

# Privatization, Corporatization, and Public-Private Partnership in the Kingdom of Saudi Arabia

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**ABSTRACT:** There are different governmental reasons and technologies for seeking public-private partnerships throughout the developed countries. Significant motives have been to improve efficiency and risk distribution in comparison to traditional financing techniques and to lessen budget and borrowing limits. In this study, the movement toward privatization enhancing the efficiency of MoH's hospitals has been assessed using Data Envelopment Analysis (DEA) from 1979 to 2020. Moreover, the efficiencies of the individual hospital were estimated through the DEA model, which includes: scale efficiency (SE), pure technical efficiency (PTE), and overall technical efficiency (OTE). In addition, factor affecting such efficiencies was analyzed through Tobit regression. The VRS results suggest that the numbers of hospitals benefiting from the complete corporatized phase are greater than those benefiting from the last phase (and vice versa in the case of DRS). The variance between inefficient hospitals in the less corporatized phase (2000-2020) was more prominent than in the fully corporatized phase (1988-1999). In conclusion, fully corporatized hospitals (on average) achieve relatively better overall efficiency. It is recommended that additional corporatization might be stimulated by a standardized set of performance measures, which cover both the quality criteria and economic efficiency measurements from a healthcare perspective.

**KEYWORDS:** Corporatization, data envelopment analysis, efficiency analysis, hospitals, privatization

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## Introduction

Public-private partnerships are categorized in different ways. For instance, Savas and Savas<sup>1</sup> used 3 different categories to divide the public-private partnerships. Formal partnerships, bilateral partnerships, and network partnerships are included in these categories. Partnerships between 1 organization from the private sector and 1 from the public sector are bilateral agreements or partnerships.<sup>2</sup> A publicly held organization that collects organizations from the private sector is organized within the network partnership. The partners from different sectors, including influencers throughout the business world, the government, and societal actors, are assembled in the formal partnership.<sup>3</sup> The network partners improve the possibilities for hospitals in Saudi Arabia to endow explicit solutions for international markets. When planning a partnership for countries with higher bureaucracy is postulated well using the formal partnership where the internationalization is supported by the governmental relations.<sup>4</sup>

The longer-lasting partnerships have not been used that comprehensively with the close association between the sectors. Design-build finance operates contracts and build-operate-transfer contracts are the most common public-private partnership models that have been used chiefly previously.<sup>5</sup> Clear-contact-based partnerships have resembled these partnership models where the right to operate is given to the public partner or ensures the project management. The contractor is accountable for the investment in the public authority finances

and capital assets in these models where the project carries the financial risk.<sup>6</sup>

There are different governmental reasons and technologies for seeking public-private partnerships throughout the developed countries.<sup>7</sup> Significant motives have been to improve efficiency and risk distribution in comparison to traditional financing techniques and lessen budget and borrowing limits.<sup>8</sup> Public-private partnerships aim to connect the aspects of leveraging government taxation and spending power so that participants benefit the larger community while pursuing their individual or organizational interests.<sup>9</sup> Well-executed public-private partnership in defining a community vision can lessen the political risk for government leaders. Along with risk reduction, well-designed, and managed public-private partnerships have a remarkable potential to improve benefits. Worldwide, its popularity is growing due to the prompt installation of new infrastructure, which allows the government to reduce its debt, and these vast projects provide value for money.<sup>10</sup> Other reasons for governments seeking an alternative to traditional procurement include a lack of government money, cost overruns and delays, and the requirement to show lower levels of debt.

