Çankırı Karatekin Üniversitesi
İktisadi ve İdari Bilimler
Fakültesi Dergisi
Y. 2018, Cilt 8, Sayı 2, ss. 157-177

Cankırı Karatekin University
Journal of the Faculty of Economics
and Administrative Sciences
Y. 2018, Volume 8, Issue 2, pp. 157-177

Total Factor Productivity of Tourism Sector of OECD Countries

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Abstract

In this study, we try to analyze the total factor productivity of OECD countries in terms of economics perspective with the 2011-2015 years data. The number of arrivals, tourism expenditures, and logistic performance index were used as input variables; tourism receipt also as output variables in accordance with the data acquired from World Bank (WB). Malmquist Total Factor Productivity Indexes were applied to data with output-oriented models. According to research findings; all OECD countries seem to have different fluctuated efficiency values in all kinds of efficiencies for those five years. Chech Republic was the only country that experienced efficiency loss for five years; while the UK is the only one that experienced increases in all type of efficiencies. Moreover; USA, Japan, Turkey and New Zealand were the ones that never experienced any loss in all kinds of efficiencies for the five years. In other words, the efficiency values of those countries were either stable or increased during that period.

Key Words: Tourism Sector, Efficiency Analysis, Malmquist Total Factor Productivity (MTFP).

JEL Classification Codes: D2, E02, E6, E20, E21, Z3.

OECD Ülkeleri Turizm Sektöründe Toplam Faktör Verimliliği

Öz

Bu çalışmada, 2011-2015 yıllarına ait verilerle OECD ülkelerinin turizm sektörünün toplam faktör verimlilik düzeyinin tespitine yönelik iktisadi analiz yapılmaya çalışılmıştır. Çalışmada, girdi değişkeni olarak gelen yolcu sayısı, turizm harcamaları, lojistik performans endeksi; çıktı değişkeni olarak da turizm gelirleri olmak üzere toplam dört değişken kullanılmıştır. Veriler, Dünya Bankası veri tabanından elde edilmiştir. Analiz yöntemi olarak, Malmquist Toplam Factor Verimliliği Indeksi'nin çıktıya yönelik modeli kullanılmıştır. Analiz neticesinde; bu beş yıllık süreçte tüm etkinlik türleri bazında OECD ülkelerinin etkinlik değerlerinin stabil olmadığı, artış ve azalış yönünde dalgalandığı gözlenmiştir. Bu dönemde Çek Cumhuriyeti'nin tüm etkinlik türlerinde sürekli kayıp yaşadığı, İngiltere'nin ise tüm etkinlik türlerinde etkinlik artışı sağladığı tespit edilmiştir. Ayrıca ABD, Japonya, Yeni Zelanda ve Türkiye'nin ise bu süreçte hiçbir etkinlik kaybı yaşamayan ülkeler olduğu görülmüştür. Bir başka ifadeyle bu ülkelerin etkinlik değerleri ya stabil kalmış ya da artış yönünde olmuştur.

Anahtar Kelimeler: Turizm Sektörü, Etkinlik Analizi, Malmquist Toplam Faktör Verimliliği.

JEL Sınıflandırma Kodları: D2, E02, E6, E20, E21, Z3.

Atıfta bulunmak için/Cite this paper:
Bayrak, R. (2018). Total factor productivity of tourism sector of OECD countries. *Çankırı Karatekin Üniversitesi İİBF Dergisi*. 8 (2), 157-177.

1. Introduction

Tourism, especially after the Second World War, became an industry and also take place in the services sector. Because of the limited use of technology, mechanization and automation facilities, it is mainly a labor-intensive sector (İçöz and Kozak, 1998:219; Ünlüönen et al., 2007:165; Bahar and Kozak, 2008). Another important feature of this sector is not only receiving input from approximately 34 different sectors but also contributing to their developments at the same time (Kotil and Kanat, 1993:46).

Considering the interaction with the main macroeconomic variables; tourism is seen to have an extremely precise effect on the economies. First and foremost, income obtained through tourism is originally export (Olalı, 1986:3). Additionally, foreign currencies obtained through tourism has an extremely positive effect on the balance of payments by reducing the current account deficit (İçöz, 1987:23).

Another feature of the tourism sector is income effect in the economy. The value arising from consumption and investment spendings constitutes the income of the production factors. Expenses of those economical units circulate for various reasons in the economy again and provide the new revenues indirectly (Frechtling, 1994:363).

Because of low capital requirements, investments in tourism sector can provide very fast results than expected (Goeldner and Mcintosh, 1990:406). In other words, tourism industry can create employment more quickly with less cost. So, it is generally acknowledged that this sector may play an active role in increasing employment and decreasing unemployment particularly in developing economies (Yanardağ and Avcı, 2012:42). As a result, tourism may be said to be a serious solution for developing countries where unemployment rates are high (Ünlüönen and Şahin, 2011:22).

Tourism is a major category of international trade in services. In addition to receipts earned in destinations, international tourism also generated US$ 211 billion in exports through international passenger transport services rendered to non-residents in 2015, bringing the total value of tourism exports up to US$ 1.5 trillion, or US$ 4 billion a day on average. International tourism now represents 7% of the world's exports of goods and services, up from 6% in 2014, as tourism has grown faster than world trade over the past four years. As a worldwide export category, tourism ranks third after fuels and chemicals and ahead of food and automotive products. In many developing countries, tourism ranks as the first export sector (UNWTO, 2016).
Examining the total value of world tourism sector (Table 1); it is observed that the value obtained is approximately 1 trillion 260 billion dollars. While the European

countries seem to have the largest share with 451 billion dollars (41%) in the world tourism market; Asia-Pacific countries are in the second place with 418 billion dollars (33%), and America is in the third place with 304 billion dollars (24%). Besides that, Africa and the Middle East countries have 36 billion dollars (3%) and 49 billion dollars (4%) respectively, which seem to be quite little.

