

Article

# Evaluation of Efficiency in Selected Areas of Public Services in European Union Countries

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**Abstract:** Over the past 40 years, the service sector has become the dominant area of market economies. The public sector and services financed from public financing represent a specific group within the services sector. This paper aims to evaluate the efficiency of EU countries and find the extent to which the volume of public services (and the respective financial allocations) can have an impact on selected economic indicators. To this end, the efficiency of public expenditure in five areas of public services (general public services; health; education; social protection; and recreation, culture, and religion) in 2009 and 2016 was evaluated in relation to selected economic indicators (GDP per capita and employment in services). In addition, the efficiency of public expenditure in EU countries was evaluated in relation to the size of the public sector and traditions of public administration. For cross-country analyses within the 27 European countries, data envelopment analysis and the input-oriented variable returns to scale (VRS) model were applied. The results demonstrated that in 2009, 13 out of 27 countries were efficient as opposed to 2016, where only seven countries were efficient. In countries with bigger size of public sector, the efficiency of public expenditure on services was not established. However, there was a similarity in the efficiency of public expenditure on services between groups of EU countries regarding the tradition of public administration.

**Keywords:** public services; public expenditure; efficiency; data envelopment analysis; EU countries; economic indicators

## 1. Introduction

Services currently represent a dynamically developing area of national economies. Over the past 40 years, the tertiary sector (service sector) has become a dominant sphere of market economies, and the growing role of services has also had a positive impact on the employment rate in services [1,2]. It must be noted, however, that certain types of services are excluded from the tertiary sector. Services that do not serve private economic processes and individual needs of the population (financial administration, public administration, judiciary, police, etc.) belong, according to Benco et al. [3] or Stiglitz and Rosengard [4], to the quaternary sector. Meanwhile, services that render the economic growth more dynamic with an emphasis on quality, development, and cultivation of human potential (education, culture, health, etc.) are part of the quinary sector. The public sector represents a special subgroup of the services sector and includes all services financed from public financing, namely, public services. Ochraňa [5] defined public services as “such services whose user (consumer) is the public as a social entity. In economic terms, public service ... is a public good (goods of collective consumption)”.

From the viewpoint of theoretical approaches, the theory of state and public financing raises the question of the provision of public services by the state. Smith [6] emphasized the significance of ensuring services, which the market is uninterested in due to their unprofitability, for public benefit. Benco et al. [3], Stejskal et al. [7], and Stejskal and Hajek [8] noted that in relation to the provision of public services, the efficiency of taxation and public expenditure is becoming a matter of interest. These issues have been mainly dealt with by representatives of neoclassical economics. On the other hand, some scholars, such as Lindal [9], Mazzola [10], and Wicksell [11], have also come up with ideas regarding the theory of public services, which have now become the basis for many of their followers and representatives of modern neoliberalism. European representatives of neoliberalism admit that certain activities of the state also include the provision of public services, while other authors, such as Musgrave [12], are still developing their opinions. Therefore, in this paper, our purpose was to examine the efficiency of the public sector in individual member countries with the help of various indicators as well as to answer some research questions.

The primary aim was to provide a comprehensive evaluation of public services from the viewpoint of efficiency of public expenditure allocated for that purpose. Public service was selected as the subject of research as it represents a significant part of the public sector structure. The allocated public expenditure on these services account for approximately 80% of the total public expenditure in the EU. Five areas of public services were particularly selected as the topics of focus. Three of the areas—education, health, and social protection—connected to the development and cultivation of human potential and satisfying individual needs, also referred to as services of the welfare state. The fourth area consisted of services in recreation, culture, and religion. Lastly, we also included general public services from the area of public state consumption, which satisfy not only social but also individual needs. These five areas were used to evaluate the efficiency of public expenditure in EU countries in relation to selected economic indicators (GDP per capita, employment in services). In addition, the efficiency of public expenditure was evaluated in relation to the size of the public sector and according to traditions of public administration in each country.

The article's overall aim was to evaluate the efficiency of EU countries and to find the extent to which the volume of public services (its financial allocations) affects the selected economic indicators. To fulfill the target, two research questions were verified: RQ1: Do efficient countries also have a bigger size of public sector? RQ2: Do EU countries with the same tradition of public administration have a similar rate of efficiency of public expenditure on public services?

The rest of the paper is structured as follows. The next section covers the theoretical background for understanding the evaluation of efficiency in the public sector in terms of theory and practice in the EU. Section 3 details the research methodology and the characteristics of the dataset. Section 4 lists the research results. Finally, in the Discussion and Conclusion section, the results obtained are interpreted and discussed to conclude and formulate recommendations for future research.

## 2. Theoretical Background

Contemporary authors Brown and Jackson [13] contributed to the theory of public goods and services and categorized public services (goods) into purely private and purely public assets. These goods constitute two opposing poles, and between them is a large amount of existing mixed goods (services). Public services have also been dealt with from the viewpoint of practical questions in relation to their ensuring, provisioning, and financing. Ensuring of public services has a wider meaning, which includes guaranteeing, organizing, regulation, and partial control and financing of public services. Scholars Brown and Potoski [14], Morton [15], Musgrave and Musgrave [16], and Wollman et al. [17] all focused on the possibilities of ensuring and providing public services. Musgrave and Musgrave [16] further distinguished between the terms “ensuring” and “providing”. Public services financing has been analyzed by many scholars [16,18–20] in the framework of public finance theory even though there is no single source or tool for financing public services provision. In the view of current authors, such as Brown and Jackson [13], Musgrave and Musgrave [16], and Stiglitz [20], public assets/services

can be financed from (1) public resources, by directly connecting to the public budget or providing subsidies and subventions to independent economic entities; (2) private resources, by fully financing through private capital; or (3) a combination, i.e., financing partially from private and partially from public resources.

Public expenditure plays a significant role in the financing of public services, and it forms a precondition for their development. Numerous papers have dealt with analyses of public expenditure, its changes, and its increased efficiency. For instance, Szarowska [21] examined long-term and short-term relationships between government expenditure and GDP in the EU15. Other authors have evaluated the relationship between public expenditure and economic growth (e.g., Reference [22]) or focused on the structure of public expenditure and expenditure on public services [23]. Leitner and Stehrer [24] analyzed changes in public expenditure structures in the EU member states over the period 1995 to 2013 based on data on government expenditure by function (Classification of the Functions of Government or COFOG), with a focus on the social expenditure categories of health, education, and social protection expressed in per capita terms in purchasing power parities (PPPs) at constant prices. In regard to the structure of public expenditure, studies devoted to the efficiency of public spending in certain sectors of public services have highlighted the importance of these expenses in relation to socioeconomic development [25,26].

Many authors have pointed to increased efficiency of public expenditure in relation to financing of public goods and services. They have looked for ways of rendering public resources more efficient and have accordingly proposed measures for improvement, e.g., Afonso et al. [27], Curristine et al. [28], Merickova and Stejskal [29], and Schaltegger and Torgler [30]. Other authors have summarized factors impacting the public sector and its efficiency [25,31–34]. The evaluation of public sector and public service efficiency has also been elaborated on the macroeconomic level. This approach is based on the definition of the relation between the performance and efficiency of the public sector. Afonso et al. [27], for instance, assumed that the performance of the public sector is dependent upon improved values of selected socioeconomic indicators. Other authors have analyzed the efficiency of public expenditure in areas of public services in relation to macroeconomic indicators. Tkacheva et al. [35], for instance, examined public expenditure on social support of the population, education, and health care. The authors showed that once the social costs begin to outpace the GDP growth rate, then there is a decrease in economic development rates. Merickova et al. [32] evaluated the correlation between the volume and structure of public expenditure and socioeconomic development as represented by the human development index. The authors indicated that the total amount of public expenditure does not have a significant impact on the socioeconomic development; however, public expenditure in “productive” sectors of public services (especially education, health, and social services) has the potential to have a positive impact on socioeconomic development. Mandl et al. [31] showed that the efficiency of public services in general, and public expenditure on education and R&D in particular, varies significantly between countries. Authors have also illustrated the difficulties of measuring efficiency and effectiveness. Dutu and Sicari [25] used data envelopment analysis (DEA) to assess the efficiency of welfare spending using a sample of OECD countries around the year 2012, focusing on health care, secondary education, and general public services. Moreno-Enguix and Lorente Bayona [33] designed public expenditure efficiency indexes, both for general government and for its functions, using single synthetic indicators as well as a free disposal hull and DEA models. The authors also tested the association between public sector performance and public expenditure efficiency and other key socioeconomic indicators. Ouertani et al. [34] assessed government spending efficiency and explained inefficiency scores using DEA–bootstrap analysis in the case of Saudi Arabia. The empirical results showed that, on average, public spending was inefficient and implied that Saudi Arabia could improve their performance on health, education, and infrastructure without having to increase spending.

