Measuring Technical Efficiency of Health Centers in Greece: A Data Envelopment Analysis Application for the Primary Health System of Greece

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Abstract:

Purpose: In this paper Data Envelopment Analysis will be applied to investigate the technical efficiency of 196 Health Centers in Greece. The analysis is referred at their efficiency in the year 2018.

Design/Methodology/Approach: Data were collected by the Ministry of Health and were analyzed by performing quality tests to ensure validity and avoid bias. The method used is the non-parametric Data Envelopment Analysis and more specifically the input-oriented, one-stage VRS model. Tobit regression analysis was performed to analyze the effect of the Health Region in the efficiency of the Health Centers.

Findings: The results of the paper indicate the efficient Health Centers in Greece, which construct the efficient frontier. The inefficient Health Centers in Greece lie beneath the efficient frontier. Moreover, the 196 Health Centers included in the research were classified depending on the Health Region they belong to, to investigate the effect of the Health Regions in the efficiency measured.

Practical Implications: This study highlights the importance of measuring the efficiency of Primary Health Care. Taking into consideration the contribution of Health Centers to the National Health System, the results may be used as a guide for improvements for the efficiency of the Health Centers.

Originality/Value: The research focus on the underestimated field of Primary Health Care and its importance. The application of Data Envelopment Analysis combined with the Tobit Regression Model reveals a new approach for measuring the efficiency.

Keywords: Health Care’s Efficiency, Data Envelopment Analysis, Tobit Regression Model, Primary Health Care

JEL codes: C14, C32, C52, I10.

Paper Type: Research Paper

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1. Introduction

Primary Health Care is an essential compound of the National Health System of every country. The World Health Organization is constantly highlighting the importance of Primary Health and its contribution to the overall health of the population in every country. Moreover, a strategy focusing on the reinforcement of primary health care was declared in Alma-Ata in 1978. Attempts have been made since then to monitor primary health care in every country and Greece was included (World Health Organization, 2017). Health Centers are one of the major compounds of Primary Health System and by attempting to evaluate their efficiency important information would be given for Primary Health Care in Greece. Nowadays, Greece has 207 Health Centers 196 of which were submitted for the analysis of this paper. The other 11 Health Centers were excluded owing to the lack of data to avoid random estimation and possibility of bias.

Considering the case of Greece, health care expenditures are higher than the average expenditures of OECD countries. This is mostly due to the insufficient primary health care system and the delivery of health care services (Androutsou, Geitona, and Yfantopoulos, 2011).

The above is amplified by the dissatisfaction of people receiving the health services, which combined with the lack of health promotion, disease prevention and rehabilitation, indicates problematic administration, low productivity, and distribution problems on health services. One of the main factors is the inadequacy of primary health care, highlighting the importance of its contribution to the overall Health Care System and the efforts that should have been made, to strengthen it (Tountas, Karnaki, and Pavi, 2002; Economou and Giorno, 2009; Lionis et al., 2009).

2. Data Envelopment Analysis

Efficiency can be measured by using parametric and non-parametric approaches. The advantage of the non-parametric approach is that the functional form need not be known. The most used non-parametric approach is Data Envelopment Analysis (Dimas, Goula, and Soulis, 2012). Moreover, through Data Envelopment Analysis multiple inputs and outputs can be handled as well as used with any input-output measurement. In healthcare efficiency measurement studies, DEA is the dominant method to apply (Worthington, 2004).

Modern efficiency was first introduced by Farrell (1957), who based on Debreu (1951) and Koopmans (1951) and attempted to measure efficiency of a firm considering multiple inputs. Farrell analyzed that efficiency consists of two components, technical efficiency, and allocative efficiency, and these two combined give the measure of economic efficiency (Farrell, 1957). The method applied in this paper is Data Envelopment Analysis (DEA), first introduced by Charnes, Cooper, and Rhodes, (1978). Data Envelopment Analysis is a method using liner
programming to construct a non-parametric frontier involving all the Decision-Making Units (DMU’s) and their data translated as inputs and outputs, measuring their efficiencies. The frontier includes all the efficient DMU’s while beneath the frontier are placed all the inefficient ones.

Technical efficiency measured by DEA, refers to the maximum production of outputs by the DMU’s given a certain number of inputs used or to the minimum quantities of inputs used by the DMU’s to obtain a certain level of outputs (Charnes, Cooper, and Rhodes, 1978). Regarding the above, technical efficiency depends on the input-output ratio of productivity (Hollingsworth, Dawson, and Maniadakis, 1999) and can be decomposed into pure technical efficiency and scale efficiency. In order to achieve the decomposition of the efficiency two methods of DEA have to be implemented, the first one based on the assumption of constant return to scale (CRS) and the second one based on the assumption of variable return to scale (VRS) (Banker, Charnes, and Cooper, 1984). CRS method is applied when all DMU’s are operating at an optimal level while, when there is imperfect competition, VRS method is applied considering that not all DMU’s are operating at an optimal level, assuming that there are scale efficiencies (SE).

The mathematical conception of DEA is analyzed briefly below, since the aim of this paper is to evaluate the efficiency of the Health Centers in Greece. Extended Mathematical analysis of DEA method and how it is employed is presented in the relevant literature. In the mathematical model of CRS, it is assumed that there are N DMU’s, using K inputs to produce M outputs. Considering the above there are two matrixes, K*N input matrix and M*N output matrix, representing the data of all DMU’s. In order to measure the efficiency of the DMU’s the literature considers the calculation of the ratio of all outputs over all inputs. The mathematical linear programming problem is represented:

\[
\max_{u,v} (u'y/v'x),
\]

subject to:

\[
u'y/v'x \leq 1, j=1,2,\ldots,N,
\]

\[
u,v \geq 0,
\]

Where u is an M*1 vector of output weights and v is a K*1 vector of input weights. The aim is to calculate the values for u and v, maximizing the efficiency of the DMU’s. As it is observed there is a constraint indicating that all efficiency measures must be placed inside the closed interval of (0,1).

In order to avoid the infinite solutions of the above mathematical formula a new constraint, v’x=1, was imposed:

\[
\max_{\mu,v} (\mu'y),
\]

subject to:
v’x_i=1,
μ’y_j-v’x_j\leq0, j=1,2,…,N,
μ, ν\geq0.

It is obtained that a notation change from u,v to μ,ν transforms the first mathematical linear programming problem to a multiplier form.