Table 1: Distribution of The World Tourism Revenue in 2014 (billion $)

	Amerika	Avrupa	Afrika	Ortadoğu	Asya-Pasifik	Toplam
Amount	304 (24%)	451 (%36)	33 (%3)	54 (%4)	418 (%33)	1260 (%100)

Reference: UNWTO, 2016. http://www.eunwto.org/doi/pdf/10.18111/9789284418145

Moreover, international passenger revenues reached about 221 billion by 2015. Considering that, the total economic value in the tourism market reaches approximately 1,5 trillion in 2015 (UNWTO, 2016).

Examining the tourism receipts on the basis of developed and developing countries (Table 2); about 61.5 % of the market share is shared by developed countries and 38.5% by developing countries. According to the distribution of international tourism receipts in 2014 and 2015, the first three countries are the U.S.A, China, and Spain respectively (UNWTO, 2016).

Table 2: International Tourism Receipts

Countries	2014 (billion)	2015 (billion)
USA	191.3	204.5
China	105.4	114.1
Spain	65.1	56.5
France	58.1	45.9
United Kingdom	46.5	45.5
Thailand	38.4	44.6
Italy	45.5	39.4
Germany	43.3	36.9
Hong Kong (China)	38.4	36.2
Macao (China)	42.6	31.3

Reference: UNWTO, Tourism Highligts, 2016, http://www.e-wto.org/doi/pdf/10.18111/9789284418145

While the number of participants in the world tourism was 25 million in 1950 (Waters, 1998:5), that number seems to have reached 1 trillion 186 billion with an increase approximately 47 times in 2015 (UNWTO, 2016).

According to UNWTO (Table 3), as of 2015, nearly 51% (608 million) of them chose to visit the Europe, 24% (279 million) of them to Asia-Pacific countries,

16% (193 million) of them to America, 5% (56 million) of them to Africa and 4% (50 million) of them to Middle Eastern countries respectively.

Table 3: Distribution of Tourists Around The World in 2015 (million)

	USA	Europe	Africa	Middle-East	Asia-Pasific	Total
Amount	193 (%16)	608 (%51)	53 (%5)	53 (%4)	279 (%24)	1186 (%100)

Reference: UNWTO, Tourism Highlights, 2016, http://www.e-wto.org/doi/pdf/10.18111/9789284418145

Evaluating the distribution of the number of tourists on the basis of developed and developing countries; as shown in Table 4, it can be said that the developed countries share 55 % of total market.

Table 4: **International Tourist Arrivals (million)**

	1990	1995	2000	2005	2010	2014	2015	Market Share (%)
World	435	527	674	809	950	1134	1134	100
Advanced Economies	296	339	424	470	516	622	622	55
Emerging Economies	139	188	250	339	434	512	512	45

Reference: UNWTO, Tourism Highlights, 2016. http://www.e-to.org/doi/pdf/10.18111/9789284418145

It is observed that the top ten countries are France, U.S.A, Spain, China, Italy, Turkey, Germany, United Kingdom, Mexico and Russia respectively according to the distribution of international arrivals in 2014 and 2015 (Table 5). France, U.S.A, and Spain seem to have an overwhelming superiority in the list (UNWTO, 2016).

Table 5: International Tourist Arrivals

Countries	2014 (million)	2015 (million)
France	83.7	84.5
USA	75.0	77.5
Spain	64.9	66.2
China	55.6	56.9
Italy	48.6	50.7
Turkey	39.8	39.5
Germany	33.0	35.0
United Kingdom	32.8	34.4
Mexico	29.3	32.1
Russian Federation	29.8	31.3

Reference: UNWTO, Tourism Highligts, 2016, http://www.e-wto.org/doi/pdf/10.18111/9789284418145

According to 2020 and 2030's forecastings, the number of tourists in the world will continue to grow at the rate of 3.3% annually. In this case, it is considered that the number of tourists will be able to reach 1.8 billion in 2030 (UNWTO, 2016).

Examining the tourism expenditures in the international area (Table 6); China, U.S.A, Germany, United Kingdom, France, Russian Federation, Canada, Korea, Italy, and Australia seem to have the highest tourism expenditures in 2015 respectively (UNWTO, 2016).

Table 6: International Tourism Expenditure, Market Share, and Population

Rank	Expenditure (billion US$)		Market Share (%, 2015)	Population (million, 2015)	Expenditure (per capita US$, 2015)
	2014	2015			
China	234.7	292.2	23.2	1375	213
United States	105.5	112.9	9.0	322	351
Germany	93.3	77.5	6.2	82	946
United Kingdom	62.6	63.3	5.0	65	972
France	47.8	38.4	3.0	64	598
Russian Federation	50.4	34.9	2.8	146	239
Canada	33.8	29.4	2.3	36	820
Korea (ROK)	23.2	25.0	2.0	51	493
Italy	28.8	24.4	1.9	61	402
Australia	26.4	23.5	1.9	24	978

Reference: UNWTO, Tourism Highlights, 2016, http://www.enwto.org/doi/pdf/10.18111/9789284418145

In light of this context; it can be said that resource efficiency is quite important for countries to get the desired share of the tourism market in the highly competitive environment. As for the studies conducted to measure tourism efficiency in literature; it seems that many of the studies dealing with the tourism efficiency are generally at the micro level. For instance, Karacaer (1998) studied the efficiency of Four and Five Star Hotels in Antalya. Hwang ve Chang (2003) evaluated the efficiency of 45 International Hotels in Taiwan. Erciş and Gülcü (2008) studied the efficiency of Four and Five Star Hotels in Eastern Anatolia. Emir and Özgür (2008) tried to evaluate the efficiency level of accommodation establishments in Aegean and Mediterranean region. Rouyendegh and Erkan (2010) studied the efficiency of Four Star Hotels in Ankara. Benli (2012) studied some accommodation settlements in Aegean region, West, and East of Marmara region and the Mediterranean region.

