Service Sector Productivity in the European Union Member States

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Abstract:

Purpose: The aim of this study was to identify the level of EU service sector productivity.
Design/Methodology/Approach: Three research methods were used: overview and critique of literature in the field of described subject, monographic method (using an analysis of secondary data) and statistical method using descriptive statistics (arithmetic average, standard deviation). Productivity research concerned sectors of EU countries during 2008-2016 in terms of indicators. Countries were classified using factors such as scale of production, labour productivity and fixed asset productivity. In the mentioned period the dynamic and the level of these factors were determined.
Findings: The results allowed the positive verification of the proposed research hypothesis. Service sectors of countries with lower economic and social growth (production potential) were characterized by a higher level of productivity of fixed assets. Such countries included: Cyprus, Denmark, Greece, Bulgaria. At the same time, it was noted that the highest indicators of productivity were present in: Luxembourg, Denmark, Ireland and, for labour productivity, also Bulgaria, Greece, Cyprus.
Practical Implications: Practical recommendations is important especially in countries with indices at a low level. They are particularly at risk of relatively low competitiveness compared to other EU countries. Good practices aimed at preventing this could include stimulating innovation in service enterprises, e.g. regarding the implementation of innovative solutions.
Originality/Value: Productivity is regarded as one of the features that impact competitiveness, which has the important role in the blobalised world economy. Moreover, the issue of productivity in the service sector is a less popular topic than the same issue concerning the industrial sector. Lastly, findings and conclusions from this paper, may inspire researchers to conduct in-depth research of the productivity issues, for example: a combination of a study of the service sector productivity with the innovation potential as well as its innovativeness and quality.

Keywords: TFP - total factor productivity, labour productivity, fixed assets productivity, scale of production, service sector, European Union.

JEL codes: D24, L80, O47, O52.

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1. Introduction

Productivity is regarded as one of the features that impact competitiveness and are sometimes equated with it. Therefore, according to the literature, it is crucial for company survival and development and economic growth (Kisiel and Wiśniewska, 2016). As indicated in the research (Brzozowski, 2018), globalization, the number of patents, and the level of human capital have a positive impact on productivity growth. Moreover, systemic banking crises and the concomitant credit crunches have an opposite impact, regardless of technological development.

The issues related to productivity in the service sector seem to be dealt with less frequently than in industry. It is mainly associated with the industrial sector and manufacturing goods (Cho and Jung, 2014). According to the literature of the subject, its importance in the service sector has been stressed increasingly often (den Hartigh and Zegveld, 2011; Balci, Hollmann, and Rosenkranz, 2011; Rew, Jung, Wonsuk, and Cha, 2017; Stefko *et al.,* 2020; Onuferová, Čabinová, and Dzurov Vargová, 2020). Moreover, it is pointed out that customers contribute to developing productivity (Spohrer and Maglio, 2008) and also the role of advanced technology - innovativeness (Matuzeviciute, Butkus, and Karaliute, 2017; Jakimowicz and Rzeczkowski, 2019a; Jakimowicz and Rzeczkowski, 2019b). Studies on the impact of innovation on average productivity growth, both in the service sector and the manufacturing sector, were conducted by Alleyne, Lorde, and Weekes (2017). The authors observed that higher innovation intensity is associated with more incredible productivity growth (in both sectors). The positive impact of innovation on productivity, expressed in TFP - Total Factor Productivity, was also observed in the research carried out by Kijek and Matras-Bolibok (2019).

Productivity defines mainly the ability to use resources, which is the basis for resource growth, and this, in turn, is regarded as the primary goal of a company (Kozioł, 2004). It is a form of expressing effectiveness, a ratio of utility effects achieved during a specific period to the input necessary to achieve such effects within the time unit (Lisiecka, 2003). Productivity is expressed in the same relation as effectiveness, but it is calculated per the unit input. Its two forms are identified: partial and total (Łukiewska, 2014).

