Expenditure and Productivity: An Examination of Gammon's Law in the Saudi Public Health Sector

Moaddi M. Almeth-hib

Associate Professor
Department of Management
College of Business Administration
King Saud University
moaddi@gmail.com

Abstract. This study aims at examining Gammon's Law of input and output in the main Saudi public health provider, the Ministry of Health (MOH). Its importance is attested by frequent calls for such a study in professional circles. No single study of this nature has ever been done in Saudi Arabia. Data were obtained from the MOH covering the period 1422 to 1426. Input and output from 1426, and 1422 were compared. Data were analyzed using SPSS. The results indicate that Gammon's Law is manifested in the MOH. Generally, output did not rise as input increased. A high percentage of the ministry employees hold administrative positions and may not contribute to the main production outcome of the ministry. These findings concur with those in advanced countries. The study suggests further examination of Gammon's Law in other public health organizations, with links between productivity and quality of service as well as other output variables. Some limitations of the study are mentioned and should be taken into consideration.

Introduction

Literature reflects a tendency of organizations to grow more than necessary, or more than it was intended (Jackson *et. al*., 1986; Saxton, 1988). Organizational growth is usually measured by expenditure. About 70% of organizational expenditure goes to human resources, exemplified in salaries and fringe benefits (Miller, and Adam Jr, 1996). At the management level, there is a belief that the more employees, the more productivity (Wilson, 1991).

However, Max Gammon has challenged this belief in which he concludes that in "a bureaucratic system…increase in expenditure will be matched by a fall in production", namely, the more expenditure in human resources, the less productivity (Gammon, 2005: 4). Since then, this has been called Gammon's law. Organizational theory has touched the concept of bureaucratic growth from a managerial perspective. It acknowledged that the growth of organizations, especially public ones, seems to be inescapable. In the light of the above, the present study aims at examining Gammon's Law of input and output in the Saudi Ministry of Health (MOH).

Research Problem

In Saudi Arabia, budget appropriations for the MOH (by SR 1,000) were 13,740,910 in 1422, and 19,683,700 in 1426, representing 5.9% of the total government budget (MOH, 1426). Official health resource indicators for 1426 show that there were 8.7 doctors per 10,000, 0.7 dentists; 0.5 pharmacists, 18.4 nurses, 10 allied health personnel, and 13.2 hospital beds. Furthermore, the number of hospitals had increased by 12.9%, from a total of 193 hospitals in 1422 to 218 in 1426. The number of beds also increased from 28,268 in 1422 to 30,489 in 1426H, for an increase of 7.8%. Health Care Centers (HCCs) stood at 1,792 in 1422, and increased to 1,905 in 1426, representing an increase of 113 HCCs or 6.3%. (MOH, 1426; MOH, 1422-1426).

However, the above statistics and indicators only provide a general picture of the incremental growth of MOH. In addition to the continuous calls in literature for similar studies, (Jacobs 2001; Banker *et. al.*, 1986; Hollingsworth and Parkin, 1998), examining Gammon's Law in the Saudi health sector is timely and crucial for many reasons. There is no single study found to explain the relationship between expenditure and productivity in the Saudi health sector. Its importance also springs from the fact that the Saudi health sector has gone through many developments and expanded over the last thirty years. No evaluation, however, has been done in the area of expenditure on the relations between human resources input and output. It is hoped that the present study will shed some light on health resources management and help decision-makers to design policies that better allocate and utilize resources.

Research Questions

The study raises the following research questions: (1) Does the input, measured in number of employees according to Gammon's Law, produce more output, measured in Bed Occupancy Rate (BOR) according to Gammon's Law, in 1426 as compared with 1422? (2) Does the input, measured in number of employees according to Gammon's Law, produce more output, measured in number of inpatients, operations, daily outpatient visits (OPDv), health care

center visits (HCCv), laboratory tests (Lab.T), and radiology tests (Rad.T) in 1426, as compared with 1422? (3) What is the percentage and ratio of administrative staff to other medical staff in 1426? (4) Are there significant correlations between the input types (number of employees), and BOR, number of inpatients, operations, OPDv, HCCv, Lab.T, and Rad.T during the period 1422 to 1426?

