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THE IMPACT OF ECONOMIC CRISIS TO HOSPITAL SECTOR AND THE EFFICIENCY OF GREEK PUBLIC HOSPITALS

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ABSTRACT

Objectives - To examine the performance of 90 general Greek hospitals in 2010 and 2011 and to identify initiatives or strategies adopted to enhance efficiency.

Methods - CCR and BCC input-oriented Data Envelopment Analysis and the bootstrapping methodology were used to derive the statistical properties of efficiency scores and to eliminate the sampling bias.

Results - The average efficiency score is increased to 85.9% and to 90% the year 2011 under the constant and variable returns to scale assumption respectively. When considering the bootstrapping results however, none of the 90 hospital units appear to be close to the frontier. Hospitals found to be inefficient by utilizing 80% of the available inputs.

Conclusions Following the implementation of the Memoranda, the Greek government decreased public spending to hospitals by more than 11%. Although overall hospital efficiency showed a slight increase, there is an imperative need for administrative measures aiming to the better distribution and use of health care resources. Additionally, as out of pocket payments to public hospitals show an increasing trend, efforts should be made to retain access especially for vulnerable groups.

Keywords: Greece, Data Envelopment Analysis, Crisis, Efficiency, Hospital Care

1. Introduction

1.1 The crisis and the Greek health care system: the first years of austerity

In 2009, Greece entered into deep economic crisis. The main features were large fiscal deficits, a huge public debt and erosion of the country's competitive position. To address the problem, the Greek government requested the activation of a support mechanism from the European Union (EU), the International Monetary Fund (IMF) and the European Central Bank (ECB), adopted austere income policies, increased direct and indirect taxes, enhanced flexibility in the labor market, cut expenses, and merged or eliminated unproductive public agencies[2].

The measures in the Memoranda signed by Troika (IMF/EU/ECB) and the Greek government between 2010 and 2013 were designed to solve the problem, but their effectiveness is now questioned. Although for the year 2013 a primary surplus was achieved, the effect on society has been devastating. In four years, Greece lost 25% of GDP [1], unemployment was peaked at 27.3% at 2013, the risk of poverty rate before social transfers reached 26.8% in 2012, the highest in the last decade, people at risk of poverty or social exclusion increased from 27.7% in 2007 to 34.6% in 2012, and material deprivation increased from 22% to 33.7% in the respective years [2].

The economic crisis in Greece unavoidably affected the health sector. With total expenditure at 10% of GDP in 2009, health was the focus of attention by the Troika, which monitors compliance with the terms of the €110 billion, advanced on May 2010, and the debt restructuring of 2012. Health has been a major contributor to fiscal consolidation with expenditure cuts estimated at 2.5% of GDP, or around €5 billion by 2013 [3].

Health expenditure rose fast in the "happy decade" 2000-2009. An inefficient and corrupt health system created a "health deficit" of €50 bil, coincidentally equal to the cumulative public deficit in 2003-2009 [3][3]. Total current expenditure rose from 8.5% of GDP in 2003 to 10% in 2009 and decreased to 9.1% of GDP in 2012 [4]. General government spending rose from 58.7% in 2003 to 69.5% in 2009 of current health spending, with private spending, primarily in the form of out-of-pocket payments, being a major driver. Pharmaceutical expenditures also shot up by 85% during this period, from €288 per capita in 2003 to €532.9 in 2010, with more than 76% of spending in 2010 covered by public money [5]. Figure 1 shows the evolution of key expenditure indicators during 2003-2012.

[2] Memorandum of Understanding (MOU) on economic policy conditionality, signed between Greece and the institutional creditors (EC, IMF, ECB).
[3] The "Health Deficit" is defined as the sum of, graft, fraud and black-economy payments resulting in tax evasion.