By applying the duality in linear programming, an equivalent form is presented:

\[
\min_{0,\lambda} \theta,
\]

subject to:
\[-y_i+Y\lambda\geq0, \]
\[\theta x_i-X\lambda\geq0, \]
\[\lambda\geq0.\]

Symbol \(\theta\) is a scalar and \(\lambda\) is a N*1 vector of constants. The above model has fewer constraints, and it can be applied more easily. Symbol \(\theta\) represents the efficiency of the DMU’s and their values are inside the closed interval of (0,1). Values of 1 impose that the DMU’s are operating at the optimum efficiency level while values less than 1 impose inefficiencies. The mathematical function above must be solved N times for every DMU (Coelli, 1996).

As already mentioned, the CRS model assumes constant return to scale based that all DMU’s are operating at an optimal scale. On the contrary, VRS model overpasses this assumption considering that there might be efficiencies of scale. By adding one more constraint to the CRS model SE effects is calculated and technical efficiency is decomposed to pure technical efficiency and scale efficiency for each DMU. The mathematical function transform as follows:

\[
\min_{0,\lambda} \theta,
\]

subject to:
\[-y_i+Y\lambda\geq0, \]
\[\theta x_i-X\lambda\geq0, \]
\[N1^1\lambda=1 \]
\[\lambda\geq0.\]

\(N1\) representing an N*1 vector of one’s (Coelli, 1996).

3. Input and Output Orientations

There are two orientations in the literature for the DEA method, input orientation and output orientation. Input orientation describes the minimum number of inputs required to achieve the level of outputs produced, while output orientation describes
the maximum amount of outputs that can be achieved through the combination of various quantities of inputs (Seiford and Thrall, 1990). In input orientation outputs produced remain constant (minimize inputs used) while in output orientation inputs used remain constant (maximize outputs produced), in an attempt to perform the linear programming approach of DEA to estimate the frontier and the efficiencies of the Health Centers.

4. Data

Attempt has been made in this paper to include all Health Centers of Greece although some of them were facing lack of data, so they were excluded to avoid random estimation and possibility of bias. Therefore, 196 Health Centers were submitted to conduct the DEA analysis and measure their efficiency.

The Health Centers contributing the sample are homogenous, since they represent the majority of the Health Centers of Greece (94.68% of the total), distributed across the seven Health Regions of Greece. Moreover, they use the same categories of inputs producing the same categories of outputs, differencing each other only through the amounts been used. This makes them comparable and validates this paper to measure their relative efficiencies. Also, there must be noted that according to the literature, the requirements to perform DEA were satisfied, ensuring meaningful results. These requirements include that at least one DMU of the sample consumes and produces every input and output and also that each DMU of the sample consumes at least one input and produces at least one output (Grosskopf, 2002; Färe and Grosskopf, 2004). Including the majority of the Health Centers in Greece discriminatory power between the efficient and inefficient units is also succeeded (Sarkis and Talluri, 2002; Sarkis, 2007).

There were 13 outputs included in the analysis of this paper to measure the efficiency and they represent the total health services provided by the Health Centers. More specifically, the outputs used by each Health Center were:

1. Total number of “Chronic disease cases” faced – Output1;
2. Total number of “Emergencies” faced – Output2;
3. Total number of “Nursing Operations” employed – Output3;
4. Total Number of “Microsurgeries” employed – Output4;
5. Total Number of “Dental Procedures” employed – Output5;
6. Total Number of “Regular Incidents” faced – Output6;
7. Total Number of “Urgent Incidents” faced – Output7;
8. Total Number of “Transcriptions” given – Output8;
9. Total Number of “Bio pathological and Laboratory exams” applied – Output9;
10. Total Number of “Other exams” applied, which are not included in the categories above – Output10;
11. Total Number of “Test Mantoux” applied – Output11;
12. Total Number of “Vaccinations for kids and teenagers” applied – Output12;
13. Total Number of “Vaccinations for adults” applied – Output13.

In contrast, there were 4 inputs used and they represent the total personnel employed and occupied at the Health Centers:

1. Total “Number of Doctors” employed – Input1;
2. Total “Number of Managers” employed – Input2;
3. Total “Number of non-medical staff” employed – Input3;
4. Total “Number of Nursing Staff” employed – Input4;

All inputs and outputs used in order to conduct this paper are referred in the year 2018. Table 1 shows the descriptive statistics of all inputs and outputs used to evaluate the efficiencies of the 196 Health Centers. In Table 1, descriptive statistics shows the minimum and the maximum values of inputs and outputs observed. Also, the Mean and the Standard Deviation of every input and output is presented.

**Table 1. Descriptive Statistics for inputs and outputs**

|                                | N   | Minimum | Maximum | Mean   | Std. Deviation |
|--------------------------------|-----|---------|---------|--------|----------------|
| Chronic Disease cases          | 196 | 0       | 47697   | 4794,07| 8186,230       |
| Emergencies                    | 196 | 0       | 20131   | 1708,84| 2054,894       |
| Nursing operations             | 196 | 0       | 28457   | 4285,74| 4291,017       |
| Microsurgeries                 | 196 | 0       | 2968    | 354,13 | 500,518        |
| Dental Procedures              | 196 | 0       | 11022   | 1122,47| 1736,334       |
| Regular incidents              | 196 | 0       | 69195   | 12969,63| 9889,944      |
| Urgent incidents               | 196 | 0       | 46759   | 9122,02| 8306,569       |
| Transcriptions                 | 196 | 0       | 56313   | 11061,94| 9079,243      |
| Bio pathological and laboratory exams | 196 | 0     | 160149  | 15181,26| 23239,509     |
| Other exams                    | 196 | 0       | 26984   | 4016,07| 4421,843       |
| Test Mantoux                   | 196 | 0       | 640     | 42,37  | 86,752         |
| Vaccinations applied for kids and teenagers | 196 | 0     | 2754    | 530,15 | 651,199        |
| Vaccinations applied for adults | 196 | 0       | 3948    | 545,35 | 641,971        |
| Number of Doctors              | 196 | 1       | 37      | 10,11  | 7,359          |
| Number of Managers             | 196 | 1       | 12      | 2,59   | 1,905          |
| Number of Non-medical staff    | 196 | 1       | 30      | 7,72   | 4,673          |
| Number of Nursing Staff        | 196 | 1       | 48      | 16,04  | 9,599          |
| Valid N (listwise)             | 196 |         |         |        |                |