Similarly, it has been posited that the public-private partnership schemes were introduced for financing infrastructure projects, which were used as off-balance sheet arrangements during the 1980s. The laws on budget deficits and debt which requires public finances to be balanced across the economic



cycle, may limit public borrowing. This supports “off-balance sheet” funding, in which public-private partnership funds appear as a series of smaller annual “revenue” expenditures over the life of the project rather than as big capital expenditures in the year in which they occur.<sup>8</sup> This can accelerate new infrastructure programs while causing no visible increase in public borrowing (ie, a type of budget expansion). On the other hand, public-private partnership policy switched toward considering a high level of risk transfer for the unitary payments and the private sector associated with the services available in the 1990s.<sup>11</sup> The successive government achieves additional benefits using the deployment of management control systems, a greater focus on whole-life costing, and optimal risk transfer by identifying these second-generation public-private partnerships.<sup>12</sup>

From the aforementioned discussion, the dominance of additional value rhetoric is underlying through policy narrative for public-private partnerships throughout developed countries. Nonetheless, their use has been led initially by macro-fiscal objectives to control borrowings among pressures for developing infrastructure.<sup>6</sup> As demonstrated by elected officials, the public-private partnership will appeal to the government to achieve electoral promises by comprehensively carrying out more infrastructure projects under tight fiscal controls or recession.<sup>13</sup> It has been learned that public-private partnerships can be made successful in achieving the governmental fiscal goals by creating accounting standards to offer off-balance sheet liabilities and treatment of the undertaking projects. Thereby, the integration of public-private partnerships will considerably require political fulfillment<sup>3</sup> and regulatory standards that can allow its implementation by governmental sectors.<sup>5</sup>

The most glaring deficit that governments have to deal with worldwide has become dominant due to the infrastructure deficit in recent years. The resources governments seek, and the infrastructure requirements should fulfill those requirements to actualize for developing countries.<sup>14</sup> Across the globe, many developing countries have congested roads, poorly maintained transit systems and amusement facilities, waste treatment facilities, bridges in need of repair, deteriorated hospitals, and schools that are all in immediate need to rehabilitate and repair.<sup>15</sup> Governments have promised many new projects to close the gap but usually do not or have not found the funding to follow through on their promises. In turn, these issues have been implied majorly in terms of costs on the society to mitigate competitiveness to an augmented number of industrial and road accidents. In this regard, there is no query left that the growth of Saudi Arabia is impeded by this infrastructure.<sup>16</sup>

Nonetheless, the adoption of public-private partnerships requires a specific environment in developing countries. Government authorities should develop sector reform policies and assess fiscal risks related to public-private partnerships. Their decisions should be based on government procurement than a public-private partnership on explicit additional values

evaluation and impose impartial transaction advisory for making public-private partnership deals sustainable and bankable.<sup>17</sup> There are 2 factors, including institutional capacity and governance, that impose the capability of developing countries to develop public-private partnerships.<sup>16</sup> In addition, political risk is also identified as a major barrier to public-private partnership in developing countries.<sup>16</sup> Moreover, currency restrictions, expropriation, unfair regulatory environments, contract interference, and violence are the 5 aspects of political risk.

Healthcare institutions play a vital role in developing any country's economy. Almost every country employs some type of public-private collaboration in delivering health care.<sup>18</sup> Like medications and support services, many inputs are supplied from the private sector in nations where care is primarily given through the public system. In nations where most facilities are privately held, the state impacts their layout through laws and financial incentives. The situation is further complex in hospitals because of the several roles supplied by such institutions. For example, training of health professionals and research and development are activities that are publicly sponsored to varying degrees.

Data Envelopment Analysis (DEA) is a nonparametric approach that has lately been used to measure the efficiency and productivity of Decision Making Units and is often used for hospital comparison.<sup>19</sup> It is a linear programming approach that investigates the link between the inputs and outputs of the manufacturing process. DEA can handle complicated production systems such as hospitals, and its nonparametric nature means that no statistical assumptions about the production frontier are required.<sup>20</sup> Previous research has used a similar strategy to evaluate and compare hospital performance, technical efficiency, and scale efficiency (SE).<sup>21-23</sup> They found that DEA serves as a strong and precise technique for comparative performance assessment in healthcare settings and recommendations for healthcare administrators seeking to enhance the performance of their departments. Along with preserving the long-term viability and effective use of hospital resources, it is unquestionably necessary to ensure that patients receive adequate and timely care safely and fairly.<sup>24</sup>

Although most hospital public-private partnerships are centered on infrastructure and physical facility management, as in the UK model, clinical management is often incorporated in the agreement. Hospital public-private partnerships in Portugal (first wave model) and Spain are 2 examples (Alzira model). Two considerations should be raised regarding PPP projects: first, *do they deliver good value for money to the public sector?* Second, *how effective can the incorporation of clinical management within the PPP be?* These 2 questions are connected to the societal significance of these institutions. If the quality of care offered cannot be monitored regularly and consistently, clinical services should not be provided by the private partner; otherwise, detrimental consequences to patients' health conditions may occur.