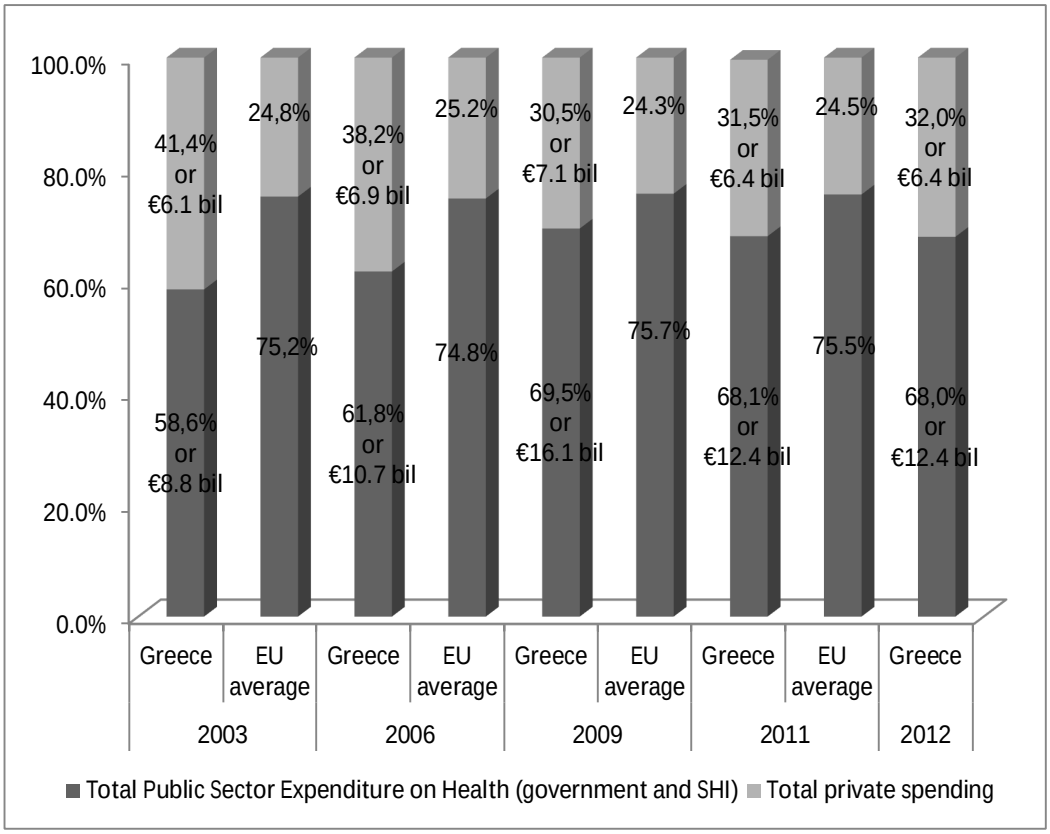

Figure 1: Health care expenditure as % of GDP and in billion euros, 2003 - 2012

* EU average: Austria, Belgium, Estonia, Finland, France, Germany, Ireland, Italy, Netherlands, Portugal, Slovak Republic, Slovenia, Spain. EU average was not available for 2012
Source: OECD, 2013; ELSTAT, 2014 & authors' estimations

The fiscal crisis led to a cut in health spending to €17.7 billion (9.1% of GDP) in 2012 considerably below the €23.2 billion (10% of GDP) in 2009. The failure to control expenditure in previous years was due uncontrolled resource use and constant subsidies to cover deficits, by Social Security Funds (SSF) and hospitals [6]. The efforts to constrain expenditure also resulted in a reduction of almost €2 billion in pharmaceutical expenditure in 2009-2012, mostly by social health insurance funds [7]. The Greek health care system is today under severe pressure, at the same time that it must address the adverse health effects of unemployment and poverty.

Under the current economic circumstances, the need for better allocation and use of scarce healthcare resources in Greece is imperative. The objective of this paper is, therefore, twofold. Primarily, to estimate the relatively technical efficiency by using a sample of 90 public general hospitals of the NHS during the recession and to identify opportunities for input reductions. Secondly, to present the impact of the economic crisis on the health care system and especially to the public hospital sector.

.2 The response of the public hospital sector

Figures 2 & 3 show that the two major cost drivers were inpatient and pharmaceutical care,[4] with the first showing a rising growth after 2010. Between 2005 and 2009, the difference between inpatient and pharmaceutical care increased from €1.4 bl to almost €2 bl., with hospital care constituting the main "culprit" in the runaway health cost "inflation" between 2006 and 2009.