*Source: Own elaboration.*

5. **Model Specifications**

In this paper the VRS, input-oriented, one-stage model is used. Firstly, input-oriented because in the health sector it is impossible to predefined the outputs but instead inputs
may be predefined and controlled. Secondly, one-stage DEA because it performs better than two-stage and multistage DEA both in deterministic and stochastic scenarios (Daouia and Simar, 2007; Johnson, Ostfeld, and Keesing, 2015; Simar and Wilson, 2018). Finally, the VRS model is used because it would be a mistake to assume that all DMU’s operate at an optimum level, since they operate in district areas with differences and peculiarities in many aspects such as concentration of people in their Region, environmental factor which may affect the health of the overall population, availability to employ specialized workforce and hospitals nearby that may affect the efficiencies calculated. After the DEA is performed, a second stage analysis will be implemented to investigate if the Health Regions where Health Centers are located has an impact in the efficiencies. Moreover, internal validity of the model will be tested.

6. Sampling – Results

The efficiencies were measured by performing DEA by the DEAP ver2.1 program. The analysis was performed assuming variable return to scale, input-oriented, one-stage DEA. The efficiencies of the firms are presented in the following Table 2.

| Firms | CRSTE | VRSTE | SLACKS | RTS |
|-------|-------|-------|--------|-----|
| 1     | 1.000 | 1.000 | 1.000  | -   |
| 2     | 1.000 | 1.000 | 1.000  | -   |
| 3     | 1.000 | 1.000 | 1.000  | -   |
| 4     | 0.633 | 0.748 | 0.846  | drs |
| 5     | 0.935 | 0.983 | 0.951  | drs |
| 6     | 1.000 | 1.000 | 1.000  | -   |
| 7     | 1.000 | 1.000 | 1.000  | -   |
| 8     | 1.000 | 1.000 | 1.000  | -   |
| 9     | 0.991 | 1.000 | 0.991  | drs |
| 10    | 0.591 | 0.612 | 0.965  | irs |
| 11    | 1.000 | 1.000 | 1.000  | -   |
| 12    | 0.807 | 0.948 | 0.852  | irs |
| 13    | 1.000 | 1.000 | 1.000  | -   |
| 14    | 1.000 | 1.000 | 1.000  | -   |
| 15    | 0.563 | 0.670 | 0.840  | irs |
| 16    | 1.000 | 1.000 | 1.000  | -   |
| 17    | 0.362 | 1.000 | 0.362  | irs |
| 18    | 0.593 | 0.796 | 0.745  | irs |
| 19    | 0.758 | 1.000 | 0.758  | irs |
| 20    | 0.778 | 0.971 | 0.802  | drs |
| 21    | 1.000 | 1.000 | 1.000  | -   |
| 22    | 1.000 | 1.000 | 1.000  | -   |
| 23    | 1.000 | 1.000 | 1.000  | -   |
| 24    | 1.000 | 1.000 | 1.000  | -   |
| 25    | 1.000 | 1.000 | 1.000  | -   |
| 26    | 0.960 | 1.000 | 0.960  | drs |
| 27    | 0.234 | 0.500 | 0.469  | irs |
|   |   |   |   |   |
|---|---|---|---|---|
| 28 | 1.000 | 1.000 | 1.000 | - |
| 29 | 0.458 | 0.466 | 0.983 | rs |
| 30 | 1.000 | 1.000 | 1.000 | - |
| 31 | 0.490 | 0.620 | 0.789 | rs |
| 32 | 0.862 | 1.000 | 0.862 | ds |
| 33 | 0.718 | 0.738 | 0.973 | rs |
| 34 | 0.350 | 0.628 | 0.558 | rs |
| 35 | 1.000 | 1.000 | 1.000 | - |
| 36 | 1.000 | 1.000 | 1.000 | - |
| 37 | 1.000 | 1.000 | 1.000 | - |
| 38 | 1.000 | 1.000 | 1.000 | - |
| 39 | 0.869 | 0.927 | 0.937 | ds |
| 40 | 1.000 | 1.000 | 1.000 | - |
| 41 | 1.000 | 1.000 | 1.000 | - |
| 42 | 1.000 | 1.000 | 1.000 | - |
| 43 | 1.000 | 1.000 | 1.000 | - |
| 44 | 1.000 | 1.000 | 1.000 | - |
| 45 | 0.781 | 0.987 | 0.792 | ds |
| 46 | 1.000 | 1.000 | 1.000 | - |
| 47 | 0.276 | 0.281 | 0.983 | rs |
| 48 | 0.401 | 0.401 | 0.999 | - |
| 49 | 1.000 | 1.000 | 1.000 | - |
| 50 | 0.686 | 0.714 | 0.960 | rs |
| 51 | 0.871 | 1.000 | 0.871 | rs |
| 52 | 1.000 | 1.000 | 1.000 | - |
| 53 | 1.000 | 1.000 | 1.000 | - |
| 54 | 0.316 | 1.000 | 0.316 | rs |
| 55 | 0.771 | 0.921 | 0.837 | rs |
| 56 | 0.471 | 1.000 | 0.471 | rs |
| 57 | 1.000 | 1.000 | 1.000 | - |
| 58 | 0.860 | 0.861 | 0.999 | ds |
| 59 | 0.771 | 1.000 | 0.771 | ds |
| 60 | 0.889 | 0.895 | 0.993 | rs |
| 61 | 1.000 | 1.000 | 1.000 | - |
| 62 | 0.772 | 1.000 | 0.772 | rs |
| 63 | 0.351 | 0.500 | 0.702 | rs |
| 64 | 1.000 | 1.000 | 1.000 | - |
| 65 | 1.000 | 1.000 | 1.000 | - |
| 66 | 1.000 | 1.000 | 1.000 | - |
| 67 | 0.794 | 0.794 | 1.000 | - |
| 68 | 1.000 | 1.000 | 1.000 | - |
| 69 | 1.000 | 1.000 | 1.000 | - |
| 70 | 1.000 | 1.000 | 1.000 | - |
| 71 | 1.000 | 1.000 | 1.000 | - |
| 72 | 1.000 | 1.000 | 1.000 | - |
| 73 | 1.000 | 1.000 | 1.000 | - |
| 74 | 1.000 | 1.000 | 1.000 | - |
| 75 | 1.000 | 1.000 | 1.000 | - |
| 76 | 0.956 | 1.000 | 0.956 | rs |
| 77 | 0.628 | 0.729 | 0.862 | rs |
|   | Column 1 | Column 2 | Column 3 | Column 4 |
|---|---------|---------|---------|---------|
| 78 | 1.000   | 1.000   | 1.000   |         |
| 79 | 0.703   | 1.000   | 0.703   | drs     |
| 80 | 0.428   | 1.000   | 0.428   | drs     |
| 81 | 0.700   | 0.703   | 0.995   | drs     |
| 82 | 1.000   | 1.000   | 1.000   |         |
| 83 | 0.236   | 0.262   | 0.902   | drs     |
| 84 | 0.479   | 0.632   | 0.758   | drs     |