2. Literature Review

An in-depth and precise productivity analysis should identify the production potential and determine the effects of its application. They can be expressed as indices. Only such a comprehensive approach to productivity allows for drawing conclusions and predicting its trends. Many researchers have considered various productivity measurement methods and have tried to define a universal methodology for analyzing productivity factors. The most frequently applied method is total productivity determination, using the sum of production productivity factors (labor, fixed assets, and human resources), which the literature of the subject refers to as

TFP. Productivity was measured in this way, for example, in studies conducted by Giang, Xuan, Trung, Que, and Yoshida (2018), Ngo, Tran, Nguyen, and Nguyen (2020) and in modified form - including natural resource dependence, banking development and an interaction term between them (Badeeb and Lean, 2017). In this regard, *productivity* is defined as a parameter used for effectiveness estimation, and it can be measured, firstly, by so-called "index methods," used to estimate changes in total productivity between the baseline and the present time (Nojszewska, 2012). According to literature reports (Grzybowska and Karwański, 2018; Kuosmanen and Sipiläinen, 2004), the following indices are the most popular Laspayres', Paasche's, Fisher's, as well as Törnqvist's and Malmquist's (now used more frequently than the others).

Another group of productivity determination methods employs the production function and estimation of its parameters. The CES (Constant Elasticity of Substitution) function between production factors (Growiec and Marć, 2009) can be applied in this case, or a two-factorial Cobb-Douglas function neutral impact of technological progress in the Hicks sense. In that case, TFP corresponds to the factor that describes the production technology (Juchniewicz *et al.,* 2015).

Various authors, including Anderson, Fornell, and Rust (1997) and Walsh, Walgenbach, Evanschitzky, and Schaarschmidt (2016), claim that these methods of productivity measurement cannot be used successfully in the service sector. In their opinion, this is hindered, among other things, by the customer's participation in the service provision process and the non-material nature of services, which is difficult to assess quantitatively. For this reason, Anderson, Fornell, and Rust (1997) proposed further research to describe the productivity differences between various sectors. In effect, the subject literature has defined forms of productivity examination in the service sector, an alternative to those applied in production. They were presented by Johnston and Jones (2004) and earlier by Blois (1984). The former proposed two different methods of productivity measurement. One of them employed the measurement of productivity referred to as operational, and, in essence, it did not differ significantly from that applied in the production sector. It was presented as the relation of output to input factors.

The measurement method can be interpreted as the ratio of results (output) obtained by engaging certain outlays (not only financial but also in-kind and non-material) to their value (input). This method of productivity calculation is widely known, e.g., as Laspayres', Paasche's, Fisher's or Törnqvist's and Malmquist's indices, quoted and described earlier. The utility of this production measurement method was discussed by Grönroos (1990), Gummesson (1993), McLaughlin and Coffey (1990). They noted that calculating productivity in this manner considers all the critical success factors in a service enterprise. On the other hand, critics pointed out the problematic effect estimation about input. This view resulted from such service features such as, for example, the impossibility of their storage and their non-material nature (Walsh, Walgenbach, Evanschitzky, and Schaarschmidt, 2016; Blois, 1984).

The second of the indices was described by Johnston and Jones (2004). They described it as customer productivity and interpreted it as the ratio of experience, value, and outcome to time, effort, cost, etc. These considerations provided grounds for the authors to propose a definition of service productivity as a maximizing experience between the operational approach (activities) and customers.

This approach to productivity measurements evolved, and researchers have pointed out the estimation variations for the phenomenon. For example, Rust and Huang (2012) measured productivity by employing the optimum productivity theory, which takes into account significant executive determinants, such as profit margin, unit price, market concentration (operationalized as the Herfindahl-Hirschman index), wages, and factors - other than service quality - that affect sales. These authors claimed that Walsh, Walgenbach, Evanschitzky, and Schaarschmidt (2012) "An enterprise decides on the service productivity level, which it should strive to achieve to maximize its profit."