Research on the efficiency of public expenditure has focused on services of welfare state (health care, education, and social protection) or analyzed only selected areas of public services,

most frequently social protection, education, or general public services. A recent European Commission (EC) report [36], for instance, focused on the service provision and subsequent mapping of financing models in three sectors (waste, hospitals, broadband) within seven countries and assessed how public services were financed. Studies carried out in connection with the evaluation of services have mainly focused on selected areas of market services [37] or paid attention to analyzing market and nonmarket services from various angles [1,38,39].

### 3. Materials and Methods

#### 3.1. Data Description

In this study, the efficiency of public expenditure was evaluated using data from Eurostat and World Bank databases. A total of seven variables were used for the purposes of the analysis, consisting of five variables as inputs (government expenditure on services by selected function, COFOG [40]) and two variables as outputs of the selected economic indicators [41]. The set of input variables represent the essential needs of people and the society; these services are always found in public sectors of developed countries. The details of the variables are presented in Table 1.

**Table 1.** Input variables involved in the model.

Abbreviation	Public Expenditure on Selected Services (by COFOG I Level)	Service	Units
* GF01	General public services	Collective	Percentage of GDP
GF07	Health	Collective 7.5, 7.6	Percentage of GDP
GF08	Recreation, culture and religion	Collective 8.3, 8.6	Percentage of GDP
GF09	Education	Collective 9.7, 9.8	Percentage of GDP
GF10	Social protection	Collective 10.8, 10.9	Percentage of GDP

Note: \* marks collective services; remaining parts are expenditure on individual final consumption; Source: Authors according to References [24,40].

Our analyses mainly concentrated on government expenditure by functions. COFOG is an internationally used classification standard to divide state expenditure (state budgets) with respect to their purpose (function) [42]. COFOG is mainly used for the purposes of obtaining statistical findings and for international comparison of the structure of expenditure on public services. COFOG classifies government expenditure into ten main categories (divisions known as the COFOG I level breakdown): general public services; defense; public order and safety; economic affairs; environmental protection; housing and community affairs; health; recreation, culture, and religion; education; and social protection [24]. Selected inputs and outputs of the present analysis are shown in Tables 1 and 2.

The year 2009 was selected for the purpose of analysis as it represents a post-crisis year and is a milestone in the subsequent growth of the economy; the year 2016 was selected as this was the last year when all data for the analyzed variables were available. It is necessary to state that all EU countries did not follow the same path after the international economic crisis. In this analysis, we assumed that the diversion did not occur in fundamental services in order to perform analysis and comparisons. However, in terms of objectivity, this weakness of analysis should be noted. Due to the methodologies of other scholars [13,36,38] or Reference [43], we assumed a time delay that was usually 5–6 years.

Due to the unavailability of all data, Malta was excluded from the analysis. The selected set comprised 27 EU countries (Belgium: BE, Bulgaria: BG, Czech Republic: CZ, Denmark: DK, Germany: DE, Estonia: EE, Ireland: IE, Greece: EL, Spain: ES, France: FR, Croatia: HR, Italy: IT, Cyprus: CY, Latvia: LV, Lithuania: LT, Luxembourg: LU, Hungary: HU, Netherlands: NL, Austria: AT, Poland: PL, Portugal: PT, Romania: RO, Slovenia: SI, Slovakia: SK, Finland: FI, Sweden: SE, United Kingdom: UK).

**Table 2.** Output variables involved in the model.

Economic Indicators	Description of Variable	Units
GDP per capita	GDP per capita based on purchasing power parity is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.	PPP (current international \$)
Employment in services	Employment is defined as persons of working age who are engaged in any activity to produce goods or provide services for pay or profit, whether at work during the reference period or not at work due to temporary absence from a job, or to working-time arrangement. The services sector consists of wholesale and retail trade and restaurants and hotels; transport, storage, and communications; financing, insurance, real estate, and business services; and community, social, and personal services.	% of total employment

Source: Authors according to Reference [41].

### 3.2. Methods

For the scientific study, analysis, comparison, and abstraction were the key methods used. For the creation of the theoretical framework and the review of literature, content analysis and synthesis were used. Partial induction was applied for drawing conclusions. The efficiency of EU countries in 2009 and 2016 was analyzed by applying the data envelopment analysis method. DEA is a mathematical programming approach used as a model-specialized tool for assessing the efficiency, performance, and productivity of comparable production units (homogeneous decision-making units or DMUs) based on the size of inputs and outputs. A unit (in this case, an EU country) is effective provided it lies on the border of its productivity capabilities (efficiency frontier), which means that the country makes an effective use of its inputs, transforming them into required outputs. The advantage of the DEA model is that it provides practical implications (for each country) on how to improve and how to change inputs and outputs to become (more) efficient and enables benchmarking against best practice. Another advantage is the fact that DEA optimizes performance measurement of each production unit (an EU country) separately, which results in the comprehension of each production unit unlike methods that operate with average production units. Input-oriented models propose changes by primarily focusing on input variables (or even minor changes on the output side). In contrast, DEA uses mathematical programming models to estimate best-practice frontiers without a priori underlying functional form assumption by computing multiple input/ output values and calculating a maximal performance measure for each DMU relative to all DMUs under observation [44]. DEA is suitable to detect the technical efficiency of compared units (e.g., countries), meaning that they use the same inputs to produce the same outputs, with different performance [45]. DEA has become the most prominent method for performance measurement and has been commonly used by different scholars to analyze the efficiency of expenditure of public services, e.g., References [46,47]. The model can be built on the assumption of constant returns to scale (one unit of input generates one unit of output) when all DMUs are operating at optimal scale (CCR model). The rather unrealistic condition is solved by introducing variable returns to scale (VRS) considering all types of returns: increasing, constant, or decreasing (BCC model). The BCC model was therefore used in this study. The efficiency can be increased either by increasing outputs under increasing returns to scale or by a reduction in outputs under decreasing returns to scale [48]. DMUs convert multiple inputs into outputs, meaning that a set of units that produce the same or equivalent effects are referred as the outputs of these units [49].

The mathematical formulation of DEA models considers the existence of a set of homogeneous production units  $U_1, U_2, \dots, U_n$ , wherein each of the units produces  $r$  outputs using  $m$  inputs [50].



Then,  $X = \{x_{ij}, i = 1, 2, \dots, m, j = 1, 2, \dots, n\}$  is considered as input matrix, and  $Y = \{y_{ij}, i = 1, 2, \dots, r, j = 1, 2, \dots, n\}$  is considered as output matrix. The efficiency rate of  $U_q$  unit is generally expressed as follows:

$$\frac{\text{weighted sum of inputs}}{\text{weighted sum of outputs}} = \frac{\sum_i u_i y_{iq}}{\sum_j v_j x_{jq}} \quad (1)$$

where

$v_j, j = 1, 2, \dots, m$  are weights assigned to  $j$ -th input.

$u_i, i = 1, 2, \dots, r$  are weights assigned to  $i$ -th output.