Literature Review

Gammon's research in the British health sector indicates that while the input - number of medical and administrative staff - increased, the yearly (BOR) decreased. He also found that most of the expenditure in human resources is on administrative positions, which make no direct contribution to productivity (Gammon, 2005). Gammon noticed that over an eight years period (1965-1973) in the British national system, the total staff in hospitals increased by 28%, with administrative staff increasing by 51%, but the output, as measured by BOR, went down by 11%. Gammon also indicated that this was not a result of any lack of patients to occupy beds. In fact, at all times, there was a waiting list for hospital beds of around 600,000 individuals. Gammon called it "bureaucratic misplacement", and concluded that such bureaucratic systems "will act rather like black holes in the economic universe, simultaneously sucking in resources, and shrinking in terms of emitted production." (Gammon, 2005: 3).

Although Gammon's first study was done a long time ago, a revisit by Gammon to recent statistics supports his conclusion. That is, the National Health Service (NHS) in England was established in 1948, with 350,000 employees. However, by 2002 this number had risen to 882,000. Between 1997 and 2002, managers increased by no less than 47.6%, compared to an overall increase in the workforce of 16%. At the same time, nurses increased only by 1.8%; a large number of these were engaged in managerial tasks, but were still counted as nurses. In this way, expanding human resources and increased spending would be matched by a fall in production and the more resources that were put into the system, the less would come out of it, a process Gammon likened to the implosion of a black hole (Gammon, 2005).

Friedman reached the same conclusion in the American health care system. From 1946 to1996, the number of beds per thousand fell by more than 60%. In sharp contrast, input skyrocketed. Hospital personnel per occupied bed multiplied nine-fold and costs per patient day adjusted for inflation, increased an astounding forty-fold (Friedman, 2001; Friedman, 1991).

While health care is one of the most important priorities of Canadians, the Canadian health care system is no different from the British and the American in terms of Gammon' Law. For example, health care spending in Canada had

increased from $78.5 billion in 1997 to $121.4 in 2003. Canada; however, is not immune to Gammon's Law. That is, while funding soars, outcome does not, and Canadian patients often wait months even for basic tests (Gratzer, 2004; Klotz, 2004).

The Australian system is experiencing the same phenomena described by Gammon's Law. Wethemier (2004) indicates that while expenditure on public hospitals remains about $18 billion per year, the health system is caught in a difficult situation. He concludes that any improvement in productivity will provoke increasing demand as rising government funding falls subject to Gammon's Law. In the light of this, public health care systems are among the most productive research subjects that input and output relations have been under investigation by both researchers and practitioners (Bilodeau *et. al*, 2006; Smet, 2007; Hughes, and McGuire, 2003; Keeler and Ying; 1996). Most of this has been discussed from an economic perspective, and no organizational explanation of management behavior was included.

Organizational Literature demonstrates many reasons driving organizations to grow bigger than they were intended to be. Niskanen (2007), for example, asserts that the bureaucrats themselves increase their power through demanding higher budgets, most of which is spent in unproductive ways. Downs (1993) also has the same idea but looked at it from an ethical perspective. He affirms that bureaucrats often have self-interests in the decisions they make, be it power, exchange benefits, hiring, or promotion.

Parkinson (1987) observed that mangers have a tendency to hire more individuals hoping for greater productivity. Parkinson, nevertheless, discovered that such hiring is destructive for organizations in that managing employees and solving their problems overcomes any dedication to goal achievement within the organization, and that there is little or no relationship between the work to be done and the size of staff to which it maybe assigned. Peter (2001) confirms that in hierarchical organizations, employees tend to be promoted to their levels of incompetence. One of the bureaucrats' tactics to be promoted, Peter mentioned, is increasing the number of their subordinates.

Methodology

The study applies a comparative content-documentary approach to explore whether Gammon's Law applies to MOH resources in 1426 as compared with 1422, and examines also the correlation among input and output variables during the period 1422 to 1426. While Gammon measured output in BOR, the study also added some output indicators.

Necessary statistical data were obtained from yearly statistical books published by MOH. These books were generally unorganized, have different

formats and scattered data, and sometimes contain overlapping data. The researcher, therefore, interviewed the MOH's officials responsible for health statistics and clarified the data necessary for the present study. Nine meetings with MOH officials were held to make sure that data were accurate.

Data were aggregated to compare the Hijri year 1426 to 1422; the most recent published data is for the year 1426. Collected data included the number of physicians, nurses, pharmacists, allied health personnel, as well as administrative staff. They were dealt with as input, according to Gammon's Law. Output was measured in bed occupancy rate, in keeping with Gammon's Law.