The Kingdom of Saudi Arabia (KSA) is a developing country with a high income.<sup>25</sup> Its economy is heavily reliant on oil money, which provides for more than 90% of exports and over 75% of government revenue.<sup>26</sup> Because of the country's oil wealth, the government has been able to fund public services, including the healthcare sector. Oil price variations, on the other hand, have an impact on government revenue and, as a result, all sectors of the Saudi economy.<sup>27</sup> Healthcare services in Saudi Arabia are provided by the Ministry of Health (MoH), various government organizations, and private healthcare providers. The KSA government is in charge of operating, funding, and administering the public healthcare sector, which provides 80% of all healthcare services to Saudi nationals for free at the point of use.<sup>28</sup> The other healthcare services are provided by the private sector on a fee-for-service basis, which is paid for by the patient individually or via private health insurance programs.<sup>29</sup>

The Saudi government has launched a significant economic reform and chose "Vision 2030" as a strategy for economic progress. Vision 2030 is a strategic plan that aims to reduce Saudi Arabia's dependency on oil revenue, with priority highlighted in all economic sectors.<sup>30</sup> It was adopted with the intention of outlining KSA's overall direction, policies, goals, and objectives. One of the objectives and changes in the Saudi healthcare system is the increased engagement of the private sector in delivering and funding healthcare services via public-private partnerships.<sup>31</sup>

Adoption of public-private partnerships in the Saudi healthcare sector, therefore, necessitates vigilance in recognizing and seeking to overcome hurdles to their long-term viability. As a result, it is worthwhile to investigate and comprehend how to apply public-private partnerships in healthcare successfully. Therefore, in the present study, the objective is to examine whether the movement toward privatization has been related to the enhancement in the efficiency of MoH's hospitals. The main aim of our study is to compare the corporatization between 1988 and 1999 and the corporatization between 2000 and 2020 phases where the privatization, corporatization, and Public-private partnership decreased during these years in Saudi Arabia. This study will offer the framework for a corresponding examination of any efforts of Saudi Arabia to go beyond corporatization to privatization.

## Material and Methods

This descriptive, analytical study has systematically compared the output from the health system of MoH public hospitals with resources employed (allied personnel, beds, doctors, and nurses). A theoretical production frontier for health has been derived through data envelopment analysis. This study will describe the medical sector's inefficiency, which might be associated with variables that are beyond the control of the government, minimal in the short-to medium run through a 2-stage approach by computing a semi-parametric health production model.

DEA is a mathematical linear programming method that determines potential efficiency for units under study by having a set of criteria as inputs and outputs.<sup>32</sup> It can be used to optimize the resources of the units under study. One of the significant advantages of DAE is its capability to analyze and thus quantify the various sources of inefficiencies in every investigated department.<sup>33</sup> In the present study, panel analysis has been carried out among MoH public hospitals to collect the primary data. The study was conducted from January 1979 to January 2020. The data relating to MoH public hospitals release has been considered to determine the potential efficiency of the health system. Data were analyzed using SPSS version 25. Statistical tests included variance testing and Tobit regression analysis. A *P*-value of less than .05 was considered significant. The figures for input slacks were used for calculating the percentages to aid the interpretation of the results.

- First step—The efficiencies of the individual hospital were estimated through the DEA model, which includes; SE, pure technical efficiency (PTE), and overall technical efficiency (OTE).
- Second step—The factor that affects the efficiencies mentioned above are examined through Tobit regression.

