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## Efficiency of Healthcare Systems in the European Union States – Who Performs Better – Bismarckians or Beveridgeans?

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**Abstract:**

**Purpose:** European nations have established two main institutional arrangements for the funding and delivery of healthcare services. These arrangements for healthcare organisations are the tax-financed National Health Service systems (known as the Beveridgean models) and those operating with Social Health Insurance (known as the Bismarckian models), where the insurance funds may be independent of the government. The current literature is inconclusive with regard to the identification of the more efficient system. The aim of this study is to examine the Bismarckian and Beveridgean healthcare systems in the 28 European Union (EU) member states.

**Design/Methodology/Approach:** The Data Envelopment Analysis (DEA) has been applied as a quantitative tool to evaluate the efficiency of healthcare systems in the EU states. The DEA evaluates the technical efficiency and aims at estimating the relationship between the inputs and outputs of homogeneous objects. It is a powerful, non-parametric method for evaluating the relative efficiency when there are multiple inputs and outputs. The variant of the super-efficient and non-oriented, slack-based DEA model, under the assumption of variable returns to scale, has been used in this study.

**Findings:** The results of the DEA calculations allowed to rank countries according to their efficiency scores, obtained from the set of the chosen input–output indicators. It was concluded that economies with the Bismarckian healthcare systems showed slightly higher advantages in terms of the efficiency of healthcare spending.

**Practical Implications:** These outcomes helped to understand the reason for accepting a particular health financing system in a country, to justify the need for specific improvements and to increase the efficiency, or even establish relevant arguments for major revisions.

**Originality/Value:** The study complements the existing knowledge in the literature with an evidence-based discussion, including the pros and cons of the two analysed healthcare models.

**Key Words:** Healthcare systems, efficiency, Bismarck model, Beveridge model, DEA.

**JEL Classification:** H21, H51, I11, I18.

**Article Type:** Research Article

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## **1. Introduction**

Traditionally two models of healthcare are distinguishable in the European Union (EU) the Social Insurance Healthcare system (SIH) and the National Health Service system (NHS), also termed the ‘Bismarckian’ and ‘Beveridgean’ healthcare models. The manner in which these healthcare systems are financed is the main deciding criterion for including the health delivery approach of any country under either of these two categories. Currently, no national healthcare system is a pure Bismarckian model or a Beveridgean model, as different domestic healthcare arrangements tend to converge, drawing the best from both prototypes. Despite the tendency to converge, it is common to divide countries into two groups representing the dominant insurance-based model or the tax-based healthcare model.

The aim of this study is to contribute to the discussion on the advantages and disadvantages of these two healthcare systems, analysing them for their efficiency of healthcare expenditure.

The article is organised as follows: section two presents a review of the literature with respect to the results of the studies performed on the comparative assessment of the performance of the healthcare systems mentioned. Section three briefly discusses the general idea of the two European models of healthcare delivery, and assigns the EU Members to these models. Sections four and five describe the methodological framework and the set of DEA input–output data. Section six presents the results of the DEA efficiency computations, and finally, the conclusions based on the DEA results are drawn.

## **2. Literature Review**

For over half a century a debate has been waged over the relative merits of the two types of healthcare deliveries, termed as, the ‘Beveridge’ and ‘Bismarck’ healthcare systems (Björnberg, 2013).

Despite the long discussion on the pros and cons of the Social Insurance Healthcare systems (Bismarckian) and the National Health Service systems (Beveridgean), the current literature is, for the most part, inconclusive with regard to which model shows a superior performance (Saltman *et al.*, 2004; Wagstaff, 2009). Very rarely can one find articles that clearly indicate the more efficient system (Björnberg, 2013). Nonetheless, the literature is rich in providing the extensive characteristics of these two systems; including their advantages and limitations (some characteristics are presented in section 3).

The recurring questions concerning the advantages and limitations of the healthcare systems prevalent in Europe imply that neither of the two models is perfect and both have been exposed to a set of economic, political, and ideological pressures, which have produced many reforms (Nemec and Kolisnichenko, 2006; Abel-Smith and

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Mossialos, 1994; Kutzin *et al.*, 2010). Hence, it is not surprising that from the turn of the twentieth and twenty-first centuries the main focus of the healthcare policy makers and practitioners has been the issue of efficiency, which has been reflected in the massive literature.