The principle of DEA models is that when evaluating the efficiency of a production unit  $U_q$ , it maximizes its efficiency level, assuming that the efficiency rate of all other DMUs cannot be higher than 1 (100%). The weights of all inputs and outputs must be greater than zero so that all the considered characteristics in the model are included. Toloo [50] formulated this model as follows:

To maximize,

$$\frac{\sum_i u_i y_{iq}}{\sum_j v_j x_{jq}} \quad (2)$$

while

$$\begin{aligned} \frac{\sum_i u_i y_{iq}}{\sum_j v_j x_{jq}} &\leq 1, \quad k = 1, 2, \dots, n \\ u_i &\geq \varepsilon, \quad i = 1, 2, \dots, r \\ v_j &\geq \varepsilon, \quad j = 1, 2, \dots, m \end{aligned}$$

where  $\varepsilon$  is an infinitesimal constant that ensures the calculated weights of inputs and outputs are greater than zero.

There is an ongoing debate about variable selection in DEA as there are no diagnostic checks for model misspecification. For constant and decreasing returns to scale processes with irrelevant inputs, DEA tends to overestimate efficiency in almost all production units. When relevant variables are omitted, VRS appears to be a safer option [51]. Therefore, for cross-country analyses within the 27 European countries in our present study, a commonly used input-oriented VRS model was applied (see above) operating with variable returns to scale. This model proposes ideal changes to input variables (expenditure), which will enable a potential growth in the efficiency of analyzed countries and suggest appropriate implications for policy makers. The optimal time delay between input and output variables was analyzed by number of researchers [43,52]. Griliches [43] empirically proved that there is no time delay with significant impact on the results of analyses. In our analysis, DEAFrontier and Microsoft Excel Add-In were used for solving DEA models.

#### 4. Results

This section presents the analysis of the efficiency of selected public expenditure on services by COFOG and their influence on economic indicators of EU countries, carried out in 2009 and 2016. The results of input-oriented VRS model are shown in Table 3. Efficient countries reached the rate of effectiveness of 1.000. Countries that did not reach the rate of effectiveness of 1.000 were not considered effective (lower rate of effectiveness means less efficiency of the country).

The results of the efficiency of public expenditure on services in relation to selected economic indicators showed that in 2009, 13 countries were efficient, while the number was just seven in 2016 (Table 3). A marked decline in the efficiency of numerous selected countries took place between years 2009 and 2016 (Belgium, Czech Republic, Denmark, Estonia, France, Austria, Slovenia, and Sweden). In 18 out of 27 countries (66%), a decreasing efficiency was measured. These countries failed to allocate their public expenditure efficiently in the evaluated areas of public services in relation to their transformation to outputs (economic indicators). These countries should therefore decrease or re-evaluate their allocation of public expenditure on services with respect to GDP per capita and

employment in services as a percentage of total employment. In 2009, 13 countries were evaluated as efficient (48%), whereas it was only seven (26%) (Bulgaria, Ireland, Cyprus, Latvia, Luxembourg, Romania, and United Kingdom) in 2016. Efficiency in the use of public expenditure increased only in two countries (7%) (Hungary and Poland). In both 2009 and 2016, six countries were efficient (1.000) (Bulgaria, Ireland, Cyprus, Latvia, Romania, and United Kingdom). These countries made an efficient use of public expenditure on services (inputs) to the defined outputs (GDP per capita and employment in services as a percentage of total employment) and therefore took the first place by evaluation.

**Table 3.** Efficiency of public expenditure on services in EU countries.

Country	Efficiency 2009	Ranking	Efficiency 2016	Ranking
Belgium	0.859	21	0.629	26
Bulgaria	1.000	1	1.000	1
Czech Republic	1.000	1	0.842	17
Denmark	0.720	27	0.592	27
Germany	1.000	1	0.786	18
Estonia	1.000	1	0.862	14
Ireland	1.000	1	1.000	1
Greece	1.000	1	0.916	9
Spain	1.000	1	0.866	13
France	0.824	22	0.657	24
Croatia	0.865	20	0.728	20
Italy	0.933	17	0.846	15
Cyprus	1.000	1	1.000	1
Latvia	1.000	1	1.000	1
Lithuania	0.938	15	0.894	11
Luxembourg	1.000	1	1.000	1
Hungary	0.820	23	0.845	16
Netherlands	1.000	1	0.982	8
Austria	0.877	19	0.673	22
Poland	0.878	18	0.898	10
Portugal	0.815	24	0.778	19
Romania	1.000	1	1.000	1
Slovenia	0.805	25	0.660	23
Slovakia	0.998	14	0.868	12
Finland	0.768	26	0.637	25
Sweden	0.937	16	0.718	21
United Kingdom	1.000	1	1.000	1

Source: Authors calculations according to References [40,41].

The data from some analyzed countries showed more pronounced decreasing efficiency of public expenditure in 2016 compared to 2009 (Germany from 1st to 18th place, Czech Republic from 1st to 17th place, Estonia from 1th to 14th place, Spain from 1st to 13th place, Belgium 21st to 26th place, Sweden 16st to 21th place—see Table 3). For these countries to become efficient, they should reduce allocated public expenditure on services and allocate them efficiently according to economic indicators. However, changes to the efficiency of public expenditure are associated with economic, political, and technological factors. Requirements for increased efficiency of public expenditure are also the result of reforming tendencies in many countries.

Table 4 gives both original values and adjusted values that show how the input variables (public expenditure on services) should have been reduced/increased in years 2009 and 2016 so that inefficient countries could reach the efficient frontier and become efficient (Table 4).