In addition to that mentioned above, it was seen only two studies conducted at the macro level. One of them is a study conducted by Atan and Arslantürk (2015) at macro level seemed to measure the tourism efficiency of 91 countries. The other

one is executed by Bayrak and Bahar (2017) and it estimated the economic efficiency level of tourism potential of OECD countries.

Moving from this point; we tried to conduct a macro level analyze and measure the technical efficiency, the technological efficiency, the pure efficiency, the scale efficiency and total factor productivity of the OECD countries to clarify the research questions (RQ) below:

RQ1: Are the OECD countries efficient ones in terms of total factor productivity in tourism sector?

RQ2: How do the values of the technical efficiency, technological efficiency, pure efficiency, scale efficiency and total productivity of the countries differentiate?

RQ3: Is it possible to improve the inefficiency scores identified to reach high social benefits?

2. Method

Malmquist Total Factor Productivity (MTFP), which deals with the "time" dimension in the measurement of the efficiency of Decision Making Units (DMU) (Yalçıner et al., 2005), in other words the effects of variables spread over time, was first used in 1982 by Stan Malmquist (Grosskopf, 1993:175; Cingi and Tarım, 2000). This index is defined to be the ratio of input and output distance function values to measure the change in total factor productivity of a firm between two time periods such as *s* and *t* (Coelli et al., 2005:289).

Malmquist TFP change index, output-oriented, is measured as shown in the equity (1) (Färe, 1994:66-80).

$$M_0^{t+1}(x^t, y^t, x^{t+1}, y^{t+1}) = \sqrt{\left[\frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} \; x \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^t, y^t)}\right]} \qquad (1)$$

$M_0 > 1$ means that there is an increase in TFP from the period of t to t+1; $M_0 < 1$ means that there is a decrease in TFP from the period of t to t+1; and $M_0 = 1$ means that TFP remains constant from the period of t to t+1 (Coelli, 1996:28).

Equation (1) can be described to be equation (2) (Grosskopf, 1993:177).

$$M_0^{t+1}(x^t, y^t, x^{t+1}, y^{t+1}) = \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} x \sqrt{\left[\frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} \; x \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^t, y^t)}\right]} \qquad (2)$$

Equation (3) refers to the change in technical efficiency and describes the catching-up process of DMUs to the efficient frontier. In other words, it is referred to be the catching-up effect of production limit (Rezitis, 2006).

$$TEC = \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} \quad (3)$$

Equation (4) represents the technological change and also describes the frontier shift or boundary shift in time. It implies shifting up and down of Production Possibilities Frontier (PPF) (Mahadevan, 2002:590).

$$TD = \sqrt{\left[\frac{D_0^t(x^{t+1}, y^{t+1})}{D_0^t(x^t, y^t)} \; x \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^t, y^t)}\right]} \quad (4)$$

Therefore, technical efficiency change and technological efficiency change are said to be parts of the changes in TFP and their multiplications, as seen in the equation (5), defines the Total Factor Productivity Index (Kök and Şimşek, 2006:5; Herrero and Pascoe, 2004). Hence, their contribution to TFP can be measured.

$$M_0^{t+1}(x^t, y^t, x^{t+1}, y^{t+1}) = TEC \; x \; TC \quad (5)$$

In this context, technical efficiency (TEC) change describes efficiency changes occurring under the assumption of constant returns to scale or approaching to the efficient frontier; technological efficiency (TE) change describes technological change used in the production process or a shift of Production Possibilities Frontier (PPF) in time (Mahadevan, 2002:590). pure technical efficiency (PTE) changes represents technical changes occurring under the assumption of constant returns to scale; scale efficiency (SE) represents the degree of achievement of optimal production scale; and total factor productivity (TFP) represents the total changes arising from the technical and technological efficiencies (Akhisar and Tezergil, 2014:7).

If convexity constraints are added to the models used in the measuring of the distance function of $D_0^{t+1}(X^{t+1}, Y^{t+1})$ and $D_0^{t}(X^{t}, Y^{t})$, which is needed to determine TEC in the index; pure technical efficiency-PTE [as seen in equation (6)] and scale efficiency-SE [as seen in equation (7)] can be obtained (Rezitis, 2006).

$$PTE = \frac{D_0^{t+1}(x^{t+1}, y^{t+1}/VRS)}{D_0^t(x^t, y^t/VRS)} \quad (6)$$

$$SE = \frac{D_0^t(x^t, y^t/VRS)}{D_0^t(x^t, y^t)} \; x \; \frac{D_0^{t+1}(x^{t+1}, y^{t+1})}{D_0^{t+1}(x^{t+1}, y^{t+1}/VRS)} \quad (7)$$

3. Data

When examining the literatüre, it was seen mostly the micro level efficiency analysis which covers generally accommodation establishments. Only two studies were observed at the macro level. Because of limited space, some of the selected studies and their variables were listed in Table 7.