Hollingsworth (2008), in his review of more than 300 published articles, has stated that the measurement of the efficiency and productivity of the health service delivery has become a 'small industry,' with an extensive supply side and a much weaker demand side. This does not come as a surprise, because, for socially sensitive issues such as healthcare, extensive research and academic discussions usually occur ahead of the practice (to fulfil the needs of the policy makers, regulators, supervisory institutions or managers of medical entities, who expect complete solutions and recommendations).

Although the need to evaluate the performance of the healthcare systems is recognised, no agreement has been reached on the concepts and dimensions that need to be measured for the performance.

Häkkinen and Joumard (2007), distinguished three levels at which healthcare efficiency could be measured: the disease, sub-sector, and system levels. The disease-level approach for specific diseases focuses on the health gains resulting from a specific treatment. The sub-sector approach mostly focuses on the hospital and other care delivery entities. Whereas the system-level approach is implemented to mainly measure the efficiency at the national level, across countries and over time. Hollingsworth's (2008) investigations reveal that more than 50% of the articles on the efficiency of healthcare are related to hospitals, whereas, only 5% have examined it at the level of the countries.

Glied (2008) distinguishes between healthcare-system efficiencies in two ways. First, the economic efficiency that focuses on how healthcare resources can be organised to maximise the benefits for all members in a society. Second, the technical efficiency which focuses on how the inputs are used to address a particular healthcare need. This study focuses on the assessment of the technical efficiency of healthcare systems at the level of international comparisons, taking into account the model by which they are arranged (Beveridge vs Bismarck).

From the point of view of the subject of this study, it is worth noting a few contributions made by Hadad *et al.* (2011), Asandului *et al.* (2014), Dlouhy (2016), and Kozuń-Cieślak (2020), to the efficiency assessment of the National Healthcare Systems. The studies mentioned exemplify a variety of approaches to evaluate the efficiency of the healthcare systems and their different perspectives. However, the paucity of research in the existing literature has focused on investigating the efficiency of the national healthcare systems from the perspective of the two conceptual models of healthcare delivery. This lack of research has inspired the topic of this article.

This article attempts to fill in this gap, to estimate which of the two approaches, the Bismarckian or the Beveridgean, is the more efficient one (in terms of technical efficiency). for healthcare delivery.

### **3. Mapping the Bismarckian and Beveridgean Healthcare Systems in the EU**

In the healthcare domain, the European systems are commonly divided into two historically rooted models, the Social Health Insurance system (SHI) and the National Health Service system (NHS), also identified by the names of their founding fathers, as the Bismarck healthcare model and the Beveridge healthcare model. The Bismarckian approach expresses the idea of health coverage as a right of labour, while the Beveridgean concept reflects the philosophy of healthcare as a human right. These two models differ mainly in terms of the role of the state as the financier and owner of the facilities (Delnoij, 2013).

Cremer and Pestieau (2003), identified two rules that characterise both the models, the flat rate–benefit rule related to the Beveridgean approach and the earnings-related rule related to the Bismarckian healthcare system. These models reflect two polar cases with respect to the redistributive character of the social protection systems. The Beveridgean rule is highly redistributive and achieves complete equalisation of benefits, while the Bismarckian system includes no redistribution. The characteristics of the two healthcare delivery systems, with respect to the role of the state, type of healthcare providers, finance sources, entitlement to healthcare, healthcare arrangement, scope of the medical services, and existence of private insurance can be found in Schnackenberg and Tabernig (2011), Wendt (2009), Kuvikova (2004).

The Beveridgean tax-based NHS system is considered the healthcare model that ensures more equitable access to healthcare, due to its universal coverage and tendency to minimise the problems of risk selection and cost shifting by healthcare providers and insurers. This model also appears to perform well in limiting the overall healthcare costs. The down side of the Beveridgean healthcare model is that it does not have a sufficient choice for users and disappointing capacity (waiting time).