| 85 | 0.512   | 1.000   | 0.512   | drs     |
| 86 | 1.000   | 1.000   | 1.000   |         |
| 87 | 0.832   | 0.878   | 0.948   | drs     |
| 88 | 1.000   | 1.000   | 1.000   |         |
| 89 | 1.000   | 1.000   | 1.000   |         |
| 90 | 0.498   | 0.623   | 0.798   | drs     |
| 91 | 0.798   | 0.809   | 0.987   | drs     |
| 92 | 0.467   | 0.479   | 0.975   | drs     |
| 93 | 0.434   | 0.508   | 0.855   | drs     |
| 94 | 0.903   | 0.943   | 0.958   | drs     |
| 95 | 1.000   | 1.000   | 1.000   |         |
| 96 | 0.583   | 0.584   | 0.999   |         |
| 97 | 0.785   | 0.787   | 0.998   | drs     |
| 98 | 0.724   | 1.000   | 0.724   | drs     |
| 99 | 0.750   | 0.770   | 0.975   | drs     |
|100 | 0.266   | 1.000   | 0.266   | drs     |
|101 | 1.000   | 1.000   | 1.000   |         |
|102 | 0.453   | 1.000   | 0.453   | drs     |
|103 | 1.000   | 1.000   | 1.000   |         |
|104 | 1.000   | 1.000   | 1.000   |         |
|105 | 0.587   | 1.000   | 0.587   | drs     |
|106 | 0.427   | 0.456   | 0.936   | drs     |
|107 | 0.546   | 0.720   | 0.758   | drs     |
|108 | 0.994   | 1.000   | 0.994   | drs     |
|109 | 0.696   | 0.711   | 0.979   | drs     |
|110 | 1.000   | 1.000   | 1.000   |         |
|111 | 1.000   | 1.000   | 1.000   |         |
|112 | 1.000   | 1.000   | 1.000   |         |
|113 | 1.000   | 1.000   | 1.000   |         |
|114 | 0.830   | 0.832   | 0.997   | drs     |
|115 | 0.742   | 0.909   | 0.816   | drs     |
|116 | 0.643   | 0.648   | 0.993   | drs     |
|117 | 1.000   | 1.000   | 1.000   |         |
|118 | 0.768   | 1.000   | 0.768   | drs     |
|119 | 1.000   | 1.000   | 1.000   |         |
|120 | 0.284   | 1.000   | 0.284   | drs     |
|121 | 0.308   | 1.000   | 0.308   | drs     |
|122 | 0.887   | 0.887   | 1.000   |         |
|123 | 0.694   | 0.769   | 0.902   | drs     |
|124 | 1.000   | 1.000   | 1.000   |         |
|125 | 0.871   | 1.000   | 0.871   | drs     |
|126 | 0.248   | 0.526   | 0.472   | drs     |
|127 | 0.729   | 0.844   | 0.863   | drs     |
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|   |   |   |   |   |
|---|---|---|---|---|
| 128 | 0.049 | 1.000 | 0.049 |    |
| 129 | 1.000 | 1.000 | 1.000 |    |
| 130 | 1.000 | 1.000 | 1.000 |    |
| 131 | 0.757 | 1.000 | 0.757 |    |
| 132 | 0.852 | 1.000 | 0.852 |    |
| 133 | 1.000 | 1.000 | 1.000 |    |
| 134 | 0.348 | 1.000 | 0.348 |    |
| 135 | 0.818 | 1.000 | 0.818 |    |
| 136 | 0.918 | 0.949 | 0.968 |    |
| 137 | 0.352 | 1.000 | 0.352 |    |
| 138 | 0.448 | 1.000 | 0.448 |    |
| 139 | 1.000 | 1.000 | 1.000 |    |
| 140 | 0.678 | 1.000 | 0.678 |    |
| 141 | 1.000 | 1.000 | 1.000 |    |
| 142 | 0.749 | 0.830 | 0.902 |    |
| 143 | 0.604 | 1.000 | 0.604 |    |
| 144 | 0.342 | 1.000 | 0.342 |    |
| 145 | 1.000 | 1.000 | 1.000 |    |
| 146 | 1.000 | 1.000 | 1.000 |    |
| 147 | 1.000 | 1.000 | 1.000 |    |
| 148 | 0.560 | 0.581 | 0.964 |    |
| 149 | 0.801 | 1.000 | 0.801 |    |
| 150 | 0.404 | 0.630 | 0.641 |    |
| 151 | 0.468 | 1.000 | 0.468 |    |
| 152 | 0.646 | 1.000 | 0.646 |    |
| 153 | 1.000 | 1.000 | 1.000 |    |
| 154 | 1.000 | 1.000 | 1.000 |    |
| 155 | 1.000 | 1.000 | 1.000 |    |
| 156 | 0.371 | 0.521 | 0.712 |    |
| 157 | 1.000 | 1.000 | 1.000 |    |
| 158 | 1.000 | 1.000 | 1.000 |    |
| 159 | 1.000 | 1.000 | 1.000 |    |
| 160 | 0.506 | 0.588 | 0.860 |    |
| 161 | 0.430 | 1.000 | 0.430 |    |
| 162 | 0.886 | 1.000 | 0.886 |    |
| 163 | 0.380 | 0.557 | 0.683 |    |
| 164 | 0.955 | 1.000 | 0.955 |    |
| 165 | 0.700 | 1.000 | 0.700 |    |
| 166 | 0.321 | 1.000 | 0.321 |    |
| 167 | 0.985 | 1.000 | 0.985 |    |
| 168 | 0.968 | 0.996 | 0.972 |    |
| 169 | 1.000 | 1.000 | 1.000 |    |
| 170 | 1.000 | 1.000 | 1.000 |    |
| 171 | 0.776 | 1.000 | 0.776 |    |
| 172 | 0.923 | 0.951 | 0.971 |    |
| 173 | 1.000 | 1.000 | 1.000 |    |
| 174 | 1.000 | 1.000 | 1.000 |    |
| 175 | 0.592 | 0.676 | 0.876 |    |
| 176 | 1.000 | 1.000 | 1.000 |    |
| 177 | 1.000 | 1.000 | 1.000 |    |
The column CRSTE represents the technical efficiency assuming constant return to scale in DEA, while the column VRSTE represents the technical efficiency assuming variable return to scale in DEA. The column presenting the SLACKS is calculated using the CRSTE/VRSTE fraction and indicates the scale efficiencies. Slacks present the extra amount by which an input can be reduced to achieve technical efficiency after all inputs have been reduced in equal proportion to reach the production frontier or the extra amount by which an output can be increased to achieve technical efficiency after all outputs have been increased to reach the production frontier. So, there are input and output slacks which are calculated by the equations $\theta x_i - X\lambda \geq 0$ and $-y_i + Y\lambda \geq 0$ respectively, represented in the VRS model. When the equations are equal to zero there are no slacks for the $i$-th DMU (Coelli, 1996).