Table 7: Some Studies Conducted

Authors of the Study	Decision-Making Units (DMUs) of the study	Variables selected to measure the efficiency of DMUs	Level of Analysis
Hwang ve Chang (2003)	45 International Hotels	**Inputs:** number of employees, number of rooms, the area of the food court, expenditures of operations **Outputs:** revenue of rooms, food, and beverages	Micro Level Analysis
Emir and Özgür (2008)	Accommodation Establishments in Aegean and Mediterranean Region	**Inputs:** number of beds, number of arrivals **Outputs:** the number of total arrivals to a facility and stay in the facility	
Rouyendegh and Erkan (2010)	Four Star Hotels in Ankara	**Inputs:** number of beds, number of employees, restaurant capacity, conference room capacity **Outputs:** hotel revenue, room occupancy rates, and customer satisfaction.	
Benli, Y.K. (2012)	Accommodation Settlements in Aegean region, West, and East of Marmara region and the Mediterranean region	**Inputs:** total bed capacity of a facility **Outputs:** the number of total arrivals to a facility and stay in the facility	
Atan and Arslantürk (2015)	91 countries.	**Inputs:** number of arrivals, number of departures, tourism expenditures, expenditures for passenger transport items, expenditures for travel items **Outputs:** tourism receipts, receipts for passenger transport items, receipts for travel items outputs.	Macro-Level Analysis
Bayrak and Bahar (2017)	OECD Countries	**Inputs:** Number of arrivals, tourism expenditures, and logistic performance index. **Outputs:** Tourism revenues	

In this study, a number of arrivals (NoA), tourism expenditures (TE) and logistics performance index (LPI) were used as input variables and tourism receipt (TR) as the output variable. The main purpose of the study was to analyze the efficiency

of tourism potential of OECD countries in terms of economics perspective for the 2011-2015 years.
The variables and their sources are presented in Table 8.

Table 8: Variables and Definitions

Variable		Definition	Source
INPUT	**NoA**	Number of Arrivals	Data Bank of World Bank*
	TE	Tourism Expenditure	
	LPI	Logistic Performance Index	
OUTPUT	**TR**	Tourism Receipts	

Source: (*) http://data.worldbank.org/web.

4. Results

As noted by Norman and Stoker (1991), the input-output variables that do not have any contribution to the production and have multi-collinearity should be eliminated. In other words, inputs and outputs, not required, should be removed from the scope of the analysis. For that purpose, correlation analysis was performed in order to examine the relationship between variables. As a result, low correlation values were observed between the variables.

At the first step of analysis; technical efficiencies, technological efficiencies, pure technical efficiencies, scale efficiencies and total factor productivities of 34 countries were examined. After that, changes inefficiencies were analyzed for the period of five years. Finally, comparison of the efficiency changes through the period of 2011-2015 was evaluated concurrently as a whole.

Efficiency scores greater than 1 ($M_0>1$) point out efficiency increases; efficiency scores equal to 1 ($M_0=1$) point out that there are not any changes in the efficiencies, and efficiency scores smaller than 1 ($M_0<1$) point out efficiency decreases for the specified period.

Examining the technical efficiency changes (TEC) as a whole (Table 8), which indicate proximity to efficiency frontier; it is seen that the efficiency scores increased in the only 2013-2014 and 2014-2015 terms for the four-year period. This increase is approximately 0.1% and 0.4% respectively. For that five-year period, there are not any changes in technical efficiencies of USA, Australia, Spain, Luxembourg, Portugal, and Turkey. The countries having efficiency increases for a five-year period are Iceland and Japan. The countries having efficiency decreases for a five-year period are the Chech Republic, Switzerland, and Poland.

Evaluating the technological efficiency changes (TC) (Table 9), which implies a shift of the efficiency frontier/the production possibilities curve in time; it is seen that all countries values as a whole increases fort hat five-year period. Germany,

USA, Portugal, Turkey, and Greece were observed to have efficiency increases in every period. The others' values have been observed to have fluctuated.

Table 9: Results of MTFP Analysis (2011-2015)