The fundamental DEA models are classified as Charnes–Cooper–Rhodes (CCR) model and the Banker–Charnes–Cooper (BCC) model. Their distinctions are based on the assumptions of production possibility sets. The CCR assumes "constant returns to scale," which means that increasing investment by 1 unit results in an increase in output by 1 unit. The BCC, on the other hand, assumes "variable returns to scale," that is, that the output scale varies. The efficiency value computed by CCR is referred to as OTE, whereas the efficiency value computed by BCC is referred to as PTE. The OTE divided by the PTE is referred to as SE. SE expresses how near a business is to ideal scale size: the greater the SE, the closer the firm is to optimal scale size (Most Productive Scale Size).<sup>34</sup>

## Results

The figures for input slacks are used for calculating the percentages to aid the interpretation of the results. This is how an efficient hospital is likely to minimize all the inputs for achieving maximum efficiency through slack analysis. It is known that slack analysis allows the management to be aware of increasing the inputs to increase the efficiency and lower the inefficiency. Table 1 shows the DEA measures of hospital relative efficiency considering the management phases. The relative efficiency scores and associated rankings are shown for each hospital. The relative efficiency scores help in calculating the level of reduction in all inputs needed to improve efficiency for the less efficient hospitals. Three groups of hospitals are shown in Table 2; efficient, always inefficient, and weakly efficient, depending on the slacks. The results show that 25% of

**Table 1.** DEA measures of hospital relative efficiency by management phases.

HOSPITAL (DMU)	1979-1982			1983-1987			1988-1999			2000-2020		
	RANK	EFFICIENCY SCORES	REDUCTION IN INPUTS REQUIRED (%)	RANK	EFFICIENCY SCORES	REDUCTION IN INPUTS REQUIRED (%)	RANK	EFFICIENCY SCORES	REDUCTION IN INPUTS REQUIRED (%)	RANK	EFFICIENCY SCORES	REDUCTION IN INPUTS REQUIRED (%)
	1	7	1	0.00	6	1	0.00	13	0.92	7.80	18	0.58
2	11	0.85	14.76	10	0.86	13.11	6	1	0.00	12	0.84	3.85
3	20	0.33	66.50	20	0.33	66.83	20	0.25	74.04	20	0.09	78.7
4	5	1	0.00	3	1	0.00	1	1	0.00	9	1	0.00
5	1	1	0.00	9	0.89	10.87	1	1	0.00	19	0.144	73.69
6	9	0.96	3.92	8	0.93	6.89	11	0.96	3.25	13	0.83	4.61
7	8	1	0.00	7	1	0.00	8	1	0.00	1	1	0.00
8	1	1	0.00	1	1	0.00	1	1	0.00	1	1	0.00
9	16	0.61	38.73	16	0.60	39.35	12	0.93	6.78	11	0.84	3.65
10	18	0.38	61.15	18	0.40	59.88	19	0.588	41.61	17	0.60	27.32
11	10	0.91	8.60	11	0.84	15.19	7	1	0.00	1	1	0.00
12	15	0.62	37.41	15	0.61	38.17	16	0.68	31.73	15	0.63	24
13	12	0.72	27.41	12	0.74	25.31	9	1	0.00	14	0.831	5
14	1	1	0.00	2	1	0.00	1	1	0.00	1	1	0.00
15	4	1	0.00	4	1	0.00	5	1	0.00	1	1	0.00
16	19	0.362	63.04	19	0.36	63.84	17	0.682	31.79	1	1	0.00
17	17	0.57	42.27	17	0.56	43.95	14	0.77	22.14	10	1	0.00
18	14	0.66	33.67	14	0.65	34.53	15	0.69	30.06	1	1	0.00
19	13	0.676	32.32	13	0.66	33.53	18	0.63	36.14	16	0.624	25
20	6	1	0.00	5	1	0.00	10	0.98	1.74	1	1	0.00