Thus, the major emphasis on reforms in countries with this system has been to increase the choice and reduce the waiting time (Or *et al.*, 2010). It must also be understood that demographic changes lead to an increased burden on tax revenues, both quantitative (increased number of old people) and qualitative (more expensive healthcare services and technology). This implies that there is a need to increase the share of healthcare expenditure in the national budget (Schnackenberg and Tabernig, 2011).

The Bismarckian insurance-based system is appreciated for its plurality of healthcare providers and abundance of choice (Or *et al.*, 2010). The arguments typically cited in favour of the Bismarckian model emphasise that the social insurance institution does

not have to compete against other spending priorities for government resources, as it has clearly identified funds coming from occupation-based premiums (Cichon and Normand, 1994). As Schnackenberg and Tabernig (2011) have stated, the major challenge this system faces is cost containment. Due to the demographic changes, the system needs to support a steadily increasing number of retirees, who no longer pay into the system. Financial cutbacks by the companies, precipitated by the economic crises, result in a steep rise in the unemployment rate resulting in fewer employees who contribute. Solutions, like raising contributions, appear to backfire because the companies cannot afford increased labour costs.

At present, no national healthcare system is a pure Bismarckian or Beveridgean model and different domestic healthcare arrangements tend to converge, taking the best from both prototypes. This compilation aims at ‘perfection’ — achieving an optimal mixture of access to healthcare, quality of care and efficiency.

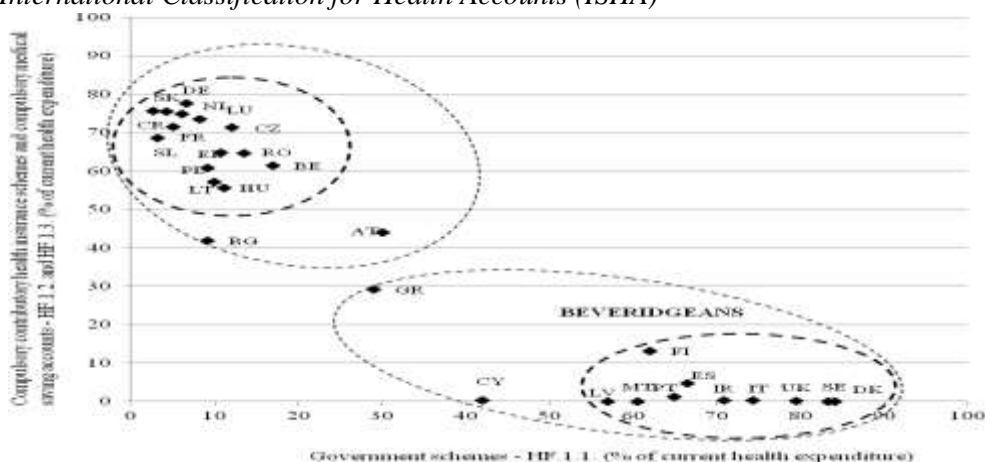
Despite this tendency to convergence, it is common in the literature to segregate European countries into these two groups based on the dominant features. It is not clear which EU country should be assigned to which system, as no country follows either of the two systems in their purest forms, also, over time, there have been shifts towards the Beveridge model or the Bismarck model.

For the purpose of this article, (according to the Organisation for Economic Co-operation and Development (OECD)), the funding scheme criterion used to identify the existing healthcare model in EU countries was the International Classification for Health Accounts (ICHA). Countries where governments used the ICHA: HF.1.1 scheme stated that more than 50% of the total current health expenditure had been recognised as belonging to the Beveridge model.

In contrast, countries where compulsory contributory health insurance schemes and compulsory medical saving accounts dominated (ICHA: HF.1.2–HF.1.3; mostly social health insurance schemes HF.1.2.1) had been included into the Bismarck model group. Figure 1 shows the 14 EU states where compulsory health insurance schemes declared 55% to 78% total current health expenditure. These states represented the Bismarckian model of healthcare delivery (Germany, the Netherlands, France, Luxembourg, Belgium, Croatia, Slovenia, Slovakia, Czech Republic, Estonia, Hungary, Poland, Romania, Lithuania). The government schemes showed less than 20% of the current health expenditure in these countries.