Researchers specializing in service quality - Grönroos and Ojasalo (2004) - attempted to estimate service productivity based on the ratio of production output to input. In effect, they identified interrelated factors which - according to other authors (Berger and Nasr, 1998; Hunt, Arnett, and Madhavaram, 2006; Vargo and Lusch, 2004).

Snyder *et al*. (2016) include, for example, customer cooperation with the enterprise. Owing to such cooperation, an enterprise can generate standard value and excellent economic results. Consumers provide input for the service (the necessary condition for initiating the service provision process), and, in consequence, they play a significant role in its provision (Sampson and Froehle, 2006). According to many authors (Grönroos and Ojasalo 2004; North, 2015), service sector productivity largely depends on the direct relations of customers with service providers and the quality-to-efficiency ratio. Productivity can significantly be improved through quality and cost reduction (Ahmed *et al.,* 2020). The function of quality in productivity was emphasized by Rewet *et al.* (2017), who regarded it as arising from the service specificity, i.e., heterogeneity, inseparable links between consumption and production and its non-material nature, which jointly lead to a change in the role played by customers and the relationship between customers and enterprises.

To sum up, the literature of the subject interprets the role of the customer and his actions as an essential component of service sector productivity. Many authors regard consumers' activity and consumers as resources and an inseparable component of the service provision process. For this reason, it is justified to regard customers' roles and actions as productivity measures, which was done by Scerri and Agarwal (2018). The other measures include efficiency (E), labor (L), energy (E), materials (M), and services (S). A similar classification which is consistent with partial productivity (Kozioł, 2004), can be found in the approach presented by Timmer, O'Mahony, and van Ark (2007).

In the context of presented assumptions, in elaboration, it was observed and defined research problem constructed in the form of a question: What is the service sector productivity in European Union (EU) countries relative to their potential in this regard? Given the problem thus presented, the research described in the study aimed to identify and evaluate service sector productivity in the EU.

The study aim and the research hypothesis presented in the methodology section were verified using three research methods an analysis and critique of the issues literature, the monographic method with secondary data analysis, and the statistical method employing descriptive statistics. Their application is described more extensively in the methodological part of this paper.

As a result of the described methodology, firstly, it was noted that the highest productivity indicators were present in Luxembourg, Denmark, Ireland, and, for labor productivity, Bulgaria, Greece, and Cyprus. Countries with indices at a low level are particularly at risk of relatively low competitiveness compared to other EU countries. Good practices aimed at preventing this could include stimulating innovation in service enterprises, e.g., regarding innovative solutions. Secondly, presented research assumptions allowed to verify the research hypothesis positively. Service sectors of countries with lower economic and social growth understood as production potential were characterized by higher productivity of fixed assets. Such countries were: Cyprus, Denmark, Greece, and Bulgaria.

3. Research Methodology

As pointed out in the introduction, the research described in this paper aimed to identify and evaluate service sector productivity in the EU. Based on the literature review, the research hypothesis that the service sectors in the EU countries with a lower socioeconomic development level understood as the production potential category are characterized by higher fixed asset productivity than in countries at a higher level of development is directly related to this research aim.

Three research methods were applied to accomplish the research aim and verify the hypothesis put forward for it. The first - an analysis and critique literature of the subject showed theoretical assumptions regarding productivity and methods of its estimation and measurement. It also provided the basis for defining the research problem in the form of a question presented in the introduction to the paper. The monographic method was another method applied in this research. It employed an analysis of secondary statistical data acquired from the Eurostat database and a dynamic approach to the data, covering 2008-2016. The third was a statistical method employing descriptive statistics tools - arithmetic average, standard deviation, applied especially to classify service sectors in individual countries of specific productivity.

The service sector in EU countries was the research object. The study dealt with service activities within sections labelled with letters H-N and division 95 in section S:

- section H - transport and warehouse management,
- section I - activities associated with accommodation and gastronomic services,
- section J - information and transport,
- section L - services on the real estate market,
- section M - professional, scientific and technical activities
- section N - activities in administration and supporting activities,
- section S, division 95 - repair and maintenance of computers and personal and household appliances.