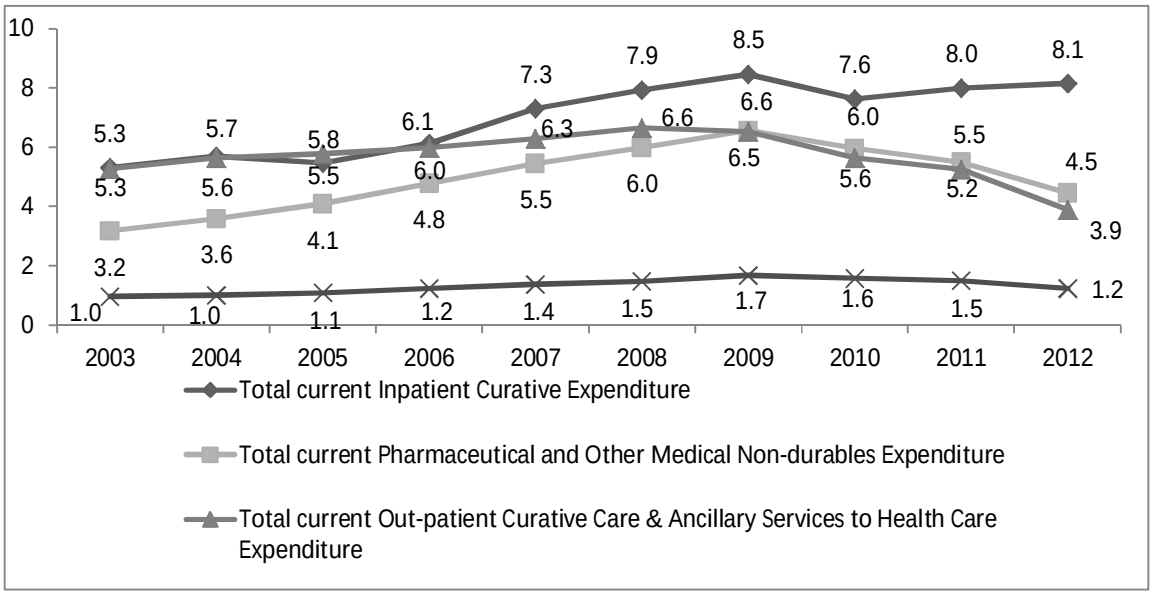

Figure 2: Total Current Inpatient expenditure, Pharmaceutical and other medical non-durables, Out-patient curative care & ancillary services to health care (billion €): 2003-2012
Sources: OECD 2013, ELSTAT 2014

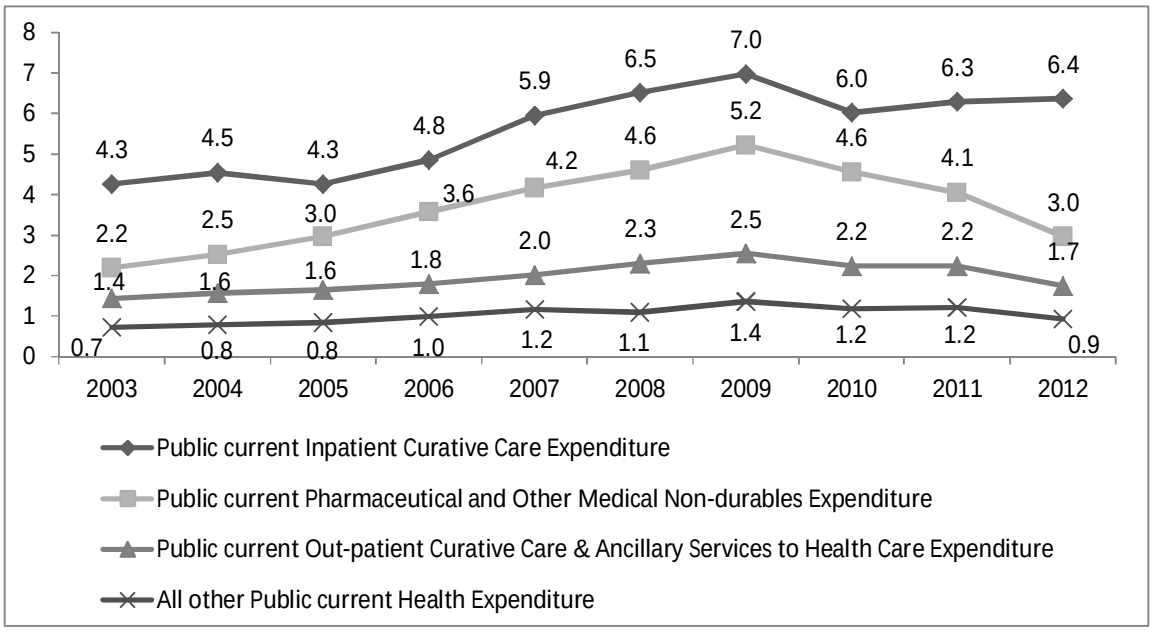

Figure 3: Public Inpatient care expenditure, Pharmaceutical and other medical non-durables, Out-patient curative care & ancillary services to health care (billion €)
Sources: ELSTAT, 2014

[4] The concept of hospital care expenditure differs from the concept of in-patient expenditure. The former includes expenditure for the outpatient department, while the second refers only to inpatient care.