Additionally, Bulgaria and Austria had been included in the Bismarckian style healthcare model group, despite their compulsory health insurance schemes being less than 50% (i.e., 42% and 44%, respectively), but at the same time, their government schemes amounted to merely 9% in Bulgaria and 30% in Austria. Complementing these sources were mainly household out-of-pocket payments, which in Austria were approximately 30% of the current health expenditure, while in Bulgaria they amounted to 47%.

**Figure 1** Health expenditure schemes in EU states (2015) according to OECD International Classification for Health Accounts (ISHA)



Source: Own work.

The other EU member states were classified as Beveridgeans. In ten of them (Denmark, Sweden, the United Kingdom, Italy, Ireland, Spain, Portugal, Malta, Finland and Latvia), the government schemes represented 57% to 84% of the current health expenditure. Additionally, Greece and Cyprus have been included to this group despite their government schemes being less than 50% (i.e., 29% and 42%, respectively), but at the same time their compulsory health insurance schemes represented merely 0.3% in Cyprus and 29% in Greece. Complementing these sources were also household out-of-pocket payments (in Cyprus it was 44% of the current health expenditure, while in Greece it was 36%).

#### 4. Methodology

The Data Envelopment Analysis (DEA) has been applied as a quantitative tool in the European Union states, to evaluate the efficiency of spending on healthcare. The DEA evaluates the technical efficiency and aims at estimating the relationship between the inputs and outputs of homogeneous objects. The main advantage of the DEA technique is that it does not require the specification of a particular functional form of technology. It is a powerful, non-parametric method for evaluating the relative efficiency, when there are multiple inputs and outputs (Toloo, 2014).

The DEA identifies a ‘frontier,’ based on which the relative performance of all the decision-making units (DMUs) in the sample can be compared — the DEA benchmarks the analysed DMU only against the best ones that formed the frontier of efficiency (productivity frontier). An object is recognised as 100% efficient (DEA efficiency measure  $\theta = 1$ ) when comparisons with other DMUs in a sample do not reveal any evidence of inefficiency with the use of any input or output. If the DMU is

not at the frontier level, it implies that it is inefficient — its distance from the frontier determines the inefficiency level and DEA efficiency score  $\theta < 1$  (for mathematical foundations of the DEA computations refer (Cooper *et al.*, 2007). Over the years, the simple DEA models have been enriched by several modifications, which enable users to have a better fit of the appropriate DEA variant to suit their research needs.

However, in this study, the more advanced super-efficiency and non-oriented, slack-based DEA model, under the assumption of the variable returns to scale (DEA SE-NO-SBM-V) has been applied. The reason for applying the DEA SE-NO-SBM-V model is to avoid several limitations and possible distortions of the simple DEA models. In particular, the slack-based condition (SBM) allows one to avoid the Farrell’s weak efficiency (Tone, 2001). Moreover, the super-efficiency variant (SE) avoids the redundancy of the efficient leaders and also identifies the so-called ‘over-efficiency’ (Banker *et al.*, 1989; Andersen and Petersen, 1993). Finally, the generalised orientation (NO) helps to avoid some problems that may occur for models with the assumption of the variable returns to scale (V) (Cheng *et al.*, 2011).

The mathematical expression of DEA SE-NO-SBM-V is as follows (Tone, 2002):

$$\delta^{DEA-SE-NO-SBM} = \min_{\phi, \psi, \lambda} \frac{1 + \frac{1}{m} \sum_{i=1}^m \phi_{io}}{1 - \frac{1}{s} \sum_{r=1}^s \psi_{ro}} \quad (1)$$

Subject to:

$$\sum_{\substack{j=1 \\ j \neq o}}^n x_{ij} \lambda_{jo} - x_{io} \phi_{io} \leq x_{io} \quad (i = 1, \dots, m),$$

$$\sum_{\substack{j=1 \\ j \neq o}}^n y_{rj} \lambda_{jo} - y_{ro} \psi_{ro} \geq y_{ro} \quad (r = 1, \dots, s),$$

$$\phi_{io}, \psi_{ro}, \lambda_{jo} \geq 0$$

Where:

$\delta^{DEA-SE-NO-SBM}$  — efficiency score of the DMU $_o$  ( $o = 1, \dots, n$ ),