**Table 4.** Modified changes of inputs (public expenditure on services) in 2009 and 2016.

Country	General Public Services		Health		Education		Social Protection		Recreation, Culture, and Religion	
	Orig.	Adjust.	Orig.	Adjust.	Orig.	Adjust.	Orig.	Adjust.	Orig.	Adjust.
Belgium	7.90 (9.10)	4.59 (5.93)	7.40 (7.70)	4.66 (5.36)	6.40 (6.00)	4.03 (5.15)	20.00 (19.10)	11.87 (16.41)	1.20 (1.30)	0.68 (1.12)
Bulgaria	2.70 (7.10)	2.70 (7.10)	5.00 (4.00)	5.00 (4.00)	3.40 (4.10)	3.40 (4.10)	12.70 (12.90)	12.70 (12.90)	1.00 (0.70)	1.00 (0.70)
Czech Republic	4.20 (4.60)	3.54 (4.60)	7.40 (7.80)	5.17 (7.80)	4.50 (5.10)	3.32 (5.10)	12.30 (13.10)	10.36 (13.10)	1.30 (1.60)	0.58 (1.60)
Denmark	6.80 (7.90)	4.02 (5.26)	8.60 (8.90)	5.00 (6.19)	6.90 (6.90)	3.97 (4.97)	23.40 (24.30)	13.84 (17.49)	1.80 (1.90)	0.86 (1.37)
Germany	5.80 (6.60)	3.70 (6.60)	7.20 (7.10)	5.20 (7.10)	4.20 (4.30)	3.30 (4.30)	19.30 (20.60)	9.90 (20.60)	1.00 (0.80)	0.50 (0.80)
Estonia	4.20 (3.80)	3.62 (3.80)	5.30 (5.50)	4.57 (5.50)	5.90 (7.20)	4.16 (7.20)	13.50 (15.40)	11.64 (15.40)	2.10 (2.30)	1.01 (2.30)
Ireland	3.70 (4.60)	3.70 (4.60)	5.20 (7.80)	5.20 (7.80)	3.30 (4.70)	3.30 (4.70)	9.90 (17.60)	9.90 (17.60)	0.50 (1.00)	0.50 (1.00)
Greece	9.20 (12.10)	4.66 (12.10)	4.90 (6.80)	4.49 (6.80)	4.30 (4.10)	3.94 (4.10)	20.70 (18.60)	10.96 (18.60)	0.80 (0.70)	0.64 (0.70)
Spain	6.10 (5.60)	3.81 (5.60)	6.00 (6.80)	5.16 (6.80)	4.00 (4.60)	3.47 (4.60)	16.80 (16.00)	10.81 (16.00)	1.10 (1.60)	0.58 (1.60)
France	6.10 (7.20)	3.87 (5.93)	8.10 (7.90)	5.13 (6.51)	5.40 (5.70)	3.55 (4.69)	24.40 (23.70)	11.27 (19.52)	1.20 (1.40)	0.62 (1.02)
Croatia	8.80 (8.30)	4.03 (6.73)	6.50 (6.30)	4.73 (3.95)	4.80 (5.10)	3.50 (4.41)	14.70 (15.10)	10.57 (13.06)	1.80 (1.00)	0.65 (0.84)
Italy	7.90 (8.60)	3.70 (8.02)	7.00 (7.50)	5.20 (6.27)	3.90 (4.60)	3.30 (4.29)	21.10 (19.80)	9.90 (18.47)	0.80 (0.90)	0.50 (0.82)
Cyprus	7.70 (9.20)	7.70 (9.20)	2.60 (3.00)	2.60 (3.00)	6.00 (6.70)	6.00 (6.70)	13.80 (11.50)	13.80 (11.50)	0.90 (1.20)	0.90 (1.20)
Latvia	4.40 (4.70)	4.40 (4.70)	3.70 (4.60)	3.70 (4.60)	5.50 (6.70)	5.50 (6.70)	12.00 (14.00)	12.00 (14.00)	1.40 (1.80)	1.40 (1.80)
Lithuania	4.10 (4.40)	3.67 (4.13)	5.80 (6.70)	5.19 (6.28)	5.20 (7.20)	3.31 (5.62)	11.20 (16.40)	10.01 (15.38)	1.00 (1.20)	0.52 (1.13)
Luxembourg	4.70 (5.10)	4.70 (5.10)	4.80 (5.10)	4.80 (5.10)	4.80 (5.50)	4.80 (5.50)	18.20 (19.20)	18.20 (19.20)	1.20 (1.40)	1.20 (1.40)
Hungary	7.90 (10.00)	4.99 (6.64)	4.80 (5.20)	4.06 (4.26)	4.90 (5.40)	4.14 (4.43)	14.30 (18.10)	11.58 (14.38)	3.30 (1.40)	0.76 (0.86)
Netherlands	4.30 (5.50)	4.22 (5.50)	7.70 (7.80)	4.90 (7.80)	5.30 (5.70)	4.32 (5.70)	16.20 (16.30)	15.91 (16.30)	1.30 (1.80)	1.05 (1.80)
Austria	6.60 (7.80)	3.70 (6.84)	8.00 (7.80)	5.20 (6.06)	4.90 (5.10)	3.30 (4.48)	21.60 (21.20)	9.90 (18.60)	1.20 (1.40)	0.50 (0.90)
Poland	4.70 (5.50)	4.22 (4.83)	4.60 (5.00)	4.13 (4.39)	5.00 (5.40)	4.10 (4.74)	16.90 (16.40)	11.83 (14.40)	1.10 (1.30)	0.99 (1.14)
Portugal	8.30 (7.30)	4.48 (5.95)	5.90 (7.90)	4.59 (4.51)	4.90 (7.00)	3.81 (4.95)	18.00 (17.00)	10.80 (13.85)	0.80 (1.20)	0.62 (0.98)
Romania	4.40 (4.20)	4.40 (4.20)	4.00 (4.10)	4.00 (4.10)	3.70 (3.90)	3.70 (3.90)	11.60 (13.20)	11.60 (13.20)	0.90 (1.00)	0.90 (1.00)
Slovenia	6.60 (5.70)	4.34 (4.59)	6.70 (6.80)	4.42 (5.47)	5.60 (6.60)	3.70 (5.10)	16.70 (17.50)	11.01 (14.08)	1.40 (1.70)	0.72 (1.37)
Slovakia	5.30 (5.90)	3.70 (5.89)	7.40 (7.20)	5.20 (5.21)	3.80 (4.20)	3.30 (4.19)	15.10 (15.10)	9.90 (15.07)	1.00 (1.00)	0.50 (0.84)
Finland	8.10 (7.80)	4.57 (5.99)	7.20 (7.90)	4.58 (6.07)	6.10 (6.50)	3.88 (4.98)	25.60 (22.70)	10.82 (17.34)	1.40 (1.20)	0.61 (0.92)
Sweden	6.60 (7.40)	4.74 (6.03)	6.90 (7.10)	4.95 (6.65)	6.60 (6.80)	4.35 (6.06)	20.60 (21.80)	13.76 (16.73)	1.10 (1.10)	0.79 (1.03)
United Kingdom	4.60 (4.10)	4.60 (4.10)	7.60 (7.70)	7.60 (7.70)	4.70 (6.50)	4.70 (6.50)	15.80 (16.90)	15.80 (16.90)	0.60 (1.00)	0.60 (1.00)

Source: Authors' calculations; Note: Orig. = the original values entered into the analysis, Adjust. = adjusted values that are proposed by DEA analysis and should be perceived as the target in the context of maximum efficiency. Values in brackets belong to the year 2009.



For the majority of inefficient countries, the present model suggested reducing public expenditure on services in relation to outputs. These results show that there is a need to focus on each category of public expenditure to avoid increasing inefficiency. The highest reduction of public expenditure was suggested for social protection in 2016 in 20 countries (74%), compared to 2009, where this reduction included 14 countries (52%). Despite the defined recommendation for reduction of expenditure on social protection in 2009, a growing trend was evident in some countries in 2016 (BE, DK, EL, FR, IT, PT, FI) and further reductions of this expenditure was therefore advised. Expenditure on social protection represents a wide range of services, sickness and disability, old age, etc, and it represents the most significant item of expenditure (function) from general government expenditure, accounting for approximately 19% of the GDP in the EU on average. Its growing tendency is connected to increased requirements on living standards and the quality of provided services in many countries. An interesting example is the situation in Ireland where, in spite of the fact that no reduction of expenditure on social protection was advised in 2009, this expenditure decreased in 2016 (by approximately 8%). The increase in expenditure on social protection in 2009 was caused by higher public expenditure on the disabled and the unemployed under social protection. Furthermore, the results from 2009 in Ireland reflected the trend of growing total expenditure and the influence of government measures in the times of crisis.

Another area of public services is general public services and health. For this, the model advised a significant decrease in public expenditure in selected EU countries. Expenditure on general public services accounts for approximately 6% of the GDP in the EU. In 2009, Belgium, Denmark, and Hungary were advised to decrease the value of expenditure on general public services. In 2016, this original value was decreased by approximately three units and yet another change was suggested. Portugal and Finland were also recommended to decrease expenditure on general public services in 2009. However, this expenditure rose in 2016, and further reductions were recommended (in PT by approximately four units and in FE by approximately three units). In Greece, no changes were recommended in 2009 for expenditure on general public service. In contrast, the original value of the expenditure changed by three units in 2016 and changes were accordingly recommended (reduction by 4.5 units) to increase their efficiency. Administrative reforms mainly focus on increasing the efficiency of expenditure on general public services, which include expenditure on public administration, general services, executive and legislative organs, and transfers of a general character between different levels of government.