Public inpatient care expenditure was constantly rising, from €4.3 bl in 2005 to €7 bl in in 2009, an increase of more than 62%. Between 2008 and 2009 it rose by €500 mil, partly a result of the promotion and salary raise of senior medical staff to the level of Director [3]. Public pharmaceutical expenditure rose by €600-€700 mil each year from €3.6 bil in 2006 to €5.2 bil in 2009.

Total health expenditure declined rapidly after 2009, with public pharmaceutical expenditure showing the largest reduction of 42.3%, from 2009 to 2012. Between 2011 and 2012 alone, it dropped 26.8%, from €4.1 billion to €3 billion [8]. Prevention, public health, and long term care, already underfinanced, suffered further cuts during the crisis. A considerable decline by €800 mil from 2009 to 2012 was recorded in outpatient care. As this mainly covers dental, diagnostic, and secondary prevention services, there is serious concern for long-term consequences on population health. According to OECD (2013) data, expenditure for prevention and public health services was estimated at only 1.3% of total health expenditure with the EU average at more than 3%. Taking in mind that for the year 2009, the rate of daily smokers in Greece (31.9%) was by far the highest in EU (19.26%) and that more than 55.7% of the population was overweight or obese, the misallocation of health expenditure to various functions seems irrational. Additionally, under financing of these services might lead to increased use of the expensive hospital services in the future. Signs are already recorded for 2011 and 2012, casting doubts on system sustainability.

The hospital sector in Greece has always been the major spender with 37-40% (2003-2011) of total health expenditure. In contrast with other European countries, the Greek health system remains "hospital centered". As shown in Table 1, total public expenditure for hospitals (not only NHS hospitals but all public hospitals including University, non-Profit, Military Hospitals, Social Security Funds –SSFs Hospitals) decreased by 9.3%, from €7.3 billion in 2009 to €6.6 billion in 2012 [5]. However, inpatient care remains the major consumer as it represents 53.3% of public health expenditure. The respective percentage for EU-15 doesn't exceed 32.6%.

Table 1: Evolution of Current Public Expenditure (HF1) and Total (Public & Private HF1+HF2) expenditure to Public Hospitals (HP1G):2009-2012

Mil Euros	**2009**	**2010**	**2011**	**2012**	**%09-12**	**%10-11**
Current Public Expenditure to Public Hospitals (HF1x HP1G)*	**6,945**	**5,943**	**6,181**	**6,180**	-11%	4%
Current Total (Public and Private) Expenditure to Public Hospitals (HF1+HF2)x HP1G ** from which:	**7,272**	**6,321**	**6,595**	**6,595**	-9.3%	4.3%
In patient currative and rehabilitative (HC1.1+HC2.1)x HP1G	*6,510*	*5,679*	*5,956*	*6,061*	-6.9%	4.9%
Outpatient and ancillary services (HC1.3+HC4.1+HC4.2)XHP1G	*623*	*565*	*549*	*505*	-18.9%	-2.8%
All other	*139*	*77*	*90*	*29*	-79.1%	16.9%
Pharmaceuticals in public hospitals	1,250	1,083	832	761	-39.1%	-23.2%

* Expenditure from public funds (mainly Ministry of Health and Social Security Funds) to public hospitals
** Expenditure from both public and private sources
Sources: OECD 2013, Center for Health Services Management and Evaluation 2014, ELSTAT (Hellenic Statistical Authority), 2014 & ESYnet (Ministry of Health) of various years

Public expenditure to public hospitals declined by 11% from 2009 to 2012, although after 2010 it shows an increasing trend again, mainly for inpatient services, possibly due to the rise of the number of inpatients (6,24% from 2010 to 2011). Pharmaceutical expenditure for in-patient services decreased by more than 39% from 2009 to 2012 and expenditure for outpatient hospital services also dropped by approximately 19%.

On the other hand, household expenditure in public hospitals increased by almost 30%, in the same period, reflecting cost shifting to family budgets (Table 2). Although households have reduced expenditure for ambulatory – outpatient services by more than 46%, there is a steadily growing spending in public and private hospitals. This may reflect higher out of pocket payments by the uninsured population, under the table payments to physicians, higher user charges arrangements and tendency to avoid preventive services in order to meet more urgent health needs.