$x_{ij}$  — amount of the  $i$ -th input of the DMU $_j$  ( $i = 1, \dots, m$ ),

$y_{rj}$  — amount of the  $r$ -th output of the DMU $_j$  ( $r = 1, \dots, s$ ),

$\lambda_{jo}$  — the intensity factor associated with the DMU $_j$  and designated for the analysed DMU $_o$  ( $j = 1, \dots, n$ ),

Weighted (by lambda coefficients) sum of inputs (outputs) of DMUs, which are the reference objects for DMU $_o$ , shows the recommended value of the inputs (outputs) of DMU $_o$ , at which it becomes efficient.

$\varphi_{io}$  — indicates the required percentage reduction of the *i*-th input,

$\psi_{ro}$  — indicates the required percentage increase of the *r*-th output.

The formula of the DEA SE-NO-SBM-V model facilitates ranking of the relative efficiencies of multiple systems (here, 28 countries) at consuming inputs (expressed by the health expenditure indicator), in order to produce multiple outputs (expressed by health status indicators, i.e., infant mortality, healthy life expectancy at birth and self-reported unmet needs for medical examination).

## 5. Data

Although there is robust evidence relating to the need to measure the performance of the healthcare systems, no conclusive agreement has been arrived yet on the choice of concepts and dimensions of performance that need to be measured. According to Pelone *et al.* (2008), the difficulties are also enhanced by the lack of up-to-date and comparable data, besides, many healthcare indicators are quality-related and not very objective.

Based on the literature review, four of the most common measures have been selected and employed in this study. Two of them are input indicators, which are, current health expenditure expressed, as the percentage of the GDP (HE%GDP), and per capita (HEpc) in PPP. Both reflect the healthcare effort in monetary terms. Three indicators were used as the output measures.

Two of them — healthy life years expectancy at birth (HLY) and infant mortality rate (IMR) — are commonly used to assess the quality of the healthcare systems. The third one, namely self-reported unmet needs for medical examination (NME), is seldom used. The NME reveals the following reasons for self-reported unmet needs for medical examination: too expensive or too far to travel or too long a wait list. This indicator reflects the patient's subjective appraisal of the available medical care, but it appears to be very informative for assessing the integrity of country's healthcare system.

As the IMR is not a stimulant (a higher value represents a worse situation of the object) its conversion into a positive indicator is necessary ( $IMR^* = 1000-IMR$ ); the same applies to the NME measure ( $NME^* = 100-NME$ ).

The list of input–output indicators mentioned above have been shown in Table 1, with a short description, scope and information on the source.

**Table 1.** *The set of input–output indicators (definition, data source and scope)*

Input indicators	Abbr.	Data source and scope
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<i>Current health expenditure as the % of GDP</i> (level of resources directed to healthcare, relative to a country's wealth)	HE%GDP	WHO 2008–2017
<i>Current health expenditure per capita (PPP)</i> (level of resources channelled into healthcare in the standard of purchasing power parity, relative to the size of population)	HEpc	WHO 2008–2017
Output indicators	Abbr.	Data source and scope
<i>Infant mortality rate</i> (reveals the number of infant deaths, as compared with 1000 live births — synthetic indicator of a society's health and level of healthcare services)	IMR	WHO 2010–2019
<i>Healthy life years expectancy at birth</i> (measure of the quality of life expressed by the number of years lived in “full health”)	HLY	EUROSTAT 2010–2019
<i>Self-reported unmet needs for medical examination (reasons: too expensive or too far to travel or too long wait list)</i> (it shows the capacity and accessibility of the healthcare system from the patient's perspective)	NME	EUROSTAT 2010–2019

*Source:* Own work.

The assessment of the efficiency of healthcare systems at the country level, by applying the indicators proposed above, involves some difficulty in selection of the appropriate input–output data sets. This is because the results achieved by the healthcare system every single year do not rise directly from the inputs incurred in that year. Therefore, the indicators used in this study represent long-term averages (the arithmetic mean of 2008–2017 for inputs, and of 2010–2019 for outputs).

