.2		
IT	22.1	22.1	22.1	26.9	86.8	26.9	26.9	35.8	35.8	35.8	60.8	60.8	62.0	60.8	10.3		
LT	56.4	56.4	71.1	49.8	48.8	48.8	48.8	0.0	0.0	0.0	69.2	69.2	80.9	69.2	58.5		
LU	12.1	12.1	52.0	0.0	0.0	0.0	0.0	76.2	59.9	59.9	57.8	63.7	57.8	57.8	38.4		
LV	30.5	30.5	59.2	43.8	43.7	43.7	43.7	45.7	45.7	59.2	46.5	46.5	46.5	46.5	50.5		
MT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.2	47.2	47.9	47.2	8.2		
NL	0.0	0.0	0.0	15.3	15.3	15.3	27.1	49.8	49.8	49.8	27.6	27.6	46.0	27.6	33.2		
PL	20.6	20.6	59.0	44.5	43.2	43.2	43.2	49.2	49.2	76.2	48.8	48.8	78.2	48.8	50.0		
PT	29.9	29.9	29.9	17.2	55.7	17.2	17.2	0.0	0.0	0.0	38.5	38.5	51.5	38.5	48.0		
RO	9.1	9.1	47.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	68.4	68.4	68.4	68.4	25.1		
SE	0.0	0.0	0.0	43.3	45.7	43.3	43.3	51.3	51.3	51.3	0.0	0.0	0.0	0.0	36.3		
SI	18.4	18.4	44.8	41.3	45.9	41.3	41.3	50.7	50.7	70.8	41.0	41.0	71.2	41.0	35.5		
SK	41.4	41.4	59.5	48.0	63.7	48.0	48.0	62.6	62.6	84.3	64.6	64.6	89.7	64.6	45.3		
UK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.6	35.6	35.6	9.4	9.4	30.6	9.4	31.5		

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