Changes were also suggested in public expenditure on health, which accounts for approximately 7% of the GDP in the EU on average. In 2009, the highest reduction in expenditure on health was suggested for PT, DK, BE, and HR. In 2016, original expenditure was reduced in PT by two units and another change was proposed. In DK and BE, expenditure was reduced only to a small extent in 2016, and further reductions in public expenditure were suggested. By contrast, a moderate increase in this expenditure took place in HR in 2016. This can be partially explained by the country joining the EU and the subsequent requirements for an increased quality of public health care services. Regarding public expenditure on education, no such significant changes were recommended in the model (reduction of public expenditure) as in other observed categories of expenditure. Expenditure on education accounts for approximately 5% of the GDP in the EU on average. In DK, PT, and FI, reduction in expenditure on education was proposed in 2009. In 2016, expenditure on education was reduced in PT by approximately two units and further reductions were suggested. In FI, only a moderate reduction took place, while expenditure did not change in DK in 2016. To increase efficiency, further reductions of expenditure on education were advised for both countries. The results of the present analysis show that successful changes were made to render public expenditure more efficient.

#### *4.1. Evaluating the Efficiency of Public Expenditure on Services and the Size of Public Sector in EU Countries*

In relation to research question RQ1, the efficiency of public expenditure of EU countries in connection to the size of the public sector was verified. The size of the public sector is usually

determined as the indicator of the percentage of public expenditure to GDP (in both the European Union and in international comparison). The indicator of the size of the public sector, including structural analyses of public services, has been previously used in researches and studies [22,30,53] or Reference [54] and [4]. A comparison of the size of the public sector (total general government expenditure as a percentage of GDP) in EU countries and the efficiency of public expenditure on services in 2009 and 2016 are shown in Table 5.

**Table 5.** Size of public sector and the efficiency of public expenditure on services in EU countries.

Size of Public Sector	Size of Public Sector 2009	Efficiency of Public Expenditure 2009	Size of Public Sector 2016	Efficiency of Public Expenditure 2016
50–60% GDP	FR (57.2)	FR (0.824)		
	DK (56.5)	DK (0.720)		
	FI (54.8)	FI (0.768)		
	BE (54.2)	BE (0.859)	FR (56.6)	FR (0.657)
	EL (54.1)	EL (1.000)	DK (53.6)	DK (0.592)
	AT (54.1)	AT (0.877)	FI (56.0)	FI (0.637)
	SE (52.7)	SE (0.937)	BE (53.2)	BE (0.629)
	IT (51.2)	IT (0.933)	AT (50.6)	AT (0.673)
	HU (50.4)	HU (0.820)		
PT (50.2)	PT (0.815)			
40–49% GDP	HR (48.3)	HR (0.865)	EL (49.5)	EL (0.916)
	NL (48.2)	NL (1.000)	SE (49.4)	SE (0.718)
	SI (48.2)	SI (0.805)	IT (49.3)	IT (0.846)
	DE (47.6)	DE (1.000)	HU (46.5)	HU (0.845)
	UK (47.3)	UK (1.000)	PT (44.9)	PT (0.778)
	IE (47)	IE (1.000)	HR (46.9)	HR (0.728)
	EE (46.1)	EE (1.000)	NL (43.4)	NL (0.982)
	ES (45.8)	ES (1.000)	SI (45.3)	SI (0.660)
	LU (45.1)	LU (1.000)	DE (44)	DE (0.786)
	PL (45)	PL (0.878)	UK (41.4)	UK (1.000)
	LI (44.9)	LI (0.938)	EE (40.6)	EE (0.862)
	CZ (44.2)	CZ (1.000)	ES (42.2)	ES (0.866)
	LV (44.2)	LV (1.000)	LU (42.1)	LU (1.000)
	SK (44.1)	SK (0.998)	PL (41.1)	PL (0.898)
	CY (42.1)	CY (1.000)	SK (41.5)	SK (0.868)
Less than 40% GDP			LT (34.2)	LT (0.894)
			CZ (39.4)	CZ (0.842)
			LV (37.1)	LV (1.000)
			CY (38.6)	CY (1.000)
	RO (39.7)	RO (1.000)	RO (34.6)	RO (1.000)
	BG (39.4)	BG (1.000)	BG (35)	BG (1.000)
			IE (27.1)	IE (1.000)

Source: Authors.

Table 5 shows that countries with a high efficiency of public expenditure on services (Bulgaria, Romania, Cyprus, Latvia, Luxembourg, and United Kingdom) demonstrated a low to moderate public sector size (i.e., total public expenditure as a percentage of GDP). These countries reached around 40% of the size of the public sector in 2009 and below 40% GDP in 2016. Despite having limited financial resources compared to the evaluated states, these countries allocated financial resources efficiently on public services, transforming them into outputs (economic indicators, in the present case). Another extreme in terms of the size of the public sector can be seen in Ireland, which was among countries with the lowest level and size of the public sector up until 2008. In 2009, public expenditure reached 47% GDP and 67% in 2010. This leap can be explained to a considerable extent by a specific government support to banks at the time of the financial crisis by means of capital injections. The impact of the economic and financial crisis, and the related need for public interventions, were the main factors for

the growing trend of public expenditure in 2008 and 2009 followed by another high increase of this expenditure in 2010 in most EU countries. It was mainly the government measures aimed at reviving the economy in the postcrisis period that contributed to the growth in public expenditure up to the year 2011. In the following years, the decreasing tendency of public expenditure showed the decline in government interventions. In 2016, a decrease in public expenditure as a percentage of GDP (size of the public sector) was observed in numerous countries (such as Ireland, where public expenditure dropped by 20% and 40% compared to 2009 and 2010, respectively, without any government interventions). This has also been corroborated by other researchers [55,56].

On the contrary, quite surprisingly, the results showed that countries (Belgium, France, Sweden, and Finland) with a large public sectors and a long-term high total public expenditure above 50% of GDP and high living standards reached only a low efficiency of public expenditure on services (see Table 5). However, these countries, owing to the size of the public sector and positive economic and financial capabilities, could afford allocating more financial resources on crucial areas of public services (mainly services of welfare state). Countries with a bigger size of public sector failed to reach efficiency in public expenditure on public services in both 2009 and 2016. Based on the acquired results, it can be argued that the first research question (RQ1) was not able to be substantiated.

#### *4.2. Evaluating the Efficiency of Public Expenditure by Public Administration Tradition in EU Countries*

Our next step was to analyze the results regarding the efficiency of public expenditure on services in EU countries according to their public administration traditions. This analysis was in connection to research question RQ2: Do EU countries with the same tradition of public administration have a similar rate of efficiency of public expenditure on public services According to Demmke [57], EU countries can be assigned different models of traditions of public administration and human resource management (Table 6). However, the grouping of EU countries into six categories also has some weaknesses that need to be considered. For instance, inclusion of the Netherlands and Slovenia into the system of continental European tradition and the inclusion of Ireland into the Anglo-Saxon tradition of public administration. Baltic states are included in several categories of traditional public administration, for example, Estonia follows the Scandinavian tradition and Lithuania and Latvia follow the Eastern-European tradition of public administration. A comparison of EU states by the efficiency of public expenditure on services and public administration in 2009 and 2016 are presented in Table 6.

Table 6 captures the similarity in the efficiency of EU countries in 2009 and 2016 in the countries with Anglo-Saxon tradition (Ireland and the United Kingdom) and in the countries with South-Eastern tradition (Bulgaria and Romania). In 2009, the highest efficiency of public expenditure (1.000) and its similarity was found in the countries with continental tradition (Germany, Luxembourg, and the Netherlands), Mediterranean tradition (Greece, Spain, and Cyprus), or countries with Eastern-European tradition (the Czech Republic and Latvia). In 2016, a similar efficiency of public expenditure on services can be observed in countries with Eastern-European tradition with a value slightly below 0.900 (except Latvia, with 1.000). The next similarity can be seen in the four countries with continental tradition (Austria, France, Belgium, and Slovenia, with efficiency around 0.660). A similarity in efficiency of public expenditure on services according to traditions of public administration can also be found in other countries in both 2009 and 2016. The results (Table 6) also show similar efficiency of public expenditure on services in groups of EU countries segmented by the tradition of public administration. The highest efficiency in 2009 and 2016 can be seen in countries with Anglo-Saxon tradition as opposed to countries with Scandinavian tradition. A similarity in the efficiency of countries by public administration can be mainly seen in countries with Mediterranean/South-European tradition and Eastern-European tradition. The results have therefore corroborated research question RQ2 that there is indeed a similarity in the efficiency of public expenditure on services among EU countries in terms of tradition of public administration.