**Table 2.** Reduction of inputs required from inefficient hospitals.

HOSPITAL DMU	1979-1982	HOSPITAL DMU	1983-1987	HOSPITAL DMU	1988-1999	HOSPITAL DMU	2000-2020
<i>Reduction of inputs required from inefficient hospitals</i>							
6	3.92	6	6.89	20	1.74	29	6.55
11	8.6	5	10.87	6	3.25	8	6.89
2	14.76	2	13.11	9	6.78	15	8.35
13	27.41	11	15.19	1	7.8	14	9.29
19	32.32	13	25.31	17	22.14	29	47.13
18	33.67	19	33.53	18	30.06	37	50.67
12	37.41	18	34.53	12	31.73	22	53.77
9	38.73	12	38.17	16	31.79	17	59.33
17	42.27	9	39.35	19	36.14	24	73.81
10	61.15	17	43.95	10	41.61	13	78.85
16	63.04	10	59.88	3	74.04	3	—
3	66.50	16	63.84	—	—	—	—
—	—	3	66.83	—	—	—	—
<i>Average reduction inputs required from inefficient hospitals %</i>							
	35.82		34.73		26.10		27.81
<i>Variance in reduction of inputs required from inefficient hospitals</i>							
	62.58		59.94		72.30		75.02

**Table 3.** Efficiency summary by phase.

	1979-1982	1983-1987	1988-1999	2000-2020
DEA-Average Relative Efficiency Score over the whole sample	0.79	0.77	0.856	0.800
DEA-% reduction of inputs to become efficient	35.82	34.73	26.10	28.65
DEA-average relative efficiency over inefficient hospitals by phase	0.64	0.65	0.74	0.60
(VRS) IRS	8	8	6	4
(VRS) DRS	2	4	4	5

the hospitals were efficient, 30% were always inefficient, and 45% had varying levels of efficiency, referring to the changes across the phases.

There was considerable variation in the level of reduction in all inputs required for the hospitals to become efficient across the phases while comparing the inefficient hospitals (Table 3). The lowest average reduction of inputs required from inefficient hospitals is shown in the third phase (fully corporatized phase). These results suggest that (on average) inefficient hospitals are most efficient (closer to their PPF) in the fully corporatized phase compared to other phases. Furthermore, the variance between inefficient hospitals in the less corporatized

phase (2000-2020) was larger compared to the fully corporatized phase (1988-1999).

An input-based DEA model for variable returns to scale was estimated to obtain further information on the relative efficiency of the hospitals (Table 4). It is important to note that there are no slacks in this case because there is no impact of the output levels on relative efficiency evaluation. Increasing Returns to Scale (IRS) was shown by 8 hospitals under the first 2 phases on their VRS frontier. However, the number of hospitals decreased to 6 under the fully corporatized phase. Lastly, under the less corporatized phase, the number of hospitals decreased to 4.

Table 4. Oriented DEA relative efficiency results under assumption of VRS.

HOSPITAL	1979-1982			1983-1987			1988-1999			2000-2020		
	CRS PE	VRS PE	SCALE	RTS	CRS PE	VRS PE	SCALE	RTS	CRS PE	VRS PE	SCALE	RTS
1	1	1	1	—	1	1	1	—	0.92	1	0.92	drs
2	0.82	0.96	0.88	irs	0.86	0.87	0.99	irs	1	1	1	—
3	0.33	0.33	1	—	0.33	6.84	0.04	irs	0.26	0.26	1	—
4	1	1	1	—	1	1	1	—	1	1	1	—
5	1	1	1	—	1	1	1	—	1	1	1	—
6	0.96	1	0.96	drs	0.93	1	0.93	drs	0.96	1	0.96	drs
7	1	1	1	—	1	1	1	—	1	1	1	—
8	1	1	1	—	1	1	1	—	1	1	1	—
9	0.61	0.70	0.86	drs	0.60	0.62	0.970	drs	0.93	0.99	0.942	drs
10	0.388	0.471	0.825	irs	0.401	0.417	0.961	irs	0.584	0.735	0.795	irs
11	0.914	0.944	0.968	irs	0.848	0.900	0.942	drs	1	1	1	—
12	0.626	0.627	0.998	irs	0.618	0.619	0.998	irs	0.683	0.689	0.991	irs
13	0.726	0.726	1.000	irs	0.747	0.749	0.997	irs	1	1	1	—
14	1	1	1	—	1	1	1	—	1	1	1	—
15	1	1	1	—	1	1	1	—	1	1	1	—
16	0.370	0.370	1	—	0.362	0.674	0.537	irs	0.682	0.698	0.977	irs
17	0.577	0.604	0.956	irs	0.560	0.569	0.985	drs	0.779	0.779	0.999	drs
18	0.663	0.679	0.978	irs	0.655	0.719	0.910	irs	0.699	0.704	0.993	irs
19	0.67	0.71	0.95	irs	0.66	0.74	0.89	irs	0.639	0.702	0.910	irs
20	1	1	1	—	1	1	1	—	0.983	1	0.983	irs