The choice of the research object was affected by many factors, which include the "industrialization" and "servicification" trends in the global economy, frequently described in the literature. Moreover, literature reports (Kisiel and Wiśniewska, 2016: 240) point out the significance of the service sector in an economic revival, which is a consequence of an impact on the gross domestic product (GDP), supporting the production growth, scientific and technological progress and the organizational level of economic entities.

The research described in this paper dealt with the productivity of the service sector in the EU, shown as three indices:

- scale of production - calculated as the ratio of production output and the number of enterprises, expressed as EUR thousand per enterprise,
- labour productivity, which is the ratio of production output and the number of employees in service enterprises, expressed in EUR thousand per employee,
- fixed asset productivity - calculated as the ratio of production value and fixed asset value (in million euro).

Each of the indices is presented in the temporal and dynamic approach, and its three values were provided: for 2008, 2012, and 2016. The data used to calculate these measures were acquired from Eurostat databases and presented for each EU member state unless the relevant data were missing in the database. The change dynamics for 2016 compared to 2008 were calculated for each country and each index and expressed as a percent. Values above 100% were evidence of an increase and below that - decreasing dynamics during that period. The productivity indices were divided into four levels (high, medium, low, and very low) based on the 2016 values. They were calculated by the methodology presented in table 1. The statistical analysis of the research material and synthetic presentation of results was done with Statistica 13.3.

Table 1. *Criteria of country grouping with respect to the service sector productivity*

Level	Basis for grouping	Description
I	$d_i \geq \bar{d} + S_d$	high index level
II	$\bar{d} < d_i \leq \bar{d} + S_d$	medium index level
III	$\bar{d} - S_d < d_i \leq \bar{d}$	low index level
IV	$d_i < \bar{d} - S_d$	very low index level

Source: *Prepared by the author based on Wysocki and Lira (2005).*

Given the methodology applied in this study, its strengths and weaknesses must be verified critically, especially concerning the research methods applied. The critique and analysis of the subject literature were conducted to identify the research problems concerning service sector productivity, the study of which can contribute to creating valuable scientific work. The monographic method is one of the most insightful research methods as it focuses on individual components of an issue. By examining such components (in this case - service sectors in EU countries), one can assess the phenomenon comprehensively under study (in this study - the service sector productivity in EU countries). The impossibility of using techniques and tools other than secondary data analysis, which would enable one to expand the knowledge on the issue under consideration and to verify the findings, is an obvious drawback of the monographic method as applied in this study.

4. Results and Discussion

Productivity of the service sector in EU countries was described using three indices. Each of them is presented in descending order as per the 2016 data. The scale of production was the first explaining factor for the total productivity. The production value was calculated per enterprise and expressed in thousand euros (Table 2).

Data on the scale of production show that it was low in the majority of EU countries. It was medium in fewer countries and high in the fewest. The index dynamics were the highest in countries with an extensive production scale, except the United Kingdom, where the production scale was found to have decreased by 3.3% compared to 2008. The dynamics were the highest in the service sector in Ireland (increase by 72.8%), followed by Luxembourg (increase by 63.2%) and Denmark (increase by 33.9%). The scale of production indices was the highest in these countries in 2016. It was EUR 1,846 thousand in Luxembourg, EUR 1 406 thousand in Denmark, EUR 1 237 thousand in Ireland, and EUR 999 thousand per enterprise in the UK.

With this scale of production, the production potential of these countries in 2016 was nearly the lowest among the EU countries (Denmark and Ireland -medium potential level), and the service sector in Luxembourg included only 19 thousand enterprises (27th place among 28 countries), which generated EUR 36,751 million - 19th place (Decyk, 2020: 59) Owing to these values, Luxembourg achieved the enormous scale of production in the EU. The United Kingdom is a notable example of a country

with high production potential - the value of services provided: EUR 1 269 407 million, with 1 270 thousand enterprises in the service sector ranked fourth in the EU (Decyk, 2020). Only in this country was the production potential used effectively and allowed it to achieve a relatively large production scale of EUR 999 thousand per enterprise in 2016 (Table 2).