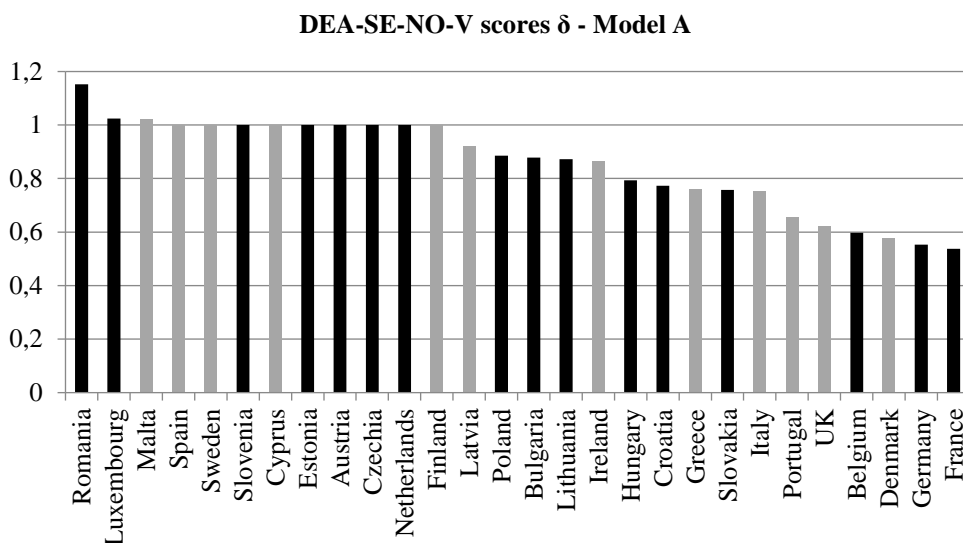
The study will consider two DEA SE-NO-SBM-V models, which differ only in the input indicator. Model (A) will employ the current health expenditure as a percentage of the GDP (HE%GDP), while model (B) will use the current health expenditure per capita (HEpc), expressed in the purchasing parity power (PPP). The output indicators are identical for both models. This two-fold approach enables the assessment of the degree to which the evaluation of efficiency of the healthcare systems is affected by the manner in which the health expenditures are expressed. The next section will examine these two models by assessing the technical efficiency of the 28 EU healthcare systems (DEA approach).

## 6. DEA Computation Results

The DEA calculations identified 12 economies as the efficiency leaders in Model A. This peer group includes seven states with the Bismarckian healthcare system (Romania, Luxembourg, Slovenia, Estonia, Austria, the Czech Republic and the Netherlands) and five states using the Beveridgean systems (Malta, Spain, Sweden, Cyprus and Finland). The other states reveal a relative inefficiency, which ranges from 8% in Latvia up to 46% in France. The coefficient of variation (CV) of the DEA scores

in Model A amounts to 20%, which means a weak differentiation. Figure 2 shows the ranking of the DMUs analysed in Model A due to the DEA efficiency score.

**Figure 2.** DEA-SE-NO-V efficiency scores  $\delta$  (Model A)



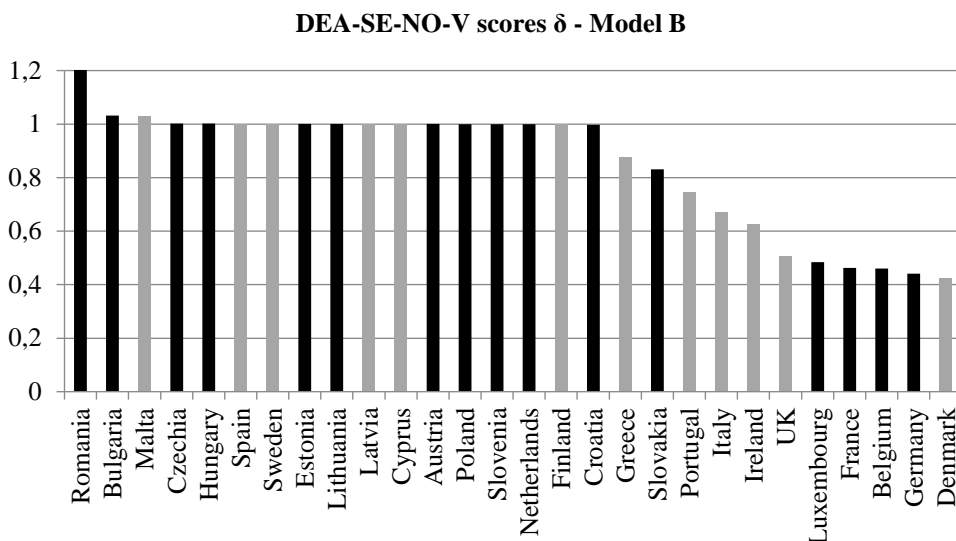
**Notes:** Bismarckians – in black, Beveridgeans – in gray