	DMU	TECHNICAL EFFICIENCY CHANGE (TEC)				TECHNOLOGICAL EFFICIENCY CHANGE (TC)			
		2011 2012	2012 2013	2013 2014	2014 2015	2011 2012	2012 2013	2013 2014	2014 2015
1	Germany	0.910	1.030	0.963	0.799	1.007	1.005	1.013	1.007
2	USA	**1.000**	**1.000**	**1.000**	**1.000**	1,020	1.042	1.057	1.048
3	Australia	**1.000**	**1.000**	**1.000**	**1.000**	0.973	0.938	0.998	0.895
4	Austria	0.968	1.001	0.937	0.973	0.981	1.039	1.052	0.929
5	Belgium	1.016	0.989	0.925	0.940	0.977	0.997	1.056	0.964
6	C. Republic	0.930	0.918	0.962	0.989	1.006	1.051	0.999	0.869
7	Denmark	0.959	0.993	1.043	0.919	0.976	1.021	1.020	0.948
8	Estonia	0.871	0.965	1.134	0.922	1.057	1.020	1.006	0.874
9	Finland	1.011	1.017	0.800	0.732	0.966	1.008	1.074	0.955
10	France	1.045	0.965	0.886	0.817	0.972	1.031	1.063	0.992
11	Netherland	0.980	1.046	0.729	0.990	0.979	1.017	1.042	1.021
12	U. Kingdom	1.002	1.016	1.085	0.976	0.984	1.013	1.028	1.009
13	Ireland	1.119	0.872	1.119	1.068	0.978	1.026	0.997	0.883
14	Spain	**1.000**	**1.000**	**1.000**	**1.000**	0.975	1.026	1.065	0.895
15	Israel	1.055	0.997	0.884	1.005	0.970	1.006	1.078	0.970
16	Sweden	1.005	1.033	0.852	0.921	0.975	0.986	1.069	0.957
17	Switzerland	0.742	0.955	0.948	0.914	0.981	1.016	1.064	0.990
18	Italy	1.023	1.038	0.979	0.876	0.971	1.025	1.062	0.991
19	Iceland	1.080	1.085	1.032	1.121	0.956	1.009	1.028	0.942
20	Japon	1.132	1.105	1.068	1.096	0.976	0.970	1.051	1.004
21	Canada	1.023	0.916	1.046	0.748	0.981	1.010	1.047	1.003
22	South Korea	1.015	0.939	0.996	0.855	0.982	1.018	1.054	1.023
23	Luxembourg	**1.000**	**1.000**	**1.000**	**1.000**	0.946	1.015	1.187	0.769
24	Hungary	0.882	1.025	1.055	1.045	1.065	1.020	1.014	0.866
25	Mexico	1.040	0.976	0.982	1.126	0.982	1.037	1.058	0.960
26	Norway	0.931	1.043	1.056	0.880	0.974	0.935	1.066	0.904
27	Poland	0.984	0.977	0.981	0.927	0.983	1.040	1.045	0.935
28	Portugal	**1.000**	**1.000**	**1.000**	**1.000**	1.011	1.037	1.003	0.864
29	Slovakia	0.948	1.012	1.056	0.852	1.053	1.020	1.053	0.976
30	Slovenia	1.037	1.016	0.924	0.996	1.028	1.020	1.002	0.875
31	Chile	0.984	0.980	0.942	1.051	1.001	1.024	0.997	0.889
32	Turkey	**1.000**	**1.000**	**1.000**	**1.000**	1.124	1.020	1.085	**1.000**
33	N. Zealand	**1.000**	**1.000**	0.993	1.007	0.957	**1.000**	1.065	1.027
34	Greece	0.960	1.076	0.817	0.956	1.081	1.018	1.057	0.911
	Minimum	0.742	0.872	0.729	0.732	0.946	0.935	0.997	0.769
	Maksimum	1.132	1.105	1.134	1.126	1.124	1.051	1.187	1.048
	Average	0.987	0.998	1.001	1.004	1.103	1.013	1.069	1.014
	Standart Deviation	0.071	0.047	0.088	0.095	0.039	0.025	0.036	0.062

Source: Obtained by the author with the Win4DEAP programme.

Interpreting the pure technical efficiency changes (PTEC) of the countries (Table 9), which explain technical efficiency change under the variable return to scale assumption; it is seen that the countries as a whole experienced efficiency increases in that five-year period. USA, Australia, Spain, Iceland, Luxembourg, Portugal, Slovenia, Turkey, New Zealand and Greece were seen as the countries

that have not any efficiency changes. While Austria and Switzerland experienced efficiency decreases, Japan was the only country that experienced the efficiency increases for all years. Assuming the relationship between the pure efficiency changes and managerial efficiency level (Lorcu, 2010:283), Japan seems to be the only country to increase managerial efficiency in a five-year period.

Table 10: Results of MTFP Analysis (2011-2015)

	DMU	PURE EFFICIENCY CHANCE (PTEC)				SCALE EFFICIENCY CHANGE (SEC)			
		2011 2012	2012 2013	2013 2014	2014 2015	2011 2012	2012 2013	2013 2014	2014 2015
1	**Germany**	0.907	1.026	0.960	0.798	1.004	1.004	1.003	1.002
2	**USA**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
3	**Australia**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
4	**Austria**	0.971	0.995	0.930	0.976	0.997	1.006	1.008	0.997
5	**Belgium**	1.016	0.989	0.925	0.939	**1.000**	**1.000**	**1.000**	1.001
6	**C. Republic**	1.078	0.961	0.872	0.869	0.863	0.955	1.047	1.034
7	**Denmark**	0.958	0.990	1.043	0.924	1.002	1.003	**1.000**	0.994
8	**Estonia**	**1.000**	0.899	1.010	1.656	0.871	1.035	0.937	0.557
9	**Finland**	1.010	1.009	0.916	0.838	1.002	1.009	0.874	1.147
10	**France**	1.040	0.964	0.882	0.822	1.004	1.001	1.004	0.993
11	**Netherland**	0.980	1.044	0.829	0.993	0.999	1.001	**1.000**	0.997
12	**U. Kingdom**	1.002	1.016	1.088	0.974	**1.000**	**1.000**	0.997	1.002
13	**Ireland**	1.151	0.846	1.123	1.071	0.972	1.031	0.996	0.998
14	**Spain**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
15	**Israel**	1.151	1.020	**1.000**	0.903	0.781	0.977	0.884	1.114
16	**Sweden**	1.004	1.033	0.853	0.919	1.001	**1.000**	0.999	1.002
17	**Switzerland**	0.742	0.954	0.949	0.913	1.001	1.001	**1.000**	1.001
18	**Italy**	1.022	1.185	0.865	0.885	1.001	0.876	1.133	0.990
19	**Iceland**	**1.000**	**1.000**	**1.000**	**1.000**	1.080	1.085	1.032	1.121
20	**Japon**	1.121	1.074	1.068	1.099	1.010	1.030	0.999	0.097
21	**Canada**	1.023	0.916	1.046	0.747	**1.000**	**1.000**	**1.000**	**1.000**
22	**South Korea**	1.015	0.939	0.997	0.862	**1.000**	**1.000**	0.999	0.991
23	**Luxembourg**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
24	**Hungary**	0.900	1.046	1.110	**1.000**	0.979	0.980	0.915	1.045
25	**Mexico**	0.971	1.065	1.054	**1.000**	1.071	0.986	0.984	1.126
26	**Norway**	0.928	1.044	1.060	0.877	1.002	0.999	0.997	1.004
27	**Poland**	0.957	1.136	1.144	0.888	1.029	0.860	0.897	1.147
28	**Portugal**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
29	**Slovakia**	1.025	1.131	**1.000**	**1.000**	0.925	0.923	1.156	0.953
30	**Slovenia**	**1.000**	**1.000**	**1.000**	**1.000**	1.037	1.016	0.924	0.996
31	**Chile**	1.025	1.108	**1.000**	0.953	0.961	0.914	0.942	1.120
32	**Turkey**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
33	**N. Zealand**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	0.993	1.007
34	**Greece**	**1.000**	**1.000**	**1.000**	**1.000**	0.969	1.076	0.817	0.956
	Minimum	0.742	0.846	0.829	0.747	0.781	0.860	0.817	0.097
	Maksimum	1.151	1.185	1.144	1.656	1.080	1.085	1.156	1.147
	Average	1.002	1.052	1.015	1.031	0.960	0.949	0.986	1.022
	Standart Deviation	0.071	0.066	0.075	0.144	0.055	0.044	0.063	0.083