As indicated by the Steering Committee for the Review of Commonwealth/State Service Provision in 1997, return to scale express the relationship between output and inputs and can be constant, increasing or decreasing depending on whether output increases in proportion to, more than or less than inputs, respectively.

The analysis assuming constant return to scale indicates 91 technical efficient Health Centers out of 196, which leads to a percentage of 46.6% of efficiency among the total number of Health Centers. In contrast, the analysis assuming variety return to scale indicates 138 technical efficient Health Center out of 196, leading to a percentage of 70.4% of efficiency among the total number of Health Centers. Performing the Spearman-rank correlation between CRSTE and VRSTE efficiencies, the correlation coefficient is 0.602 and it is statistically significant presenting high
The degree of correlation between the two methods as shown in the Table 3 (Reddy et al., 2015).

**Table 3. Spearman-rank correlations between input oriented crste-vrste models**

| Spearman's rho | crste Correlation Coefficient | vrste Correlation Coefficient |
|----------------|--------------------------------|--------------------------------|
| crste Sig. (2-tailed) | .602** | .000 |
| N | 196 | 196 |
| vrste Correlation Coefficient | .602** | 1.000 |
| vrste Sig. (2-tailed) | .000 | . |
| N | 196 | 196 |

**. Correlation is significant at the 0.01 level (2-tailed).**

*Source: Own elaboration.*

Table 4 presents the average efficiency score with CRSTE method being 0.806 with standard deviation 0.243 and minimum efficiency observed 0.049. The average efficiency score with VRSTE method is 0.916 with standard deviation 0.163 and minimum efficiency observed 0.262. VRS method is more accurate considering the high significant correlation between the two models and the assumption that not all DMU’s are operating at an optimal level, taking into consideration the scale efficiencies in the analysis.

**Table 4. Frequencies**

| N | crste | vrste |
|---|-------|-------|
| Valid | 196 | 196 |
| Missing | 0 | 0 |
| Mean | 0.80578 | 0.91608 |
| Std. Deviation | 0.243251 | 0.163452 |
| Minimum | 0.049 | 0.262 |
| Maximum | 1.000 | 1.000 |
| Percentiles | | |
| 25 | 0.64375 | 0.92250 |
| 50 | 0.95550 | 1.00000 |
| 75 | 1.00000 | 1.00000 |

*Source: Own elaboration.*

In Appendix, the summary of peers is represented. Peers are the efficient DMU’s “operating” closer to the inefficient Health Center. The percentage variation from the inefficient Health Center to achieve the efficiency of its peers, are the peer weights. The number of times a Health Center is a reference to an inefficient Health Center is presented at the table as peer count (Coelli, 2011).

**7. Tobit Regression Analysis**

Furthermore, analysis is conducted to investigate if the Health Regions where the Health Centers belong to affects the efficiencies. Since the results of the efficiencies
of the DMUs are censored between the interval (0,1), OLS (Ordinary Least Squares) cannot be used. The application that will give valuable results explaining the efficiencies is the censored regression model Tobit, which is designed to estimate the linear relationship between variables when the dependent variable is censored (Jehu-Appiah et al., 2014; Xenos et al., 2017). In this application of Tobit regression model, the dependent variable is the VRS technical efficiency of each Health Center censored between the interval (0,1), while the independent one is the exogenous factor Health Regions. In this second stage of the analysis, DEA efficiency scores are regressed against the 7 Health Regions of Greece. Model verification:

\[ Y_i = X_i b_0 + e_i - (0, \sigma_0^2), \]
\[ Y_i = \max(y_i, 0) \]

Where \( X_i \) is a row vector of observable Health Region of efficiencies, \( b \) is a column vector of associated coefficients, \( e_i \sim (0, \sigma_0^2) \) and \( y_i \) is a latent variable with data that are censored at (0, 1) interval (Dimas, Goula, and Soulis, 2012)

Tobit regression analysis results are presented in Table 5 indicating that (given p-value=0.255>\( \alpha \)) Health Regions are not statistically significant.

**Table 5. Tobit Regression Analysis results under VRS assumption**

| Coefficient     | Std. Error | z Value | Sig.  |
|-----------------|------------|---------|-------|
| (Intercept)     | 1.102      | .108    | 10.211| .000  |
| HealthRegions   | .025       | .022    | 1.138 | .255  |
| Log(scale)      | -.877      | .109    | -8.031|       |

**Note:** Lower bound: 0, Upper bound: 1; Tobit(formula=vste_tobit~HealthRegions, left = 0, right = 1, dist = "gaussian", data = dta, na.action=na.exclude). Scale: 0.4159. Residual d.f.: 193; Log likelihood: -98.741, D.f.: 3; Wald statistic: 1.296, D.f.: 1

**Source:** Own elaboration

8. **Model Validation**

For the internal validity of the DEA model under VRS assumption the Spearman-rank correlation test was performed. Internal validity is to compare if there are differences in the efficiencies of Health Centers using different inputs and outputs. DEA is a non-parametric method, so it is not possible to compare the efficient scores produced by different models directly. However, the comparison of the efficiencies can be applied by non-parametric correlation tests (Ganley and Cubbin, 1992; Valdmanis, 1992; Parkin and Hollingsworth, 1997; Maniadakis et al., 2008).