**Source:** Own work based on Table A1.

The mean value of the DEA efficiency score for Model A amounts to  $\delta = 0.86$  for the Bismarckian states and  $\delta = 0.85$  for the Beveridgean ones. This implies that the ‘average’ Bismarckian healthcare system is producing about 14% more costly than it would be, if it were efficient. The same occurs for the ‘average’ Beveridgean state, the efficiency gap amounts to 15%. The maximum value of the DEA efficiency score is more advantageous for the Bismarckian system (Romania,  $\delta = 1.15$ ) than for the Beveridgean (Malta,  $\delta = 1.02$ ). Consecutively, the minimum DEA efficiency score is worse for the Beveridgean Denmark ( $\delta = 0.54$ ) than for Bismarckian France ( $\delta = 0.58$ )

The DEA calculations for model B identified 16 efficient healthcare systems. These include the same leaders as listed in model A (except Luxembourg) and four additional Bismarckian states (Lithuania, Poland, Bulgaria and Hungary) and one Beveridgean system (Latvia). The efficiency scores in Model B show a medium differentiation (CV = 28%). The states that have been assessed as relatively inefficient show an efficiency gap that is practically irrelevant in the case of Croatia (0.3%) and up to 58% in Denmark. Bismarckian Romania achieved an extraordinary relative over-efficiency ( $\delta = 1.20$ ). Figure 3 shows the ranking of all the DMUs analysed in Model B.

**Figure 3.** DEA-SE-NO-V efficiency scores  $\delta$  (Model B)



*Notes:* Bismarckians – in black, Beveridgeans – in gray.

*Source:* Own work based on Table A1.

The mean value of the DEA efficiency score in Model B amounted to  $\delta = 0.87$  for the Bismarckian states and  $\delta = 0.82$  for the Beveridgean states. Thus, the ‘average’ Bismarckian healthcare system is proving to be 13% more expensive than it would be if it were efficient, while the ‘average’ Beveridgean state is proving to be about 18% more costly than it would be if it were efficient. The maximum DEA efficiency score in Model B is also higher for the Bismarckian system (Romania,  $\delta = 1.20$ ) than for the Beveridgean one (Malta,  $\delta = 1.03$ ). As for the minimum DEA scores, they are almost the same (for Bismarckian Germany  $\delta = 0.44$  and for Beveridgean Denmark  $\delta = 0.43$ ).

Comparison between the DEA scores of the Bismarckian and Beveridgean healthcare systems in the European Union states, enable the following conclusion:

- The DEA model in which the input measure is expressed by health expenditure as a percentage of GDP (Model A) is more favourable for the Bismarckian healthcare system, due to the three of four criteria included in the tally below:
  - The number of states assessed as relatively efficient is higher among Bismarckian healthcare systems,
  - The lowest quartile of the DEA scores includes less Bismarckians,
  - The efficiency gap for the ‘average’ Bismarckian system is slightly lower.
- The DEA model in which the input indicator was expressed by health expenditure per inhabitant (Model B) also shows the advantages of the Bismarckian system, but only regarding the following two criteria:
  - The number of states assessed as relatively efficient is higher among the Bismarckian healthcare systems,
  - The efficiency gap for the ‘average’ Bismarckian system is lower.

The criterion relating to the number of states with the DEA score in the lowest and the highest quartile of DEA scores does not show any advantage in either of the two healthcare systems.