**Table 5.** Tobit regression analysis results.

	1979-1982	1983-1987	1988-1999	2000-2020
<i>Dependent variable: CRS hospital relative efficiency scores</i>				
Population	0.121* (0.0213)	0.137* (0.022)	0.464* (0.006)	-0.012*** (0.006)
	.000	.000	.000	.056
<i>Reference: hospital located in the rural area</i>				
Hospital located in the semi-urban area	0.127* (0.043)	0.141* (0.039)	0.191* (0.034)	0.088* (0.254)
	.005	.001	.000	.001
Hospitals located in the urban area	0.098** (0.037)	0.108* (0.032)	0.094* (0.019)	0.039* (0.014)
	.010	.001	.000	.007
<i>Reference: size of the city—big city</i>				
Size of the city—medium city	0.174* (0.045)	0.156* (0.041)	0.175* (0.036)	0.056*** (0.031)
	.000	.000	.000	.073
Size of city—small city	0.136* (0.036)	0.119* (0.0323)	0.072* (0.018)	0.011 (0.013)
	.000	.000	.000	.413
Constant	0.410* (0.081)	0.422* (0.076)	0.647* (0.037)	0.945* (0.024)
	.000	.000	.000	.000
Observations	80	100	240	300

Robust standard errors in parentheses.

P-values in the second rows, where significance levels are: \* $P < .01$ . \*\* $P < .05$ . \*\*\* $P < .1$ .

Table 5 shows the relationship of different control variables (population, location, size of city) to the CRS relative efficiency scores of the hospitals across the 4 different management and operational phases. The control variables are positively and significantly related to the CRS relative efficiency scores across the 4 phases, apart from the small city in the last phase, and show that there is a greater significance when moving to the third phase compared to moving to the final phase, except in the intercept (constant which shows the variance in the average relative efficiency score for each period) which shows that the fourth phase exhibits greater efficiency.

## Discussion

Hospital performance can be measured in various ways, which vary from regulatory evaluations and inspections, statistical indicators, and public satisfaction surveys. The value of measurement strategies depends on various factors, which include their objective, the results, how they are implemented, and the domestic culture.<sup>35</sup> The focus of the study emphasizes majorly on collecting statistical information for discovering information related to modifications in management structures via different degrees of corporatization. This study has covered 20 hospitals in total in Saudi Arabia to evaluate operational efficiency in its totality.

The economic efficiency level is a fundamental aspect when evaluating and comparing the overall performance of different phases of hospital corporatization through the analysis of input

and output variables of hospitals. This study has used output quantity variables as the first sets of variables. These encompassed the numbers of inpatients discharged, review visits, laboratory tests, and radiology tests. These 4 variables were utilized as the dependent output variables for measuring hospital efficiency. It has been observed that improved efficiency is achieved interactively in the most corporatized phase compared to the less corporatized phase.

This finding indicates that retained financial surplus might have performed as an efficient incentive for raising efficiency in the most corporatized phase with effective utilization of non-financial inputs, whereas higher profits in non-for-profit organizations could possibly be used for other sources of managerial utility, additional doctors, and nurses, higher wages or bonuses for staff. This induces that agency issues might be more appropriate in fewer corporatized stages. Compared to the last phase, the findings showed that the hospitals had higher efficiency levels in the 1988 to 1999 which represented the most (fully) corporatized phase period based on the findings of the input-oriented 2-stage DEA models and Tobit regression as follows:

### The DEA results

- Although the highest relative efficiency was in the less corporatized phase compared with the other phases, the difference between the last 2 phases (0.056) is minimal.