The VRS efficiencies were calculated by performing different models of DEA. The models are represented in Table 6, which shows the different inputs and outputs used to calculate efficiencies.
Table 6. Models with different combinations of variables

| Models/Variable | O1 | O2 | O3 | O4 | O5 | O6 | O7 | O8 | O9 | O10 | O11 | O12 | O13 | O14 | O15 | O16 | O17 | O18 | O19 | O20 | O21 | O22 | O23 | O24 | O25 | O26 | O27 | O28 | O29 | O30 |
|-----------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| M0              | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  |
| M1              | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  |
| M2              | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  |
| M3              | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  |

Source: Own elaboration.

The first model (MO) is the model taking into consideration all inputs and outputs, the second model (M1) excludes the input variable “Number of Managers”, the third model (M2) excludes the output variables “Chronic Disease Cases” and “Emergencies”, while the fourth model (M3) excludes the input variables “Other Exams” and “Number of Managers” and the output variables “Test Mantoux”, “Dental Procedures” and “Transcriptions”. After the efficiencies of each model were estimated under the VRS input-oriented DEA model the Spearman-rank correlation coefficients were calculated.

Table 7. Model Validity test with Spearman Rank Correlation

| Spearman's rho | model0 | model1 | model2 | model3 |
|----------------|--------|--------|--------|--------|
|                | Correlation Coefficient | 1.000  | .578** | .955** | .481** |
| model0         | Correlation Coefficient | .578** | 1.000  | .526** | .873** |
| model1         | Correlation Coefficient | .955** | .526** | 1.000  | .422** |
| model2         | Correlation Coefficient | .481** | .873** | .422** | 1.000  |

Note: **. Correlation is significant at the 0.01 level (2-tailed).
Source: Own elaboration.

The Spearman-rank correlations tests for internal validity show that there is statistically significant correlations between different model specifications.

9. Limitations

The dataset was provided by the Ministry of Health and refers to the period 2018. Attempts had been made to gather Financial Data for the Health Centers that would have been used as inputs for the purposes of this paper, contributing to the evaluation of the efficiencies. Unfortunately, there was lack of data for costs and expenditures for the Health Centers, but regarding that Health Centers are labor-intensive units the total personnel employed and occupied was used as inputs to estimate the efficiencies. It is strongly recommended that the Greek Government start collecting Financial Data in order to evaluate the efficiency of Primary Health Care given the attention that has been paid during the last decade (Xenos et al., 2017). Moreover, eleven Health Centers were excluded from this paper due to lack of data.
10. Conclusion

This paper provides the relative efficiency of Primary Health Care Centers by using the non-parametric Data Envelopment Analysis method. The technical efficient Health Centers are indicated, benchmarking the overall efficiency of Health Centers in Greece. The efficient Health Centers can be used as benchmarks for the inefficient ones to improve their efficiencies. Furthermore, it was investigated if the Health Region where the Health Centers are located affects the efficiency, without significant results. Extensive research should be made to investigate other exogenous factors that may affect efficiency such as demographic, socioeconomic, community criteria, environmental factors, etc. This paper may contribute to improve Health Centers efficiencies. Also, valuable results can be extracted for National Health Care System to match available resources depending on each Health Center’s needs.

The results of the analysis for the efficiencies of the Health Centers were extracted by using the DEAP version 2.1 for Windows by Coelli (1996). Also, statistics and Tobit regression analysis were applied by the IBM SPSS program and R programming add-on for SPSS.

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**Appendix. SUMMARY OF PEERS**