Source: Obtained by the author with the Win4DEAP programme.

Evaluating the changes of the total factor productivity levels (Table 11), which includes the technical and technological changes and measured by multiplication of them, it is seen that there were efficiency increases in 2012- 2013 and 2013-2014 approximately about 1.3% and 4.7% respectively. It is possible to say that this efficiency increase/decrease was associated with the increase/decrease occurring at the technical and technological efficiency levels in the same period.

Table 11: Results of MTFP Analysis (2011-2015)

DMU		TOTAL FACTOR PRODUCTIVITY CHANGE (TFPC)			
		2011-2012	2012-2013	2013-2014	2014-2015
1	Germany	0.916	1.035	0.974	0.805
2	USA	1.020	1.042	1.057	1.048
3	Australia	0.973	0.938	0.998	0.895
4	Austria	0.949	1.039	0.985	0.904
5	Belgium	0.993	0.986	0.977	0.907
6	C. Republic	0.935	0.965	0.962	0.860
7	Denmark	0.937	1.014	1.064	0.870
8	Estonia	0.921	0.985	1.141	0.806
9	Finland	0.977	1.026	0.859	0.699
10	France	1.016	0.995	0.942	0.810
11	Netherland	0.959	1.064	0.759	1.010
12	U. Kingdom	0.986	1.029	1.115	0.985
13	Ireland	1.095	0.894	1.115	0.944
14	Spain	0.975	1.026	1.065	0.883
15	Israel	1.024	1.002	0.953	0.975
16	Sweden	0.979	1.019	0.911	0.881
17	Switzerland	0.728	0.971	1.009	0.905
18	Italy	0.993	1.064	1.040	0.868
19	Iceland	1.032	1.095	1.061	1.056
20	Japann	1.104	1.072	1.123	1.100
21	Canada	1.004	0.925	1.095	0.750
22	South Korea	0.997	0.956	1.050	0.875
23	Luxembourg	0.946	1.015	1.187	0769
24	Hungary	0.939	1.046	1.276	0.905
25	Mexico	1.021	1.011	1.040	1.080
26	Norway	0.907	1.027	1.127	0.796
27	Poland	0.967	1.016	1.025	0.866
28	Portugal	1.011	1.037	1.003	0.864
29	Slovakia	0.999	1.032	1.061	0.832
30	Slovenia	1.066	1.037	0.926	0.871
31	Chile	0.986	1.004	0.939	0.935
32	Turkey	1.124	1.020	1.085	1.036
33	N. Zealand	0.957	**1.000**	1.057	1.034
34	Greece	1.037	1.095	0.864	0.872
Minimum		0.728	0.894	0.759	0.699
Maksimum		1.124	1.095	1.276	769
Average		0.982	1.013	1.047	0.895
Standart Deviation		0.068	0.044	0.080	0.070

Source: Obtained by the author with the Win4DEAP programme.

USA, Iceland, Japan, Mexico, and Turkey were the countries that experienced increasing improvement in the total factor productivity level for a five-year period; while Australia, Belgium and the Chech Republic experienced efficiency decreases. The other countries experienced efficiency increases or decreases over the five years and sometimes they did not experience any efficiency changes. In other words, they seemed to have fluctuating trend for five years.

Countries had improvements in all type of efficiencies in the 2013-2014 period as seen in Table 12, which was prepared to examine the improvements covering all kinds of efficiencies of the whole countries. PTEC is the only efficiency type which all the countries as a whole experienced positive values in that five years. Examining the TFPC; it is seen that there was an increase in the values from 2012 to 2015. As previously stated, it is possible to put forward that the changes resulting in total factor productivity levels could emerge with the changes occurring at technical and technological efficiency levels during the same period. In other words, it is possible that the efficiency increase/decrease at total factor productivity level can associate with the increase/decrease at the technical and technological efficiency level in the same period.

Table 12: Efficiency Values of Four Terms

Years	TEC	TC	PTEC	SEC	TFPC
2011-2012	0.987	0.995	1.002	0.985	0.982
2012-2013	0.998	1.015	1.052	0.949	1.038
2013-2014	1.001	1.045	1.015	1.016	1.047
2042-2015	0.951	0.942	1.031	1.022	1.056
Minimum	0.951	0.942	0.931	0.949	0.982
Maksimum	1.001	1.045	1.052	1.022	1.058
Average	0.984	0.998	0.999	0,985	1,047
Standart Deviation	0,022	0,043	0,050	0,021	0,031

Source: Obtained by the author with the Win4DEAP programme.