Table 2: Households Health Expenditure (HF2.3):2009-2012

Mil Euros	**2009**	**2010**	**2011**	**2012**	**%09-12**	**%10-11**
Households Expenditure (=A+B+C) from which:	**6.593**	**6.096**	**5.809**	**5.096**	-22,7%	-4,7%
A) Hospitals (HP1)	1.166	1.217	1.317	1.388	19,0%	8,2%
Public Hospitals (HP1G)	*314*	*359*	*395*	*408*	29,9%	10,1%
Private Hospitals(HP1P)	*852*	*858*	*922*	*979*	14,9%	7,4%
B) Providers of Ambulatory health care (HP3)	3.926	3.337	2.948	2.087	-46,8%	-11,6%
C) Retail sale and other providers of medical goods (HP4)	1.501	1.542	1.543	1.621	8,0%	0,1%
Pharmacists (HP4.1)	1.336	1.403	1.426	1.501	12,3%	1,6%

Sources: OECD 2013, Center for Health Services Management and Evaluation 2014, ELSTAT (Hellenic Statistical Authority), 2014

Regarding hospital budgets, the major savings were in supplies (pharmaceuticals, medical supplies etc.) and cuts to health personnel salaries and benefits. Major restructuring of the public hospital sector has been targeted as part of efficiency-enhancing efforts since 2011. However, it was only in the fall of 2013 that limited restructuring took place, with the integration of hospitals belonging to Social Health Insurance with the NHS, and the merger of the 133 public hospitals into 83 groups with common management [9].

Hospital supplies represent 68% of total hospital operating expenses (excluding salaries and wages). These costs were cut by more than 38% between 2009 and 2011 due to streamlined procurement procedures, pharmaceutical policy reforms and horizontal cuts implemented by the Ministry of Health [9]. On the other hand, operating expenditures (consumables, overheads, security etc.) increased in many hospitals for reasons not immediately apparent. For example, in a sample of 40 general hospitals (out of 90) for which all expenditure data were available for the three-year period (2009-2011), expenditures on outsourcing (legal services, consulting services etc) increased by 40% in 2010 (compared to 2009) with a further increase of 27% in 2011. The results for other overheads or outsourcing services are similar. Examples include catering (up 22% in 2010 and 12% in 2011 for the 19 hospitals for which data were available for the three-year period); cleaning (16% increase in 2010 and 24% increase in 2011 for 50 hospitals); and security services (23% increase in 2010 and a further 27% increase in 2011 for 34 hospitals) [7]. Considering that overheads should be among the first affected by cost containment, such results show that this area may offer further efficiency opportunities.

2. Hospital Efficiency

The efficient provision of healthcare services has always been a highly controversial issue, especially in recent years, as demographic factors and strained government budgets exert pressure on healthcare providers to better allocate their resources [10]. A significant volume of literature has been devoted to investigating the relationship between outputs and inputs of hospital services through production functions. Hollingsworth et al. provide a thorough review of various applications at the micro level [11]. Clement et al. investigate the relationship between hospital efficiency and quality by assessing the joint production of desirable and undesirable hospital outputs [12].

Many different approaches have been taken for the evaluation of hospital units' performance assessment Data Envelopment Analysis (DEA) [13-21]. For a review of DEA studies see Hollingsworth et al. [17], Ozcan et al. [18] and Chilingerian and Sherman [19]. More applications of DEA to measure hospital efficiency can be found in Hofmarcher et al. [22], Bhat [23], and Thanassoulis et al. [24]. These studies elaborate on DEA's applicability, strengths and limitations, single out inefficient hospitals and provide the magnitudes of specific input reductions or output added that is needed to attain technical efficiency.

Regarding Greek studies using DEA analysis for public hospitals, the findings conclude that there is considerable space for improvements [25, 26]. Aletras [27], using a sample of 91 general public hospitals, estimated that in 1992 the average hospital X-efficiency was 20-34% of observed hospital costs. Kontodimopoulos, Nanos and Niakas [27], investigating the efficiency of small-scale Greek hospitals known as hospital-health centres located in remote rural areas, demostrated technical inefficiencies of 25.13-26.77%. However, of high interest are the results of a study attempting to estimate the impact on hospital efficiency of the reform initiative in 2001. Using DEA, the technical and scale efficiencies of a sample of 51 general acute public hospitals were examined and the analysis concluded that technical and scale efficiency was reduced following the policy changes, indicating that the expected benefits from the reform were not achieved [29].