**Table 6.** Comparison of EU countries by the efficiency of public expenditure on services and public administration tradition.

Tradition of Public Administration	Efficiency 2009	Average 2009	Efficiency 2016	Average 2016
Anglo-Saxon tradition	IE (1.000) UK (1.000)	1.000	IE (1.000) UK (1.000)	1.000
Continental European tradition	AT (0.877) FR (0.824) DE (1.000) BE (0.859) LU (1.000) NL (1.000) SI (0.805)	0.908	AT (0.673) FR (0.657) DE (0.786) BE (0.629) LU (1.000) NL (0.987) SI (0.660)	0.898
Mediterranean/South European tradition	EL (1.000) IT (0.933) PT (0.815) ES (1.000) CY (1.000)	0.949	EL (0.916) IT (0.846) PT (0.778) ES (0.866) CY (1.000)	0.881
Scandinavian tradition	DK (0.720) FI (0.768) SE (0.937) EE (1.000)	0.856	DK (0.592) FI (0.637) SE (0.718) ES (0.862)	0.702
Eastern European tradition	CZ (1.000) HU (0.820) SK (0.998) PL (0.878) LI (0.938) LV (1.000)	0.939	CZ (0.842) HU (0.845) SK (0.868) PL (0.898) LI (0.894) LV (1.000)	0.886
South-Eastern tradition	BG (1.000) RO (1.000) HR (0.865)	0.995	BG (1.000) RO (1.000) HR (0.728)	0.909

Source: Authors according to reference [57] and own calculation.

## 5. Discussion and Conclusions

### 5.1. Discussion

The article aimed to evaluate the efficiency of EU countries and to find the extent to which the volume of public services (resources allocated to public services) had an impact on the selected economic indicators in the years 2009 and 2016. The evaluation of the efficiency of public expenditure on services applying the DEA method showed that out of 27 countries, 13 (48%) were efficient in 2009 and only seven (26%) were efficient in 2016. In both 2009 and 2016, only six countries were efficient out of 27 (22%). Based on the results, it can be argued that in most EU countries, a trend of decreasing efficiency of public expenditure on public services appeared in relation to the evaluated economic indicators. The results also indicated that most countries should implement more extensive reduction in expenditure on social protection. Another decrease in public expenditure was suggested for selected EU countries in general public services, health, and education. In a number of countries, suggested changes to public expenditure were successfully implemented and further changes have been devised for the following period to render these even more efficient. Freysson [56] argued that at the EU level, almost 90% of public expenditure on social protection pertains to social benefits and transfers allocated to households. This share does not exceed 80% in all Scandinavian countries, where the percentage allocated to benefits to employees regarding this economic function is higher than 10%. Other researches have also aimed to seek for optimal ways of allocating financial resources for public services. Agenor and Neanidis [22] studied the optimal allocation of government spending between public services in an endogenous growth framework. Mura [58] looked at how different types of productive public expenditure influence economic growth in countries of Eastern Europe. Leitner

and Stehrer [24] showed that analyses based upon individual spending areas (function-by-function approach) seemed to be a more promising approach to measure efficiency and effectiveness on a cross-country basis. In-depth analyses of the areas in question allow for a better identification of meaningful indicators.

Due to the different nature of the researches and the indicators used for the evaluation of efficiency of the countries, it is difficult to carry out an in-depth comparison of previous results with the present one. Compared to our results, most authors of similar studies evaluated a different number of public services, different sets countries (EU, OECD, developing countries), and different time frames. However, similar to our research, other researchers have also dealt with public expenditure on services, e.g., health, education, social protection, general public services as input indicators using the DEA method. Several authors have evaluated the efficiency of public expenditure using a variety of output indicators (human development index or GDP). Dutu and Sicari [25] assessed the efficiency of welfare spending (health care, secondary education, and general public services) and provided possible quantified improvements for both output and input efficiency in OECD countries. The empirical results of Ouetani et al. [34] showed that, on average, public spending was inefficient and that Saudi Arabia could improve its performance in health, education, and infrastructure without having to increase spending. Similarly to our research, Merickova et al. [32] noted that “the total amount of public expenditure does not have significant impact on the socio-economic development; however public expenditures in ‘productive’ sectors of public services (especially education, health and social services) have the potential of positive impact on the socio-economic development” in EU countries. Most authors have found that the highest efficiency of public expenditure and HDI is seen in Eastern-European countries (EE, LI, LT), as opposed to South-European countries with the lowest efficiency (BG, CY, EL, HR, ML, PT, ES, IT). These countries, apart from MT, BG, HR, are to a large extent represented by countries with the Mediterranean/South-European tradition with similar efficiency of public expenditure.

In terms of research results presented in this paper, the efficiency of public expenditure was also evaluated in relation to the size of the public sector. The results showed that countries with a high efficiency in public expenditure on services have a small to medium-size public sectors with a value of approximately 40% of GDP or less. On the contrary, countries with a long-term high total public expenditure above 50% of GDP and high living standards reached a relatively low efficiency in public expenditure on services. Due to the size of the public sector and appropriate economic capabilities, these countries (FR, DK, FI, BE, and AT) can afford to allocate more financial resources to crucial areas of public services (mainly services of welfare state). In comparison to the other countries in the set, these countries can appear as less efficient, also with respect to the evaluated output indicators. In relation to the research question RQ1, the present results failed to establish that countries with a bigger size of public sector also have efficient public expenditure on services. As Mankiw [59] argued, it could be presumed that countries with higher GDP can afford a better quality of education and health care than poorer countries (the rich countries have better education and health care systems) and with this, they automatically achieve better results from delivering educational, health care, and other services. Many authors (e.g., Kelley [60] and Ravallion [61]) have suggested that the Human Development Index should be considered as a more comprehensive indicator of socioeconomic development than GDP or GDP per capita as it also includes the results of education or health care services. As other researchers have shown, the sheer size of the public sector is not per se a good indicator as it may not be indicative of the quality of these expenditures. Afonso and Furceri [62] pointed to a negative correlation between the size of the government sector and potential growth. Pench and Governatori [63] emphasized that the size of the government sector may have an impact on potential growth, employment, and private investments. Several internal and external factors influence the size and structure of the public sector. Moreno-Enguix and Lorente Bayona [33] tested the association between public sector performance and public expenditure efficiency and other key socioeconomic indicators and showed significant evidence of the connection between public efficiency and state of development, democracy, and corruption as

well as population density, especially in the field of environmental protection. The direction of the association between public sector size and public performance differs per function, i.e., it is positive for health and social protection.

## 5.2. Conclusions

The results of our study showed that in 2009, 13 out of 27 countries were efficient as opposed to 2016, when only seven countries were efficient. In countries with bigger size of public sector, efficiency of public expenditure on services was not established. Various comparative approaches can be applied to evaluate the efficiency of EU countries and their public services, e.g., typology of national industrial relations arrangements in public services [39]. In our research, the approach based on the tradition of public administration was chosen to evaluate the efficiency of EU countries due to its close relationship with public services (historical traditions, internal conditions, their variety in the countries). The results showed there was a similarity in the efficiency of public expenditure on public services in EU countries according to the traditions of public administration; this substantiated our second research question (RQ2). In 2009 and 2016, a similarity was found in the efficiency of public expenditure on services in EU countries in countries with Anglo-Saxon tradition (MT and UK) and South-Eastern tradition (BG and RO). Another similarity of efficiency of public expenditure was found in 2009 in the countries with continental European tradition (DE, LU, and NL), Mediterranean/South-European tradition (EL, ES, and CY) or Eastern-European tradition (CZ and LT). By contrast, in 2016, a similarity in efficiency of public expenditure on services was found in most countries representing the Eastern-European and continental-European traditions.