| firm | peers | peer weights (lambda weight) | Firm peer count |
|------|-------|-------------------------------|-----------------|
| 1    |       |                               | 0               |
| 2    |       |                               | 0               |
| 3    |       |                               | 0               |
| 4    | 7, 42, 89, 153, 70, 164, 184 | 0.097, 0.236, 0.230, 0.239, 0.049, 0.085, 0.064 | 0               |
| 5    | 184, 7, 6, 53, 41, 69, 42   | 0.005, 0.559, 0.064, 0.081, 0.080, 0.143, 0.067 | 0               |
| 6    |       |                               | 1               |
| 7    |       |                               | 19              |
| 8    |       |                               | 2               |
| 9    |       |                               | 0               |
| 10   | 119, 153, 41, 184, 7, 30, 78, 157, 166 | 0.017, 0.283, 0.189, 0.139, 0.004, 0.078, 0.052, 0.163, 0.075 | 0               |
| 11   |       |                               | 0               |
| 12   | 157, 69, 166, 111, 24       | 0.159, 0.011, 0.333, 0.376, 0.121 | 0               |
| 13   |       |                               | 3               |
| 14   |       |                               | 1               |
| 15   | 176, 166, 41, 184, 119, 157, 88 | 0.034, 0.405, 0.074, 0.075, 0.311, 0.057, 0.044 | 0               |
| 16   |       |                               | 0               |
| 17   | 174, 119, 64, 166 | 0.085, 0.836, 0.033, 0.046 | 0               |
| 18   | 166, 35, 69, 173 | 0.112, 0.125, 0.128, 0.635 | 0               |
| 19   | 184, 129, 196, 88, 169, 74 | 0.518, 0.000, 0.134, 0.091, 0.202, 0.054 | 0               |
| 20   | 24, 7, 14, 30, 21, 184     | 0.365, 0.293, 0.013, 0.158, 0.082, 0.088 | 0               |
| 21   |       |                               | 1               |
| 22   |       |                               | 5               |
| 23   |       |                               | 2               |
| 24   |       |                               | 4               |
| 25   |       |                               | 0               |
| 26   |       |                               | 0               |
| 27   | 111, 179, 119, 184, 174, 166, 173 | 0.132, 0.030, 0.254, 0.076, 0.050, 0.282, 0.176 | 0               |
| 28   |       |                               | 0               |
| 29   | 69, 70, 170, 23, 130, 196, 78, 88, 35, 41, 179, 119 | 0.024, 0.009, 0.001, 0.160, 0.235, 0.024, 0.088, 0.258, 0.051, 0.025, 0.104, 0.020 | 0               |
| 30   |       |                               | 14              |
| 31   | 130, 88, 173, 153, 78, 65, 166 | 0.027, 0.099, 0.390, 0.077, 0.201, 0.013, 0.193 | 0               |
| 32   |       |                               | 0               |
| 33   | 155, 157, 184, 41, 117, 30, 78 | 0.168, 0.314, 0.160, 0.139, 0.007, 0.055, 0.157 | 0               |
| 34   | 173, 69, 166, 119 | 0.531, 0.001, 0.367, 0.101 | 0               |
| 35   |       |                               | 4               |
| 36   |       |                               | 0               |
| 37   |       |                               | 2               |
| Page | Index | Numbers | Values | |
|------|-------|---------|--------|---|
| 38   | 117, 42, 157, 192, 7, 147, 184 | 0.146, 0.121, 0.026, 0.316, 0.235, 0.116, 0.041 | 0 |
| 39   | 117, 42, 157, 192, 7, 147, 184 | 0.146, 0.121, 0.026, 0.316, 0.235, 0.116, 0.041 | 0 |
| 40   | 78, 184, 157, 117, 41, 69, 119, 7, 88 | 0.224, 0.049, 0.470, 0.013, 0.006, 0.103, 0.077, 0.026, 0.031 | 0 |
| 41   | 130, 195, 196, 157, 42, 153, 177, 194, 69 | 0.039, 0.149, 0.371, 0.119, 0.060, 0.055, 0.016, 0.109, 0.082 | 0 |
| 42   | 78, 157, 71, 166, 153, 119, 24, 41 | 0.167, 0.039, 0.031, 0.142, 0.224, 0.254, 0.029, 0.114 | 0 |
| 43   | 147, 184, 119, 64, 22, 179 | 0.026, 0.037, 0.060, 0.119, 0.244, 0.513 | 0 |
| 44   | 181, 7, 164, 119, 8, 42 | 0.000, 0.123, 0.332, 0.203, 0.233, 0.108 | 0 |
| 45   | 38, 119, 37, 153 | 0.093, 0.179, 0.102, 0.626 | 0 |
| 46   | 173, 195, 177, 78, 69, 146, 166, 141 | 0.112, 0.116, 0.060, 0.108, 0.184, 0.159, 0.242, 0.020 | 0 |
| 47   | 153, 88, 166, 140, 196, 141, 174 | 0.119, 0.093, 0.194, 0.212, 0.036, 0.008, 0.338 | 0 |
| 48   | 13, 157, 184, 103, 141 | 0.590, 0.132, 0.057, 0.046, 0.175 | 0 |
| 49   | 173, 157, 66, 78, 184, 71, 41, 184, 88 | 0.002, 0.031, 0.048, 0.044, 0.502, 0.015, 0.147, 0.074, 0.037, 0.099 | 0 |
| 50   | 184, 195, 88, 129, 166, 140, 196, 181 | 0.085, 0.214, 0.090, 0.021, 0.061, 0.373, 0.103, 0.053 | 0 |
| 51   | 111, 119, 7, 30, 184, 177, 42, 157, 130 | 0.307, 0.136, 0.018, 0.085, 0.140, 0.088, 0.154, 0.068, 0.004 | 0 |
| 52   | 88, 157, 119, 78, 141, 69, 177, 195, 119 | 0.079, 0.315, 0.232, 0.005, 0.064, 0.039, 0.073, 0.061, 0.132 | 0 |
| 53   | 110, 43, 42, 153, 69, 119, 111, 184 | 0.065, 0.182, 0.024, 0.106, 0.122, 0.385, 0.053, 0.062 | 0 |
| 54   | 153, 78, 141, 69, 64, 177, 195, 119 | 0.075, 0.014, 0.154, 0.073, 0.100, 0.097, 0.017, 0.470 | 0 |
| Page | Text                                                                 |
|------|----------------------------------------------------------------------|
| 84   | 141, 191, 184, 43, 111, 166, 84, 41, 179, 195, 129, 103, 0.091, 0.116, 0.010, 0.053, 0.073, 0.379, 0.048, 0.116, 0.038, 0.006, 0.070, 0 |
| 85   | 184, 174, 129, 128, 30, 0.015, 0.065, 0.278, 0.164, 0.478           |
| 86   | 4                                                                       |
| 87   | 42, 2, 70, 196, 7, 0.164, 0.086, 0.422, 0.286, 0.043, 0              |
| 88   | 18                                                                      |
| 89   | 2                                                                       |
| 90   | 195, 166, 159, 41, 88, 119, 130, 23, 129, 196, 0.011, 0.230, 0.036, 0.012, 0.085, 0.103, 0.190, 0.016, 0.270, 0.046 |