2.1 Materials and Methods

2.1.1. Data analysis

Data Envelopment Analysis (DEA) is used to study the efficiency of Greek hospitals. DEA is a non-parametric linear programming model for a frontier analysis of multiple inputs and outputs of decision making units suggested by Charnes et al. (CCR model) [30] and extended by Banker et al. (BCC model) [31]. It gained wide acceptance in recent years due to its effectiveness in comparing efficiencies of departments, sectors, organizations, etc [32]. It has the advantage of dealing with the multidimensional nature of input/output variables of production processes that need not be specified, in order to identify the most efficient group of decision making units within a sample [33, 34]. The CCR model estimates the overall technical efficiency (TE). The BCC model decomposes the overall technical efficiency into pure technical efficiency (PTE) and scale efficiency.

The bootstrapping methodology is also used in order to derive the statistical properties of efficiency scores and to eliminate the sampling bias. According to Setnitar and Andoljsek [35], DEA suffers from certain drawbacks, since its main disadvantage originates from its own non-stochastic nature. In most cases some, if not all, of the input-output variables display volatility (variation) and therefore the estimated efficiency

scores should be presented with their estimated variability as well. Given the above, the accurate calculation of confidence intervals is especially important in the decision-making process. Simar & Wilson [36] suggested the DEA bootstrapping methodology, through which it is possible to retain the advantages of DEA, and also perform statistical hypothesis testing on the DEA efficiency scores. Bootstrap introduced by Efron [37] and Efron and Tibshirani [38], is a statistical computer-intensive method for assigning measures of accuracy to sample estimates, which has gained great popularity over the last decade. It is based on the idea of re-sampling from an original data sample to obtain statistical properties for the quantities of interest.

In the present study, our sample data is analyzed using CCR and BCC input-oriented assumption. Regarding the choice of input- or output-oriented models, is dependent upon the production process characterizing the undertaking (i.e. minimize the use of inputs to produce a given level of output or maximize the level of output given levels of the inputs). For the purpose of estimating hospital units performance, the input-oriented DEA measures have been empirically estimated [13, 25, 32, 33, 39].

A bootstrap procedure was also used to derive the efficiency scores based on the Simar and Wilson algorithm. All calculations were run by the FEAR 1.12 package for R software and our bias-corrected scores are derived from 2000 bootstrap iterations. This way the benchmarking of the hospitals is achieved under a "quasi" homogenous socio-economic environment, and efforts are focused on the examination of the weaknesses on the side of the management. Thereby, the combination of first stage DEA analysis and the bootstrapped DEA provides useful information for decision makers on improving a hospital's operating efficiency and cutting costs.

2.1.2. Sample synthesis

The study was based on data provided by the Ministry of Health and collected from a sample of 90 public general hospitals in 2010 and 2011 (ESYnet database). Specialized units (psychiatric, pediatric etc.) were excluded from the analysis.

After review of the literature on hospital efficiency and the available datasets, four input and three output variables were chosen. The number of beds, physicians, administrative and nursing personnel and total hospital expenditures (without wages) were used as inputs. The number of patient admissions, outpatient visits and surgical interventions were used as outputs.

Regarding the selected inputs, hospital size and capacity were measured by the number of beds. Most studies exclude the number of physicians because there exist independent contractors who may admit patients. For the purpose of the current study, it is important to include them as an input since they largely determine the volume of the health services that a hospital can perform. Nursing and administrative personnel is also an important input. The importance of more evenly distributed finances throughout the healthcare system was the primary reason for performing a DEA analysis with the input being "total expenditure". The focus of the current study is on grand total expenditure and not on the individual resource component costs (doctors' salaries, nurses' salaries, etc.). Therefore, total hospital expenditures do not include medical personnel expenses.

Likewise, the use of number of patient admissions, outpatient visits and surgical interventions as outputs of the study was selected in order to become criteria for efficiency assessment of units as proxy factors of the degree of resources utilization. These criteria have been utilized in a plethora of related studies [13, 19, 25, 39].

The composition of the sample is presented in Table 3.