Table 2. *Scale of production in EU countries in 2008-2016 (thousand euro per enterprise)*

Country	2008	2012	2016	Dynamics % (base year 2008)	Index level
Luxembourg	1 131	1 172	1 846	163,2	high
Denmark	1 051	1 268	1 406	133,9	
Ireland	716	1 019	1 237	172,8	
United Kingdom	1 033	1 081	999	96,7	
Germany	811	773	803	99,0	medium
Finland	645	695	709	109,9	
Austria	613	614	653	106,5	
Belgium	775	645	641	82,7	
France	801	667	636	79,4	
Sweden	526	552	570	108,3	
The Netherlands	1 038	629	536	51,6	
Cyprus	438	464	479	109,1	low
Italy	361	354	361	100,0	
Estonia	378	352	312	82,6	
Spain	288	276	273	94,7	
Croatia	267	227	262	97,9	
Romania	218	234	254	116,5	
Slovenia	299	238	213	71,1	
Poland	223	204	207	92,7	
Lithuania	248	240	189	76,5	
Czech Republic	187	172	182	97,3	
Slovakia	669	179	178	26,6	
Latvia	257	207	165	64,1	
Portugal	152	150	146	95,8	
Bulgaria	157	130	141	90,1	
Hungary	122	117	131	107,8	
Greece	171	129	108	63,2	

Source: *Prepared by the author based on Eurostat data: [sbs_na_1a_se_r2], accessed on-line on 30.10.2019.*

The indices of the scale of production for the service sector in Italy (EUR 361 thousand/ enterprise) and Spain (EUR 273 thousand/enterprise) were at a low level, whereas in France (EUR 636 thousand/enterprise) and Germany (EUR 803 thousand/enterprise) these indices were at a medium level. The production scale was found to decrease in each of these countries in 2016 compared to 2008, with the decrease being the largest in France (by 20.6%), and only in the Italian service sector

did it remain unchanged. Moreover, the production potential in these countries was among the highest in the whole EU (Decyk, 2020).

The scale of production in 2016 was the smallest in Greece - EUR 108 thousand/ enterprise, with a clear downward trend during that time - dynamics of 63.2%. The most significant decrease compared to 2008 was observed in the Slovak service sector - by 73.4%. This can be attributed to a considerable increase in the number of enterprises during the period under study. This increase was not accompanied by equally significant growth in the service value (Decyk, 2020).

Labour productivity was another index under analysis. Different methods can measure it. One encountered in the literature is the percentage of total based on purchasing power standard (PPS) per employed person (Balcerzak and Pietrzak, 2016). However, in this paper, *labor productivity* was defined as the ratio of production value and the number of employees and expressed in EUR thousand per employee. In this approach, the highest labor productivity was calculated for the service sector in Luxembourg - EUR 276 thousand per employee (Table 3).

Table 3. *Labour productivity in EU countries in 2008-2016 (EUR thousand per employee)*

Country	2008	2012	2016	Dynamics % (base year 2008)	Index level
Luxembourg	159	175	276	172,8	high
Ireland	135	229	237	175,5	
Denmark	171	237	230	134,1	
Belgium	151	156	164	108,2	medium
Sweden	140	159	158	113,0	
Finland	122	132	139	113,3	
France1	0	133	133	100,0	
United Kingdom	106	115	119	111,9	
The Netherlands	102	110	118	115,9	
Italy	101	104	103	101,9	
Austria	96	98	103	107,0	
Cyprus	76	82	91	119,5	low
Germany	88	82	83	94,3	
Slovenia	75	72	73	96,2	
Estonia	58	70	70	120,6	
Spain	65	64	66	102,2	
Czech Republic	66	63	63	95,2	
Slovakia	56	53	61	108,6	
Poland	51	48	52	102,0	
Croatia	52	43	51	99,4	
Portugal	54	52	51	93,4	
Lithuania	39	41	42	106,7	
Latvia	40	44	38	94,6	
Romania	33	33	37	112,2	