If the changes occurring in all types of efficiencies at the country basis were examined for five years as a whole (Table 13); it could be said that Chech Republic was the only country that experienced efficiency loss for five years; while the UK is the only one that experienced increases in all type of efficiencies for five years. Moreover; USA, Japan, Turkey and New Zealand were the ones that experienced never any loss for the five years.

Table 13: Efficiency Averages of the Countries Between 2011-2015

	DMU	TEC	TC	PTEC	SEC	TFPC
1	**Germany**	0.922	1.008	0.919	1.003	0.929
2	**United States**	**1.000**	1.042	**1.000**	**1.000**	1.042
3	**Australia**	**1.000**	0.950	**1.000**	**1.000**	0.950
4	**Austria**	0.969	0.999	0.967	1.022	0.968
5	**Belgium**	0.967	0.998	0.967	**1.000**	0.965
6	**C. Republic**	0.949	0.979	0.953	0.996	0.929
7	**Denmark**	0.977	0.991	0.978	**1.000**	0.968
8	**Estonia**	0.969	0.987	**1.000**	0.969	0.956
9	**Finland**	0.881	**1.000**	0.878	1.003	0.881
10	**France**	0.924	1.014	0.924	1.001	0.937
11	**Netherland**	0.927	1.014	0.928	0.999	0.940
12	**U. Kingdom**	1.010	1.008	1.019	1.015	1.027
13	**Ireland**	1.039	0.970	1.040	0.999	1.007
14	**Spain**	0.997	0.998	**1.000**	0.997	0.985
15	**Israel**	0.983	1.005	1.026	0.958	0.988
16	**Sweden**	0.950	0.996	0.950	1.001	0.946
17	**Switzerland**	0.885	1.012	0.885	1.001	0.896
18	**Italy**	0.977	1.012	0.981	0.996	0.989
19	**Iceland**	1.079	0.983	**1.000**	1.079	1.061
20	**Japan**	1.100	**1.000**	1.090	1.009	1.100
21	**Canada**	0.925	1.010	0.925	**1.000**	0.934
22	**South Korea**	0.949	1.019	0.951	0.998	0.967
23	**Luxembourg**	**1.000**	0.968	**1.000**	**1.000**	0.967
24	**Hungary**	1.101	0.998	1.125	0.979	1.088
25	**Mexico**	1.029	1.008	1.193	0.862	1.038
26	**Norway**	0.975	0.981	0.974	**1.000**	0.956
27	**Polond**	0.967	**1.000**	1.053	0.918	0.967
28	**Portugal**	**1.000**	0.976	**1.000**	**1.000**	0.976
29	**Slovakia**	1.125	1.025	1.338	0.840	1.153
30	**Slovenia**	0.993	0.979	**1.000**	0.993	0.972
31	**Chile**	0.989	0.976	**1.000**	**1.000**	1.039
32	**Turkey**	**1.000**	1.039	**1.000**	**1.000**	1.039
33	**New Zealand**	**1.000**	1.011	**1.000**	**1.000**	1.011
34	**Greece**	0.948	1.015	**1.000**	0.948	0.962
	Minimum	0.881	0.950	0.878	0.840	0.881
	Maksimum	1.125	1.042	1.338	1.079	1.153
	Average	0.984	0.998	0.999	0.985	0.983
	Standart Deviation	0.056	0.019	0.085	0.042	0.058

Source: Obtained by the author with the Win4DEAP programme.

The efficiency changes experienced by all countries in the period of 2011-2015 are presented in Table 14.

Table 14: Variation of Efficiencies of Countries (2011-2015)

	Increased (>1)	Stable (=1)	Decreased (<1)
TEC	7 (%21)	6 (%18)	21 (%61)
TC	15 (%44)	3 (9)	16 (%47)
PTEC	7 (%21)	11 (%35)	16 (%44)
SEC	8 (%24)	12 (%35)	14 (%41)
TFPC	11 (%32)	-	23 (%68)

Source: Obtained by the authors of the Win4DEAP programme.

It is seen that 7 countries in terms of the technical efficiency, 15 countries in terms of the technological efficiency, 7 countries in terms of the pure technical efficiency, 8 countries in terms of the scale efficiency and 11 countries in terms of the total factor productivity experienced efficiency increase for this five-year period covering 2011-2015.

The highest efficiency improvements took place in technological efficiency type with 15 countries (44%) and the total factor productivity with 11 countries (327%). Hence, it is possible to say that 15 countries managed to move up the production possibilities curve and 11 countries increased their total factor productivity for five years.

5. Discussion and Recommendations

Considering increasing intensity of competition in the tourism sector, it is possible to express that effective usage of the production factors is so important to get the desired share in the market. In that context, we analyzed technical, technological, pure technical, scale efficiency and total factor productivity of the tourism sector of OECD countries with the data of 2011-2015 years to reply the research questions.

The first question of the study is "if the OECD countries are efficient ones in terms of total factor productivity or not? The second research question is "How do the values of the technical efficiency, technological efficiency, pure efficiency, scale efficiency and total productivity of the countries differentiate between them?".

Considering the changes in the total factor productivity levels experienced, it is seen that there were efficiency increases in 2012-2013 and 2013-2014 approximately about 1.3% and 4.7% respectively. It is possible to say that this efficiency increase/decrease was associated with the increase/decrease occurring at the technical and technological efficiency levels in the same period. USA, Iceland, Japan, Mexico, and Turkey were the countries that experienced increasing values in the total factor productivity level for a five-year period; while Australia, Belgium and the Chech Republic experienced efficiency decreases. The other countries experienced efficiency increases or decreases over the five years and sometimes they did not experience any efficiency changes. In other words, they seemed to have fluctuating trend for five years.