Table 3: Inputs and outputs of 90 Public General Hospitals (mean and standard deviation)

PERIOD TIME	**2010**		**2011**	
INPUTS	**Mean**	**Std. Deviation**	**Mean**	**Std. Deviation**
Number of beds	301.4	217.9	299.8	215.8
Physicians (headcount)	243.7	174.3	204.3	145.6
Administrative and nursing personnel (headcount)	580.7	391.6	591.0	382.0
Hospital expenditure (€)	24,841,129.8	27,404,757.1	22,604,397.7	24,932,320.4
OUTPUTS	**Mean**	**Std. Deviation**	**Mean**	**Std. Deviation**
Number of patient admissions	20,533.9	15,804.0	21,838.8	17,595.8
Number of surgical interventions	4,248.2	3,380.2	4,481.4	3,693.5
Number of outpatient visits	111,078.7	69,634.9	109,812.6	61,461.6

2.3 Results

The implementation of CCR and BCC DEA, with the use of the inputs and outputs described, led to the results presented in Table 4. CCR model identified 21 hospital units as efficient in 2010 and 25 in 2011 of the 90 sample hospitals, while BCC model identified 32 efficient hospital units in 2010 and 37 in 2011 with both methods showing a slight increase in the number of effective hospitals.

The average efficiency score of all 90 hospitals is increased to 85.9% and to 90% the year 2011 under the constant and variable returns to scale assumption respectively. The result confirms the fact that hospitals are aimed to optimize the production factors utilization and to operate efficiently.

Table 4: CCR and BCC efficiency scores for the cross-section data, year 2010, 2011

	BCC technology (input oriented)		**CCR technology (input oriented)**	
Year	**Number of efficiency Units**	**Mean of efficiency degree**	**Number of efficiency Units**	**Mean of efficiency degree**
2010	32 (35.56%)	0.882	21 (23.33%)	0.825
2011	37 (41.11%)	0.901	25 (27.78%)	0.859

Note: Number of efficiency hospital units with score =1.000

The Spearman's Rank Correlation between the mean of efficiencies calculated in two years was then estimated. The results are listed in Table 5; as it is seen there is significant correlation in the year's results.

Table 5: Spearman's rank correlation rho in the year 2010 and 2011

	Coefficient	P-value
CCR (2010, 2011)	0.7098424	4.771e-15 <0.05
BCC (2010, 2011)	0.5971747	5.208e-10 <0.05

The application of Bootstrap led to the results of Table 6. In particular, the table provides the arithmetic mean of the original DEA efficiency scores (under CCR and BCC approach), the DEA bootstrapped efficiency scores, the BIAS (computed as the difference between original DEA and bootstrapped DEA) of the original DEA, the standard error of the bootstrap values, and the lower (LB) and upper bounds (UB) of the DEA-bootstrap confidence intervals. It is evident from the first stage CCR and BCC DEA analysis that there are efficient healthcare units on the frontier of best practices with a technical efficiency score equal to one. However, when considering the bootstrapping results none of the 90 hospital units appear to be close to the frontier. Hospitals found to be inefficiency by utilizing the 80% of the available inputs (efficiency 80% approximately under VRS assumption).

The original efficiency estimates lie also outside the estimated confidence intervals in every instance. This is due to the bias in the original estimates, and the fact that the confidence interval estimates are correct for the bias. These results therefore reinforce the fact that the DEA bootstrap model is more superior to the traditional DEA model in estimating the efficiency scores [36, 40]. Moreover, bootstrap analysis leads to decreased mean efficiency score in relation to that resulting from the first stage CCR and BCC DEA analysis, demonstrating that the "quasi" environment adversely affects performance. This could be further explained by the fact that external-environmental factors may affect hospital units' performance [40-42].

Table 6: Benchmarking efficiency scores before and after bootstrap in CCR and BCC technology for the cross-section data in the year 2010 and 2011

BCC technology							
Year	**Mean DEA BCC score**	**Mean BCC Bootstrapped score**	**% difference**	**Mean bias**	**Mean Std, error**	**Mean LB**	**Mean UB**
2010	0.882	0.807	-8.42%	-0.095	0.004	0.736	0.873
2011	0.901	0.826	-8.37%	-0.088	0.004	0.754	0.889
CCR technology							
Year	**Mean DEA CCR score**	**Mean CCR Bootstrapped score**	**% difference**	**Mean bias**	**Mean Std, error**	**Mean LB**	**Mean UB**
2010	0.825	0.739	-10.43%	-0.143	0.007	0.675	0.819
2011	0.859	0.781	-9.09%	-0.116	0.005	0.714	0.854

The Spearman's Rank Correlation between the bootstrapped efficiencies in two years was then estimated. The results are listed in Table 7; as it is seen there is significant correlation in the year's results.