Greece	58	47	36	62,3	
Hungary	36	34	36	100,0	
Bulgaria	27	26	29	109,3	very low

Note: *the dynamics for France was calculated with reference to 2012 as the base year because of the lack of relevant data.*
Source: *Prepared by the author based on Eurostat data: [sbs_na_1a_se_r2], accessed on-line on 30.10.2019.*

It was followed by Ireland - EUR 237 thousand per employee, and Denmark - EUR 230 thousand per employee. These countries were also the best ones in the previous classification, and the productivity index calculated for them was high. The labor productivity dynamics in these three countries were also among the highest during the period under study (Luxembourg 172.8%, Ireland 175.5%, and Denmark 134.1%). The service sector in the United Kingdom, with labor productivity of EUR 119 thousand per employee in 2016, was classified among medium-level countries, whereas the scale of production in it was significant.

Apart from analyzing the situation in the countries discussed so far, the service sectors in Estonia (EUR 70 thousand per employee) and in Cyprus (EUR 91 thousand per employee), in which the labor productivity was classified as low, are also notable. Despite this, its high dynamics were a positive phenomenon. It was 120.6% in Estonia and not much less - 119.5% - in Cyprus. A similar increase in this index affected their production dynamics identified in 2016 - ninth and seventh place, respectively, among all the EU countries (Decyk, 2020).

An analysis of the whole service sector in all EU countries shows that labor productivity was much higher than the scale of production. It was seen to decrease in only seven countries in 2016 compared to 2008, with the most significant decrease observed in the service sector in Greece (dynamics 62.3%). It was directly affected by the production value decreasing year-on-year (dynamics of 71.4%), and it reached EUR 41 357 million in 2016 (Decyk, 2020). Secondly, these studies revealed considerable growth in employment in the Greek service sector. It was a consequence of the crisis which affected the whole Greek economy.

Meanwhile, the study conducted by Kwiatkowska (2015) showed that the service sector in this country accounted for 71.8% of the employment in 2014, i.e., it dominated, as in the other EU countries. Due to all these variables, labor productivity had a significant impact on the economic condition of Greece in 2008-2016. About the weak position of the discussed country in the interpreted scope, it was also deepening the research results of Kiseľáková, Šofranková, Onuferová, and Čabinová (2019). Productivity was one of the components of GCI indicators, which was the lowest in Greece's case (58.29).

The findings of this research regarding labor productivity (Table 3) can be juxtaposed with those of the research conducted earlier by Jarmołowicz and

Knapińska (2014). Despite the different methodologies applied to calculate this index in the studies under comparison, certain relationships are noticeable, especially for member states with the highest and lowest levels. Luxembourg,

Denmark, and Ireland were the three best countries regarding labor productivity in the quoted research. Bulgaria, Romania, Latvia, and Lithuania were on the other end of the classification. They were also classified close to the end of the group in this research. Moreover, labor productivity as determined in this source (Jarmołowicz and Knapińska, 2014) was correlated with the country's membership in the Eurozone and depended on its wealth and the duration of the Community membership, e.g., Luxembourg, Ireland, Belgium, France, Germany, and Denmark - productivity above the EU average. In order to conduct a comprehensive analysis of the service sector productivity, fixed asset productivity was also taken into consideration. It was expressed as the ratio of the production value and the fixed asset value, and the data (in a million euro) are presented in Table 4.