| 91   | 7, 184, 41, 42, 157, 111, 0.018, 0.238, 0.061, 0.074, 0.354, 0.254  |
| 92   | 196, 69, 130, 7, 111, 140, 153, 0.212, 0.014, 0.367, 0.165, 0.072, 0.117, 0.054 |
| 93   | 30, 173, 166, 184, 155, 130, 0.021, 0.702, 0.041, 0.137, 0.069, 0.030 |
| 94   | 130, 113, 66, 173, 177, 71, 0.148, 0.260, 0.007, 0.205, 0.224, 0.156 |
| 95   | 0                                                                       |
| 96   | 7, 130, 117, 157, 184, 66, 0.001, 0.453, 0.121, 0.273, 0.115, 0.037  |
| 97   | 195, 117, 78, 7, 30, 184, 101, 196, 0.566, 0.001, 0.241, 0.077, 0.008, 0.019, 0.005, 0.083 |
| 98   | 179, 103, 153, 178, 37, 38, 0.241, 0.063, 0.419, 0.014, 0.122, 0.141 |
| 99   | 41, 7, 78, 130, 153, 101, 196, 0.115, 0.182, 0.055, 0.178, 0.451, 0.004, 0.014 |
| 100  | 86, 119, 153, 169, 140, 0.090, 0.011, 0.291, 0.343, 0.264, 0          |
| 101  | 2                                                                       |
| 102  | 179, 184, 166, 88, 173, 0.299, 0.253, 0.180, 0.004, 0.264, 0          |
| 103  | 4                                                                       |
| 104  | 1                                                                       |
| 105  | 0                                                                       |
| 106  | 119, 184, 153, 71, 173, 78, 0.150, 0.042, 0.094, 0.023, 0.437, 0.254  |
| 107  | 184, 157, 166, 173, 0.168, 0.166, 0.210, 0.456                         |
| 108  | 0                                                                       |
| 109  | 157, 78, 173, 41, 184, 153, 71, 0.108, 0.161, 0.264, 0.088, 0.212, 0.030, 0.138 |
| 110  | 1                                                                       |
| 111  | 9                                                                       |
| 112  | 2                                                                       |
| 113  | 1                                                                       |
| 114  | 196, 155, 30, 7, 181, 69, 42, 0.533, 0.129, 0.136, 0.034, 0.037, 0.096, 0.036 |
| 115  | 8, 42, 89, 196, 119, 7, 70, 0.074, 0.066, 0.141, 0.050, 0.278, 0.126, 0.265 |
| 116  | 196, 119, 153, 13, 7, 141, 69, 0.396, 0.027, 0.058, 0.080, 0.038, 0.376, 0.025 |
| 117  | 7                                                                       |
| 118  | 184, 153, 177, 174, 141, 169, 0.109, 0.205, 0.055, 0.445, 0.008, 0.179, 0 |
| 119  | 37                                                                      |
| 120  | 196, 86, 166, 133, 0.009, 0.062, 0.628, 0.301                         |
| 121  | 184, 153, 166, 129, 0.150, 0.461, 0.356, 0.033                         |
| 122  | 184, 130, 13, 41, 0.393, 0.284, 0.161, 0.162                         |
| 123  | 35, 41, 176, 88, 119, 130, 46, 0.032, 0.012, 0.213, 0.173, 0.179, 0.386, 0.003 |
| 124  | 0                                                                       |
| 125  | 1                                                                       |
| 126  | 173, 119, 196, 166, 184, 57, 179, 0.534, 0.046, 0.020, 0.323, 0.021, 0.026, 0.030 |
| 127  | 65, 196, 166, 30, 119, 130, 155, 157, 0.354, 0.043, 0.188, 0.022, 0.058, 0.119, 0.000, 0.216 |
| 128  | 119, 140, 166, 0.222, 0.556, 0.222                                     |
| 129  | 10                                                                      |
| 130  | 18                                                                      |
|   |   |   |
|---|---|---|
| 131 | 38, 52, 64, 141, 166 | 0.142, 0.316, 0.012, 0.282, 0.248 |
| 132 | 65, 153, 78, 173, 41, 119, 166 | 0.490, 0.035, 0.007, 0.029, 0.200, 0.227, 0.012 |
| 133 | 173, 184, 52, 38 | 0.530, 0.026, 0.415, 0.030 |
| 134 | 153, 146, 132, 177, 173, 166 | 0.039, 0.162, 0.436, 0.010, 0.215, 0.139 |
| 135 | 0 |
| 136 | 65, 153, 78, 173, 41, 119, 166 | 0.490, 0.035, 0.007, 0.029, 0.200, 0.227, 0.012 |
| 137 | 0 |
| 138 | 0 |
| 139 | 0 |
| 140 | 0 |
| 141 | 71, 78, 157, 65, 72, 153, 173, 30 | 0.013, 0.146, 0.027, 0.098, 0.161, 0.022, 0.454, 0.078 |
| 142 | 72, 170, 179, 57, 130, 173, 119, 78 | 0.023, 0.068, 0.325, 0.083, 0.205, 0.009, 0.166, 0.121 |
| 143 | 0 |
| 144 | 0 |
| 145 | 0 |
| 146 | 0 |
| 147 | 0 |
| 148 | 64, 173, 153, 181, 184, 166, 157, 53 | 0.055, 0.344, 0.049, 0.056, 0.197, 0.192, 0.042, 0.065 |
| 149 | 0 |
| 150 | 0 |
| 151 | 0 |
| 152 | 0 |
| 153 | 0 |
| 154 | 0 |
| 155 | 0 |
| 156 | 0 |
| 157 | 0 |
| 158 | 0 |
| 159 | 0 |
| 160 | 119, 153, 179, 166, 184, 65, 88, 78 | 0.113, 0.073, 0.137, 0.282, 0.093, 0.126, 0.126, 0.050 |
| 161 | 0.143, 0.842, 0.016 |
| 162 | 0 |
| 163 | 0 |
| 164 | 0 |
| 165 | 0 |
| 166 | 0 |
| 167 | 0 |
| 168 | 0 |
| 169 | 0 |
| 170 | 0 |
| 171 | 0 |
| 172 | 0 |
| 173 | 0 |
| 174 | 0 |
| 175 | 0 |
| 176 | 0 |
|    |    |    |    |    |    |
|----|----|----|----|----|----|
| 177|    |    |    |    | 10 |
| 178|    |    |    |    | 1  |
| 179|    |    |    |    | 15 |
| 180|    |    |    |    | 6  |
| 181|    |    |    |    | 1  |
| 182|    | 119, 41, 30, 166, 179, 153, 184, 173 | 0.029, 0.043, 0.023, 0.607, 0.057, 0.077, 0.056, 0.108 | 0 |
| 183|    |    |    |    | 42 |
| 184|    | 119, 166, 184, 111, 179 | 0.041, 0.220, 0.300, 0.258, 0.181 | 0 |
| 185|    |    |    |    | 0  |
| 186|    |    |    |    | 0  |
| 187|    |    |    |    | 0  |
| 188|    | 22, 184, 177, 104, 38, 196, 190, 129 | 0.099, 0.170, 0.099, 0.066, 0.119, 0.301, 0.146, 0.000 | 0 |
| 189|    | 103, 157, 129, 158, 191 | 0.090, 0.086, 0.093, 0.147, 0.584 | 0 |
| 190|    |    |    |    | 1  |
| 191|    |    |    |    | 2  |
| 192|    |    |    |    | 1  |
| 193|    | 42, 140, 119, 181, 195, 196, 111, 7, 157, 153 | 0.172, 0.195, 0.089, 0.190, 0.172, 0.029, 0.003, 0.054, 0.022, 0.073 | 0 |
| 194|    |    |    |    | 1  |
| 195|    |    |    |    | 9  |
| 196|    |    |    |    | 22 |

Source: Own elaboration