Evaluating the efficiency of the public sector and public services is a broad topic. The authors are aware that the efficiency of the public sector cannot be expressed clearly through a complex indicator but that it rather needs partial indicators based on various objective criteria. Plenty of questions regarding the investigation and evaluation of public services remain unanswered and can serve as a theme for further research. This can include the evaluation of efficiency of public expenditure with a focus on different categories of public services, e.g., tradition of public services (general public services, defense and public order and safety) or the use of other output indicators (added value in services, share of employment in particular areas of services). Moreover, new methodological approaches to evaluation and measurement of efficiency of public services have appeared in the scientific world that apply not only direct but also indirect descriptors or indicators.

Finally, the limitations of the study should be mentioned. The first major limitation results from the quality of data inputs. Data quality and the significance of the data are relative. The DEA analysis also has some limitations as described above. Another limitation is the already mentioned milestone (2009), which was chosen for the baseline analysis. The length of time delay that was applied to analyze the results of the year (2016) should also be discussed here. Restrictions arise from the fact that some aspects and specificities of the economies of some countries (e.g., Nordic states with a larger public sector), as well as missing factors affecting the size of the public sector or its effectiveness, have not been included in the analysis. This can be seen as a stimulus for further ongoing research in the future.

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## References

1. Kemecliene, G.; Connoly, H.; Keune, M.; Watt, A. *Services Employment in Europe—Now and in the Future*; Background Paper; ETUI-REHS and UNI-EUROPA: Brussels, Belgium, 2007; 64p.
2. Šebo, J. Macroeconomic Perspektive of Public Services. In *Economics of the Public Services*, 1st ed.; Benčo, J., Kuvíková, H., Eds.; Matej Bel University: Banska Bystrica, Slovak Republic, 2011; pp. 90–130. ISBN 978-80-557-0323-7. (In Slovak)
3. Benčo, J.; Kuvíková, H.; Mikušova Merickova, B.; Šebo, J.; Štrangfeldová, J. *Economics of the Public Services*, 1st ed.; Matej Bel University: Banska Bystrica, Slovak Republic, 2011; 334p, ISBN 978-80-557-0323-7. (In Slovak)
4. Stiglitz, J.E.; Rosengard, J.K. *Economics of the Public Sector*, 4th ed.; W. W. Norton & Company: New York, NY, USA, 2015; 960p, ISBN 978-093-92522-7.
5. Ochrana, F. *Public Services—Their Provision, Procurement and Evaluation*, 1st ed.; Ekopress: Prague, Czech Republic, 2007; 166p, ISBN 978-80-86929-31-6. (In Czech)
6. Smith, A. *An Inquiry into the Nature and Causes of the Wealth of Nation*; The University of Chicago Press: Chicago, IL, USA, 1976; 568p, ISBN 0-226-76374-9.
7. Stejskal, J.; Kuvíková, H.; Mikušova Meričkova, B.; Linhartova, V. *Theory and Practice of the Public Services*, 1st ed.; Wolters Kluwer ČR, a. s.: Prague, Czech Republic, 2017; 280p, ISBN 978-80-7552-726-4. (In Czech)
8. Stejskal, J.; Hajek, P. Effectiveness of digital library services as a basis for decision-making in public organizations. *Libr. Inf. Sci. Res.* **2015**, *37*, 346–352. [CrossRef]
9. Lindal, E. Just Taxation—A Positive Solution. In *Classic in the Theory of Public Finance*, 1st ed.; Musgrave, R.A., Peacock, A.T., Eds.; Palgrave Macmillan: London, UK, 1958; pp. 168–176. ISBN 978-1-349-23426-4.
10. Mazzola, U. The Formation of the Prices of Public Good. In *Classic in the Theory of Public Finance*, 1st ed.; Musgrave, R.A., Peacock, A.T., Eds.; Palgrave Macmillan: London, UK, 1958; pp. 37–47. ISBN 978-1-349-23426-4.
11. Wicksell, K. A New Principle of Just Taxation. In *Classic in the Theory of Public Finance*, 1st ed.; Musgrave, R.A., Peacock, A.T., Eds.; Palgrave Macmillan: London, UK, 1958; pp. 72–118. ISBN 978-1-349-23426-4.
12. Musgrave, R.A. Cost-benefit Analysis and the Theory of Public Finance. *J. Econ. Lit.* **1969**, *7*, 797–806.
13. Brown, C.V.; Jackson, P.M. *Public Sector Economics*, 4th ed.; Wiley-Blackwell: Oxford, UK, 1990; 622p, ISBN 0631162089.
14. Brown, T.L.; Potoski, M. Transaction Costs and Institutional Explanations for Government Service Production Decisions. *J. Public Adm. Res. Theory* **2003**, *13*, 441–468. [CrossRef]
15. Morton, A. European Union Public Procurement Law, the Public Sector and Public Service Provision (July 2012). Available online: <https://european-services-strategy.org.uk/archived.website/news/2012/european-public-services-briefing-4-european-u/eu-public-procurement.pdf> (accessed on 15 October 2018).
16. Musgrave, R.; Musgrave, P. *Public Finance in Theory and Practice*, 5th ed.; McGraw-Hill Book Co.: New York, NY, USA, 1989; 650p, ISBN 0-07-044127-8.
17. Wollmann, H.; Koprić, I.; Marcou, G. *Public and Social Services in Europe from Public and Municipal to Private Sector Provision*, 1st ed.; Palgrave Macmillan: London, UK, 2016; 342p, ISBN 978-1-137-57499-2.
18. Cullis, J.; Jones, P. *Public Finance and Public Choice—Analytical Perspectives*, 3rd ed.; University Press: Oxford, UK, 2009; 560p, ISBN 9780199234783.
19. Rosen, H.S. *Public Finance*, 7th ed.; McGraw-Hill/Irwin: Boston, MA, USA, 2005; 690p, ISBN 0072876484.
20. Stiglitz, J.E. *Economics of the Public Sector*, 2nd ed.; W. W. Norton & Company: New York, NY, USA, 1988; 220p, ISBN 0-393-95683-0.
21. Szarowská, I. Long-term and short-term relationship between government expenditure and GDP in the EU15: Cointegration approach. *Ekonomista* **2014**, *6*, 865–882.
22. Agénor, P.R.; Neanidis, K.C. The Allocation of Public Expenditure and Economic Growth. *Manch. Sch.* **2011**, *79*, 899–931. [CrossRef]
23. Alper, F.O.; Demiral, M. Public Social Expenditures and Economic Growth: Evidence from Selected OECD Countries. *Res. World Econ.* **2016**, *7*, 44–52. [CrossRef]
24. Leitner, S.; Stehrer, R. *Development of Public Spending Structures in the EU Member States: Social Investment and Its Impact on Social Outcomes*; Working Papers No. 128; The Vienna Institute for International Economic Studies: Wien, Austria, 2016; 38p.