Table 4. *Fixed asset productivity in EU countries in 2008-2016, in million euro*

Country	2008	2012	2016	Dynamics % (base year 2008)	Index level
Bulgaria	5,1	8,2	8,99	175,8	high
Cyprus	3,0	7,2	8,92	299,7	
Luxembourg	4,5	4,2	7,09	157,9	
Greece	1,7	3,3	6,96	413,1	
Denmark	4,0	7,3	6,62	166,2	
Slovenia	3,0	6,1	6,41	215,1	medium
United Kingdom	5,5	6,7	5,96	108,3	
The Netherlands	4,1	5,9	5,31	131,0	
Portugal	3,8	5,4	5,01	132,7	
Hungary	3,2	5,0	4,71	146,8	low
Lithuania	3,7	5,5	4,62	124,3	
Latvia	2,7	4,6	4,56	169,8	
Slovakia	2,8	4,3	4,36	157,1	
Malta	4,8	8,7	4,33	89,9	
Italy	3,4	3,9	4,29	125,7	
Estonia	3,8	5,4	4,24	110,6	
Belgium	3,4	4,1	4,05	120,6	
Czech Republic	3,6	4,2	4,03	112,6	
Sweden	4,1	4,4	3,79	93,0	
Spain	2,3	3,3	3,64	160,4	
Finland	2,9	3,5	3,61	124,4	
France	3,1	3,5	3,41	109,3	
Germany	2,9	2,9	3,01	105,0	very low
Romania	2,0	3,1	2,94	144,1	

Austria	2,5	2,8	2,80	110,2	
Ireland	-	-	-	-	
Croatia	-	-	-	-	
Poland	3,6	3,7	-	100,7	

Source: *Prepared by the author based on Eurostat data [nama_10_nfa_fl], accessed on-line on 30.10.2019.*

An analysis of the data in the table revealed high fixed asset productivity in the countries in which the results had not been good earlier and which, therefore, were not regarded as positive examples, i.e., Bulgaria, Cyprus, and Greece (8.99; 8.92; 6.96 million euro, respectively). High productivity of non-financial fixed assets in these countries can be explained by the neoclassical growth theory, which assumes that productivity is higher in less developed countries (in this study, they are understood as those with lower production potential) and in those in which the capital level per one employee is lower (technical devices). Neoclassical models of economic growth were also dealt with by Batóg and Dmytrów (2017).

However, they used 2017 data from a different database than in this research and whole concerned economies rather than only the service sector. Despite these differences in methodology, the authors used the findings of a study of technical devices to show the high productivity of non-financial fixed assets in Cyprus, Greece, and Slovenia. According to these authors, the technical devices in these countries were under EUR 200 thousand Batóg and Dmytrów (2017). Moreover, the neoclassical theory of economic growth in these countries was also confirmed by the negative correlation between the gross outlay for fixed assets and the level of non-financial fixed assets per employee Batóg and Dmytrów (2017).
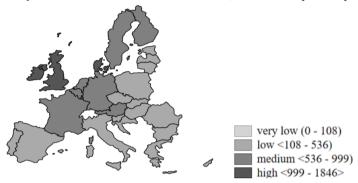
The fixed asset productivity in Greece was the highest among the EU countries (413.1%). This atypical situation may have resulted from the specificity and potential of the country, which was mentioned in earlier analyses. In terms of the fixed asset productivity dynamics, Greece was followed by Cyprus (299.7%). The dynamics of change between 2016 and 2008 were much lower in Denmark and Luxembourg, which dominated the indices discussed so far. Slovenia, with a medium-level index, is also notable. The index dynamics of 215.1% in this country were classified as the third-highest. The values of the productivity indices discussed in this paper: of labor, fixed assets, and production scale are shown in Figure 1 for the 2016 data. The data analysis reveals certain repeatability of the first and the second index. This study shows that countries with high levels of these indexes include Luxembourg, Ireland and Denmark, and the United Kingdom - concerning the production scale.