- Model B identified a larger group of efficient countries than Model A. However, it must be emphasised that 90% of the countries assessed as leaders in Model A also form a group of efficient healthcare systems in Model B. At the same time, the additional efficient systems indicated by Model B are mainly of the Bismarck-type.

	Healthcare system			
	Bismarckian	Beveridgean	Bismarckian	Beveridgean
	Model A		Model B	
Number of states assessed as efficient	<b>7 of 16</b> <b>(44%)</b>	5 of 12 (42%)	<b>10 of 16</b> <b>(63%)</b>	6 of 12 (50%)
Efficiency gap for the 'average' healthcare system	<b>14%</b>	15%	<b>13%</b>	18%
Number of states with the DEA score in the highest quartile	3 of 16 (19%)	<b>4 of 12</b> <b>(33%)</b>	4 of 16 (25%)	3 of 12 (25%)

Although this study reveals a certain superiority in efficiency of the Bismarckian healthcare system, it is crucial to emphasise that the DEA efficiency scores reveal the success in which a given set of efforts (inputs) have been transformed into a given set of results (outputs). Therefore, selection of the appropriate input–output indicators becomes decisive for the study results; hence, all the conclusions and recommendations should be accepted with much caution.

## 7. Conclusions

The aim of this article was to examine the Bismarckian and Beveridgean health delivery systems in 28 European Union member states, in order to identify which of them was more efficient in healthcare expenditure. The study examined two super-efficiency DEA models, which differed just in the way of expression of the input indicator. The examined period covered years 2008-2019. The DEA calculations allowed to rank countries according to the efficiency scores obtained on the set of their chosen input–output indicators. It was concluded that economies with the Bismarckian healthcare systems showed slight advantages in terms of the efficiency of healthcare spending.

It should be noted here that the advantages of the Bismarck system found in this study are not very strong, and to confirm a better efficiency of the Bismarckian healthcare system, research should be continued, using different sets of input–output indicators.

It is also crucial to emphasise that the assessment of DEA efficiency is merely an analysis of the relationship between the results and efforts (Expressed by the randomly chosen set of input–output indicators), and it does not necessarily express searching for the most desirable or best target solution. Hence, DEA-efficiency indicators do not indicate the economies with the best healthcare systems or the healthiest society, but the states that have obtained the best results within the determined level of inputs, or states that obtained the determined level of output, with employment of the lowest input.

This is confirmed by the results of different surveys on patient satisfaction. For example the annually published Euro-Health Consumer Index (Björnberg, 2019) ranks 35 European states, including the 28 EU members. Many of them have been assessed as more or less inefficient in this study, while the Euro-Health Consumer Index placed them on the top of list, as the most satisfying healthcare solutions, (e.g., the Netherlands, Denmark and Belgium). Moreover, there is nothing strange about it because health is valued above all prices. Therefore, it is not surprising that the rich societies are ready to sacrifice the technical efficiency, as it is just one of the many criteria that determine the quality of the health system.

It can be expected that the discussions about the pros and cons of healthcare systems will not stop for a long time, especially in the context of assessing how they dealt with the pandemic.

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**Appendix:***Table A1. DEA-SE-NO-V efficiency computations*

Economy	DEA Score		Economy	DEA Score	
	Model A	Model B		Model A	Model B
Austria	1,000	1,000	Italy	0,752	0,670
Belgium	0,598	0,461	Latvia	0,920	1,000
Bulgaria	0,878	1,032	Lithuania	0,873	1,001
Croatia	0,773	0,997	Luxembourg	1,024	0,484
Cyprus	1,000	1,000	Malta	1,021	1,030
Czech Republic	1,000	1,002	Netherlands	1,000	1,000
Denmark	0,578	0,425	Poland	0,885	1,000
Estonia	1,000	1,001	Portugal	0,657	0,744
Finland	1,000	1,000	Romania	1,152	1,204
France	0,537	0,462	Slovakia	0,758	0,831
Germany	0,553	0,441	Slovenia	1,000	1,000
Greece	0,762	0,877	Spain	1,001	1,001
Hungary	0,794	1,001	Sweden	1,001	1,001
Ireland	0,865	0,626	United Kingdom	0,620	0,505

*Source:* Own calculations performed with the DEA solver. LV 8.