Evaluating the types of efficiencies (technical efficiency, technological efficiency, pure efficiency, scale efficiency and total factor productivity) experienced at the basis of the country; it could be declared that all countries seemed to have different fluctuated efficiency scores. Chech Republic was the only country that experienced efficiency loss for five years; while the UK is the only one that experienced increases in all type of efficiencies for five years. Moreover; USA,

Japan, Turkey and New Zealand were the ones that never experienced any loss in all kinds of efficiencies for the five years.

The highest efficiency improvements emerged in technological efficiency types. Germany, USA, Portugal, Turkey, and Greece were observed to have technological efficiency increases in every period. This results can point out that these countries could manage to move up their production possibilities curves.

Examining the technical efficiency changes (TEC); the countries that have efficiency increases for a five-year period are Iceland and Japan. But Chech Republic, Switzerland, and Poland are the countries that have efficiency decreases for a five-year period. Additionally USA, Australia, Spain, Luxembourg, Portugal, and Turkey seemed to have no any changes in technical efficiencies. When examining the study conducted by Atan and Arslanürk (2015), it is seen that these countries were observed as efficient ones in CCR models. Additionally, these countries seemed to be efficient ones in the study conducted by Bayrak and Bahar (2017) not only in CCR but also in BCC models. In sum, this result is consistent with the studies conducted by Atan and Arslantürk (2015), Bayrak and Bahar (2017). Moreover, it can be postulated that Iceland and Japan gained proximity to the efficient frontier while the others move away.

Interpreting the pure technical efficiency changes (PTEC) of the countries; the USA, Australia, Spain, Iceland, Luxembourg, Portugal, Slovenia, Turkey, New Zealand and Greece were seen as the countries that have not any efficiency changes. While Austria and Switzerland experienced efficiency decreases, Japan was the only country that experienced the efficiency increases for all years. Assuming the relationship between the pure efficiency changes and managerial efficiency level, Japan could be said the only country to increase managerial efficiency in a five-year period.

Analysing scale efficiency values; Germany was the only DMU that experienced efficiency increases for a five-year period; while the USA, Australia, Spain, Canada, Luxembourg, Portugal, and Turkey did not have any efficiency changes. The other one's values seemed to have fluctuated. Also, it is possible to say that Germany was the only country to catch the optimal production level.

Generally speaking, the results show us, there is no convergence among the G-7 countries (USA, UK, Germany, Italy, France, Japan, Canada) in terms of technical efficiency, technological efficiency, pure efficiency, scale efficiency and total productivity. But it can be put forward that developing countries seemed to mostly have lover values than developed ones.

The research question "Is it possible to improve the inefficiency scores identified to reach high social benefits?" was our final question. The answer to this question could be also "yes" moving from literature and findings acquired from our study.

In that context, the recommendation developed for policymakers were submitted below.

As emphasized before, tourism has an enormous impact on job creation, export revenue, and domestic value added to the economy. On average, tourism directly contributes 4.1% of GDP, 5.9% of employment and 23.1% of service export to OECD economies. At the same time, OECD members play a prominent role in international tourism. International arrivals to OECD countries accounted for 54% of the global arrivals in 2014 (OECD, 2016:23-25).

Also moving from these facts; countries should underline some policies to improve the inefficiencies experienced in order to compete very effectively in the market. In that context, some policies might be specified as follows:

- Employment of the educated workforce is very important in the highly competitive environment. Also, it can be highly advised to set the regulations about the education of people according to sectoral needs,
- To be an international trademark by improving infrastructure help countries attract the international tourists to get desired revenues,
- Regulating market conditions and access to the sector is highly recommended to provide competitiveness in the business world,
- Diversifying the product and service quality and facilitating the travel conditions can be immensely advised to get the desired share in that highly competitive environment,
- Ensuring the sustainable development of natural and cultural resources not only might attract the international arena by means of providing positive perception but also very important to get sustainable growth,
- Setting international accepted standards (safety, security, quality and environmental) might help countries to get more credit and finally more tourist than usual,
- To provide different kinds of alternatives such as health tourism, winter tourism, convention tourism, cruise tourism, golf tourism and culture tourism etc. may help countries get the big share of the market and additionally support the governments in the crises terms of the tourism,
- Responding immediately some sudden crises and disasters could affect the sector by making government gain confidence in the international area,
- Marketing and promotion are the other important measures to be taken into account. Especially due to cross-cutting and fragmented nature of tourism, these policies need to have the coordination of government and private sector businesses concurrently. In that context, developments on the market and in the customer's profile should be monitored.

6. The Restrictions of the Study and Future Implications

The main restrictions of this study were dataset covering the years 2011-2015. Malmquist Total Factor Productivity Index used as a method and Win4DEAP programme as an analysis program were the other restrictions. Additionally, the type and number of input and output variables, the periods of the study and decision making units (here countries) may be accepted other restrictions of the study.

This research is a relative analysis in essence and the results are not precise values. Additionally, we assumed the 34 countries to be homogenous DMUs while analyzing them. It can be preferred to chose DMUs in terms of the region such as Mediterranean ones etc. Therefore, validity and generalizability of this study can be increased by changing data (input, output), analysis period, analysis method, programme and decision making units.

Some values of inefficient countries may arise from the period (2011-2015) of the study. In other words, the causality of the inefficiencies can emerge as different kinds of reasons (such as regime, business cyles, low growth rates, economic crises etc.) that the countries faced. Also, it can be preferred to evaluate the effects of such variables in the next studies to reach more comprehensive results.

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