25. Dutu, R.; Sicari, P. Public Spending Efficiency in the OECD: Benchmarking Health Care, Education and General Administration. In *OECD Economics Department Working Papers, No. 1278*; OECD Publishing: Paris, France, 2016; pp. 1–26.
26. Verhoeven, M.; Gunnarsson, V.; Carcillo, S. *Education and Health in G7 Countries: Achieving Better Outcomes with Less Spending*. IMF Working Paper 07/263; International Monetary Fund: Washington, DC, USA, 2007; 50p, ISBN 978-1-451868265/1018-5941.
27. Afonso, A.; Schuknecht, L.; Tanzi, V. Public Sector Efficiency: An International Comparison. *Public Choice* **2005**, *123*, 321–347. [[CrossRef](#)]
28. Curristine, T.; Lonti, Z.; Jourmard, I. Improving Public Sector Efficiency: Challenges and Opportunities. *OECD J. Budg.* **2007**, *7*, 1–42. [[CrossRef](#)]
29. Meričková, B.M.; Stejskal, J. Value of collective consumption goods. *Politická Ekonomie* **2014**, *62*, 216–231. [[CrossRef](#)]
30. Schaltegger, C.A.; Torgler, B. Growth Effects of Public Expenditure on the State and Local Level: Evidence from a Sample of Rich Governments. *Appl. Econ.* **2006**, *38*, 1181–1192. [[CrossRef](#)]
31. Mandl, U.; Adriaan, D.; Ilzkovitz, F. *The Effectiveness and Efficiency of Public Spending*; Working Paper, No. 301; Directorate General Economic and Financial Affairs (DG ECFIN): Brussels, Belgium, 2008; 36p, ISBN 978-92-79-08226-9.
32. Meričková, B.M.; Nemeč, J.; Svidronová, M.M.; Pischko, V. Analysis of the relationship between the size and structure of public expenditure and socio-economic development. *Ekon. Cas.* **2017**, *65*, 320–333.
33. Moreno-Enguix, M.R.; Lorente Bayona, L.V. Factors Affecting Public Expenditure Efficiency in Developed Countries. *Polit. Policy* **2017**, *45*, 105–143. [[CrossRef](#)]
34. Ouertani, M.N.; Naifar, N.; Ben Haddad, H. Assessing government spending efficiency and explaining inefficiency scores: DEA-bootstrap analysis in the case of Saudi Arabia. *Cogent Econ. Financ.* **2018**, *6*, 1–16. [[CrossRef](#)]
35. Tkacheva, T.; Afanasjeva, L.; Goncharenko, L. The impact of public social expenditures on economic development. In Proceedings of the 29th International Conference Education Excellence and Innovation Management through Vision 2020: From Regional Development Sustainability to Global Economic Growth, Vienna, Austria, 3–4 May 2017; pp. 531–540.
36. European Commission. *Study on the Financing Models for Public Services in the EU and Their Impact on Competition*; Final Report; Publications Office of the European Union: Luxembourg, 2016; 125p, ISBN 978-92-79-59777-0.
37. Žižka, M. Services in the Context of Entrepreneurial Environment of the Czech Republic. *E M Econ. Manag.* **2012**, *15*, 97–109. (In Czech)
38. D’Agostino, A.; Serafini, R.; Ward-Warmedinger, M. *Sectoral Explanations of Employment in Europe the Role of Services*; Working Paper Series No 625; European Central Bank: Frankfurt, Germany, 2006; 61p, ISSN 1561-0810.
39. Mapping of the Public Services. Public Services in the European Union & in the 27 Member States. May 2010. Available online: [http://www.ceep.eu/images/stories/pdf/Mapping/CEEP\\_mappingreport\\_DEF\\_02072010.pdf](http://www.ceep.eu/images/stories/pdf/Mapping/CEEP_mappingreport_DEF_02072010.pdf) (accessed on 20 October 2018).
40. Eurostat. General Government Expenditure by Function (COFOG). Available online: [http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=gov\\_10a\\_exp&lang=en](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=gov_10a_exp&lang=en) (accessed on 20 June 2018).
41. World Bank. World Development Indicators. Employment in Services (% of Total Employment). Available online: <http://databank.worldbank.org/data/reports.aspx?source=2&series=SL.SRV.EMPL.ZS&country=> (accessed on 20 June 2018).
42. OECD. Classification of the Functions of Government (COFOG). In *Government at a Glance 2015*; OECD Publishing: Paris, France, 2015; pp. 194–195. ISBN 978-92-64-23347-8.
43. Griliches, Z. Patent statistics as economic indicators: A survey. *J. Econ. Lit.* **1990**, *28*, 1661–1707.
44. Gong, B. The Impact of Public Expenditure and International Trade on Agricultural Productivity in China. *Emerg. Mark. Financ. Trade* **2018**. accepted. [[CrossRef](#)]
45. Prokop, V.; Stejskal, J.; Hajek, P. Effectiveness of Selected Knowledge-Based Determinants in Macroeconomics Development of EU 28 Economies. In *Finance & Economics Readings, 2018*; Tan, L.M., Lau Poh Hock, E., Tang, C., Eds.; Springer: Singapore, 2018; pp. 69–83.

46. Moreno, P.; Lozano, S. Super SBI Dynamic Network DEA approach to measuring efficiency in the provision of public services. *Int. Trans. Oper. Res.* **2018**, *25*, 715–735. [[CrossRef](#)]
47. Wang, S.; Cheng, E.; Zhu, J.; Fu, C.; Wang, W. Using DEA Models to Measure the Performance of Public Culture Services in China. In Proceedings of the International Conference on Computational Science and Computational Intelligence, Las Vegas, NV, USA, 15–17 December 2016; pp. 447–452.
48. Hudec, O.; Prochádzková, M. The Relative Efficiency of Knowledge Innovation Processes in EU Countries. *Stud. Reg. Sci.* **2013**, *43*, 145–162. [[CrossRef](#)]
49. Stanickova, M.; Melecky, L. Competitiveness Evaluation of Visegrad Four Countries by CCR Input Oriented Model of Data Envelopment Analysis. *Sci. Pap. Univ. Pardubic. Ser. D* **2011**, *22*, 176–188.
50. Toloo, M. *Data Envelopment Analysis with Selected Models and Applications*, 1st ed.; SAEI, VŠB-TU: Ostrava, Czech Republic, 2014; 223p, ISBN 978-80-248-3738-3.
51. Galagedera, D.U.A.; Silvapulle, P. Experimental evidence on robustness of data envelopment analysis. *J. Oper. Res. Soc.* **2003**, *54*, 654–660. [[CrossRef](#)]
52. Wang, E.C.; Huang, W. Relative efficiency of R&D activities: A cross-country study accounting for environmental factors in the DEA approach. *Res. Policy* **2007**, *36*, 260–273. [[CrossRef](#)]
53. Shelton, C.A. The Size and Composition of Government Expenditure. *J. Public Econ.* **2007**, *91*, 2230–2260. [[CrossRef](#)]
54. Halaskova, M.; Halaskova, R. Public Expenditures in Areas of Public Sector: Analysis and Evaluation in EU Countries. *Sci. Pap. Univ. Pardubic. Ser. D* **2017**, *24*, 39–50.
55. Freysson, L. General Government expenditure trends 2005–2010: EU countries compared. *Eurostat Statistics in Focus* **2011**, *42*, 1–11.
56. Freysson, L. General government expenditure: Analysis by detailed economic function. *Eurostat Statistics in Focus* **2012**, *33*, 1–7.
57. Demmke, C. *What Are Public Services Good at? Success of Public Services in the Field of Human Resource Management*; European Institute of Public Administration: Maastricht, The Netherlands, 2008; 171p.
58. Mura, P.O. How growth-friendly are productive public expenditure? An empirical analysis for Eastern Europe. *Theor. Appl. Econ.* **2014**, *21*, 7–20.
59. Mankiw, N.G. *The Savers-Spenders Theory of Fiscal Policy*; Working Paper No. 7571; National Bureau of Economic Research: Cambridge, UK, 2000; pp. 1–14.
60. Kelley, A.C. The Human Development Index: Handle with Care. *Popul. Dev. Rev.* **1991**, *317*, 15–324. [[CrossRef](#)]
61. Ravallion, M. Troubling tradeoffs in the Human Development Index. *J. Dev. Econ.* **2012**, *99*, 201–209. [[CrossRef](#)]
62. Afonso, A.; Furceri, D. *Government Size, Composition, Volatility and Economic Growth*; Working Paper No. 849; European Central Bank: Frankfurt, Germany, 2008; pp. 1–43. ISSN 1561-0810.
63. Pench, L.; Governatori, M. *European Economy. The Quality of Public Expenditures in the EU*; Occasional Papers 125; Directorate-General for Economic and Financial Affairs: Brussels, Belgium, 2012; 66p, ISBN 978-92-79-22932-9.