- The lowest reduction required in inputs was in the full corporatized phase.
- The VRS results suggest that the numbers of hospitals benefiting from the full corporatized phase are greater than those benefiting from the last phase (and vice versa in the case of DRS).
- The average relative efficiency scores over inefficient hospitals show an increase in relative efficiency in the first 3 phases as the movement toward privatization, through greater corporatization, is achieved. Subsequently, the less corporatized, which is a movement away from privatization, shows a comparative decrease in relative efficiency. The fully corporatized phase exhibits higher relative PE than the last phase, where the lowest reduction required in inputs was in the most (fully) corporatized phase.

#### *The Tobit results*

- The control variables (which are positively and significantly related to the CRS relative efficiency scores across the 4 phases) have a greater significance when moving to the third phase than moving to the final phase, except in the constant, which shows that the fourth phase exhibits greater efficiency. However, the increasing level of local population growth caused by improving birth and death statistics, and internal and external migrations, is seen to be associated with increases in the CRS relative efficiency in all phases, except the less corporatized phase, and this is supportive of the view that increased PE may be associated with greater levels of corporatization.

It must be observed that this important event might be appropriate to the different modifications and experiences in policies for health progress toward privatization, which gradually increased from less to more corporatization, and then returned to a lower level of corporatization in the last phase (from 2000). This perspective is supportive of the political underpinning of privatization theory as a short-term solution for addressing rapid financial issues (which involves contracting out public services to save money) and can be revealed throughout the seventh development plan.<sup>36</sup>

In the recent period, there has been an escalating phase throughout Saudi Arabia and the MoH that the existing financing method needs to reemphasize outputs as compared to inputs for ensuring the offering of incentives in providing high-quality services regardless of positioning the citizen with any further costs.<sup>37</sup> It has been identified that the outputs revealed both within-phase and between-phase variations. This shows the concern of whether the inputs firmly generated the outputs or some external constructs such as poor operational management and whether similar findings are being undertaken across a broader timeframe. Alatawi et al<sup>38</sup> have recommended that low efficiency is because of either external factors or internal production, where the public

healthcare sector reform needs government authenticity in terms of policy stability, strict coordination, and stability between policy implementation and design.

Generally, the Tobit model reveals that they are positively significantly associated with the CRS relative efficiency scores of the hospitals across the different operational and management phases with the inclusion of control variables. However, the increasing level of local population growth is associated with decreases in the CRS relative efficiency in the less corporatized phase, and this is supportive of the view that increased PE may be associated with greater levels of corporatization.

This study had some limitations as well. With the major advantages of the DEA method, there is also a limitation. For instance, when the number of observations is minimal in comparison to the sample size, efficiency ratings can become inflated, and because DEA overlooks stochastic components in production, statistical noise can affect efficiency ranking. Furthermore, the result of this study fully relies on previous data and descriptive statistical analysis. Therefore, future studies should include in-depth information from policymakers or stakeholders.

#### **Conclusion**

In conclusion, the efficiency of hospitals was examined by investigating the theoretical advantages of hospital corporatization. The study revealed that efficiencies differ over the different phases, emphasized by output and input indicators modifications. The undertaking of effectiveness and quality might change the conclusions that were accomplished from the preliminary economic investigation. DEA measures showed that the most productively efficient phase was the most corporatized phase in this study.

It is recommended that additional corporatization might be stimulated by a standardized set of performance measures, which cover both the quality criteria and economic efficiency measurements from a healthcare perspective. These measures could undertake inputs, outcomes, and outputs across the 3 performance realms for providing a wider insight into performance and inform adjustments for plans when it is comprehended that policy modifications must take time to be encompassed before the lasting effects on outputs and outcomes can be observed.<sup>39,40</sup>

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#### **Author Contributions**

CK work on searching the research topic in detail and the research plan. Part of Literature review, data analysis, and conclusions. VN Guide CK through the research topic, and help with resources and data. Contribute to literature review as well and review the full text.



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## Availability of Data and Materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

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