According to the data in Figure 1, the most significant number of EU countries recorded a low level of labor productivity and production scale. There were 17 countries in each index. At the same time, no relationship was observed between these indices and the geographic position of a country. The labor productivity and
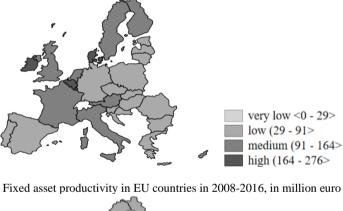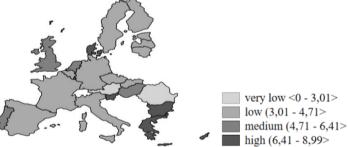
the production scale were low both in the western and eastern countries of the EU. The data in figure 1 also show that the classification of countries concerning fixed asset productivity was different from the classification based on labor productivity or the scale of production. Countries occupied the top places with a primarily low level of socio-economic development: Bulgaria, Cyprus, and Greece.

Figure 1. *Service sector indices in EU countries in 2016.*

Scale of production in EU countries in 2008-2016 (thousand euro per enterprise)

Labour productivity in EU countries in 2008-2016 (EUR thousand per enterprise)

Fixed asset productivity in EU countries in 2008-2016, in million euro

Source: Prepared by the author based on Eurostat data[sbs_na_1a_se_r2], accessed on-line on 30.10.2019; [nama_10_nfa_fl], accessed on-line on 30.10.2019 with Statistica 13.1 software.

5. Conclusions

The findings of this study show that the scale of production and labour productivity in different EU countries was nearly identical. Almost the same countries were classified as having high, medium and low levels of these indices. There were three exceptions:

- The United Kingdom: scale of production - large, labour productivity - medium,
- Germany: scale of production - medium, labour productivity - low,
- Italy: scale of production - low, labour productivity - medium.

The other EU countries except these three had the productivity indices at a similar level. The classification was completely different concerning service sector fixed asset productivity in individual EU countries. The group of countries where this index was high includes well-developed economies (Luxembourg, Denmark) and those in poor socio-economic conditions, e.g., Greece, Bulgaria, and Cyprus. The dynamics of the index for the service sector in Slovenia is also notable - it was the third in terms of growth among all the EU countries.

The productivity indices can be referred to earlier research of production potential. Many data provided in this paper results from the identified level of the production potential of the service sectors in EU countries. The productivity indices in countries with high production potential, e.g., the United Kingdom, Germany, Spain, France, and Italy, were lower than those classified as lower, i.e., Luxembourg, Denmark, and Ireland. Therefore, it can be concluded that an increase in the service sector production potential in the countries of the first group was not reflected in the productivity indices, except in the United Kingdom. A regularity was also observed that slightly higher productivity indices characterized the service sectors in poorly developed countries. This phenomenon was not observed in the case of the scale of production. However, it was much more visible in fixed asset productivity, to which the research hypothesis applied. Two factors contributed to its verification. Firstly, production potential identification (Decyk, 2020) provided information that such countries as Cyprus, Bulgaria, Slovenia, and even Greece, had the lowest indices in this regard. Secondly, the research in this study showed that these countries were classified as the best in terms of fixed asset productivity.

In conclusion, the study findings, both regarding the production potential and those associated with the fixed asset productivity, confirmed the research hypothesis that service sectors in the EU countries with a lower economic development level, understood in terms of production potential, are characterized by higher fixed asset productivity.

Practical recommendations concerning these analyses should apply mainly to the service sectors in countries with indices at a low level. They are particularly at risk

of relatively low competitiveness compared to other EU countries. Good practices aimed at preventing this could include stimulating innovation in service enterprises, e.g., regarding innovative solutions. Lack of activity in this regard or a slow rate of innovation implementation may lead to aggravation of European service sector competitiveness. This, in consequence, would have a negative impact on the EU operation relative to the increasingly globalized world economy.

Based on earlier considerations, these analyses and their findings may inspire researchers to conduct in-depth research on the issues discussed in this paper. It may include, for example, a combination of a study of the service sector productivity with the innovation potential and its innovativeness and quality. A combination of innovativeness and productivity can provide an exciting platform for research considerations in the future and provide an excellent complement to earlier research in this area. Exploration of these issues can further or develop existing, practical implications concerning the service sector operations.

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