Table 7: Bootstrapped CCR Spearman's rank correlation rho in the year 2010, 2011

	Coefficient	P-value
Bootstrapped CCR (2010, 2011)	0.6841421	2.2e-16 <0.05
Bootstrapped BCC (2010, 2011)	0.5655266	1.125e-08 <0.05

Finally, increased efficiency of the hospital units will be achieved through the reduction of inputs at different levels for each input, a fact which also highlights the areas as well as the extent of the need for administrative measure to be taken. Among others, this includes reductions in the number of beds and better redistribution of personnel.

3. Discussion

The rising cost of health care and the need for cost containment has created interest in measuring the efficiency of health care organizations. In this context, the study concentrated on the performance of 90 general NHS hospitals, using first stage DEA and Bootstrapped DEA. Based on the findings of first stage DEA, the number of efficient hospitals increased by 15% (under the VRS assumption) and by 19.05% (under the CCR assumption) in 2011 compared to the previous year. It is thus established that when we consider variable returns to scale, hospitals' average pure technical efficiency scores (PTE) is increased compared to the average of TE score, indicating that scale size is important. Considering the bootstrapped results, however, none of the healthcare units appear to be close to full efficiency and even the rankings are not preserved. Hospitals' efficiency found to be lower compared to the first stage results. This confirms previous results from Simar and Wilson [36, 44] who argued that traditional DEA models tend sometimes to present firms as efficient, when they are actually not. The bootstrapped result is also reported by Katharakis et al [41, 42].

Similar findings were found in other studies of hospital efficiency in Mediterranean countries. Puing-Junoy (2000) who estimated the performance of 94 acute care hospitals in Spain, found that 69 hospitals performed below the efficiency frontier with a mean inefficiency of 10.1% [46]. Alfonso & Fernandes [47] investigated the efficiency of 68 public hospitals in Portugal and found a mean inefficiency of 10% in a five year period (2000-2004) and 5.7% in 2005, with 70% of the hospitals inefficient. Based on the size of hospitals, results of this study showed that large hospitals achieved higher performance in 2011.

The DEA model in the present study, identified potentials for optimal utilization of inputs by inefficient hospitals in order to improve efficiency, as for example, redistribution or even reduction in the number of beds along with other cost containment efforts. The need to reduce beds in order to increase efficiency of large public hospitals was also confirmed in a previous Greek study [45]. Policies promoting better resource allocation should be targeting other aspects of hospital performance, such as control of overheads and administrative services, rational distribution of human resources, medical audit, and adherence with clinical guidelines and rationalization of the Diagnosis-Related Group (DRG) system. Appropriate measures may result in the increased utilization of the available factors of production by more than 20%.

It is probably hard to improve efficiency without appropriate staffing levels and the right skill mix. Staffing, mainly for nurses, was already very low even before the crisis. Greece in 2009 had the lowest nurse per 1.000 population ratio in Europe with 3.3 nurses versus 9.6 in the EU. After the Memoranda, many health professionals retired to ensure better pensions, making understaffing even worse. Salary and benefits reduction exacerbated wage imbalances in the health sector, increasing shortages and undermining quality and efficiency [48]. To address these issues, decision makers should consider alternative non-financial measures which could increase productivity while retaining personnel. These include clear job descriptions, team management and team working, development of professional norms and codes of conduct, and proper matching of skills to the tasks in hand [49]. Rationalization of operating costs, re-structuring of hospital services based on demand, along with the provision of patient-friendly services could also have positive effect.

At the same time, rational financing of health care services, becomes of great importance. Although public expenditure on hospitals decreased between 2009 and 2011, with a positive impact on hospital efficiency, out of pocket household payments to public hospitals and other health services (e.g. pharmaceuticals) showed a remarkable increase. As these payments constitute both formal and informal payments, serious concerns arise regarding equity. Especially in a time of crisis and significant per capita income reduction, such payments deprive the poor and uninsured of necessary health services, placing a disproportionate burden on their shoulders.

4. Conclusions

Following the Memoranda, the Greek government decreased public spending to hospitals by more than 11%. Although overall hospital efficiency showed a slight increase between 2010 and 2011, considering the bootstrapped results, none of the healthcare units appear to be close to full efficiency, indicating a need for administrative measures aiming to better distribution and use of health care resources.

Rather than implementing across the board cuts, policy making should focus on maximizing the value of the NHS as a whole. Efforts should be made for the implementation of measures to increase hospital performance such as restructuring, human resource management and coordination with primary care. The neglect of such structural measures may undermine access and quality of care, resulting in the escalation of health care costs and the aggravation of the effects of the fiscal crisis in the long run.

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