However, the study added other output variables including the number of: inpatients, operations, OPDv, HCCv, Lab.T, and Rad. T. Differences between the designated years were calculated for both input and output, presented in numbers and in minus or plus percentages. Person correlation was applied to find out whether input and output variables correlate.

The study focuses only on main input/output indicators as Gammon's law measured them, and on other added output variables as to what has been clarified in the research questions. Quality of health services was not examined at all in this study. It is understood that other input and output indicators can be also added, but the study focuses on main output and output indicators in MOH. Other governmental public health providers are not included in this study.

Results

The study raised the question of whether the input produced more output in 1426, compared to 1422. Table-1 contains the input and output of MOH in the two specified years. It is obvious from Table- 1 that the input increased in 1426H, compared to 1422. The total number of workforce in MOH was 144,627 employees in 1426H, compared to 129,859 employees in 1422. The increase was 14,786 employees or 11.38 %. That is, physicians increased by 25.5%, nurses by 13.1%, pharmacists by 30.7%, allied health personnel by 5.7%. Further examination of the data indicates that the total number of administrative staff is 51,022 in 1426, representing 35.27% of the total MOH workforce. The increased percentage in administrative staff was (8.1%), in 1426H, or 3,852 employees out of 14,786 employees, which was the total increase of HR in 1426.

Despite the fact that the nature of service of MOH is medical, more than one-third of its employees hold administrative jobs. The ratio of administrative staff to physicians in MOH for 1426 is 2.5:1; 1.20:1 to nurses, 45.4: 1 to pharmacists, 1.7:1 to allied health personnel. The ratio of administrative staff to all medical employees is 0.54, which means that two administrators serve each medical employee.

Table 1. A Comparison of Input -Output of MOH in 1422-1426*.

Input Types:	1422	1423	1424	1425	1426	Differences in 1426 vs. 1422	+ - (%) of Differences in 1426 vs. to 1422
Physicians**	16111	16654	17623	18621	20219	+ 4108	+ (25.5%)
Nurses	37666	37918	38019	41356	42628	+ 4962	+ (13.1%)
Pharmacists	859	881	899	1167	1123	+ 264	+ (30.7%)
Allied health personnel ***	28053	28393	28498	28204	29635	+1600	+(5.7)
Administrative staff	47170	48228	48064	52132	51022	+ 3852	+ (8.1%)
Total	**129859**	**132074**	**133103**	**141480**	**144627**	**+14786 = + (11.38%)**	
Output Types:							
BOR	62.4%	62.2%	62.2%	64.7%	62.2%	- 0.2	- (0.32%)
Inpatients	1,307,875	1,299,667	1,297,868	1,312,534	1,319,625	11750	+ (0.89%)
Operations	358688	366001	363018	373655	353918	- 4770	- (1.32%)
OPDv****	10.5	10.7	10.32	10.8	10.3	-0.2	- (1.90%)
HCCv****	53.5	57.4	57.9	55	50	-3.5	- (6.54%)
Lab. T. ****	81.2	85.5	75.2	77.9	103.6	22.4	+ (27.5%)
Rad. T. ****	5.7	3.9	5.5	6.25	6.1	0.4	+ (7.01%)

Notes: * Data presented in table 1 were compiled from many tables included in MOH statistical yearly books for the designated years.
　　　** including dentists.
　　　*** including technical personnel (not medical).
　　　**** In millions.

While the input increased, BOR decreased by - 0.32 %, operations decreased by - 1.32%, OPDv decreased by - 1.90%, HCCv also decreased by - 6.54%, and very minimal increase is inpatients, + 0.89%. The only significant increases were Lab.T, + 27.5%, and Rad.T., +7.01%. BOR, the main indicator Gammon used for output, is used as an indicator utilization of hospital resources. BOR is the percentage of beds occupied by patients during a period of time: a year in this study. As can be seen in Table-1, 37.8% of beds were unoccupied in 1426. In fact, BOR decreased from 62.4% in 1422 to 62.2% in 1426.

No data were available on waiting lists in MOH yearly published data; however, several reports and interviews with health officials indicate that patients suffered (Alhajri, 1425; Fahad, 2006; Alquma; 2006) and are still suffering (Alkatheri, 2007) from long waiting lists for admission in most MOH hospitals. It can be argued that the reason for these long waiting lists is the shortage in the number of beds, and not the lack of patients, but having a higher BOR in 1422 with less number of beds makes such arguments fall apart. Furthermore, outpatient services and HCCs may lower BOR in one way or another, but both these also decreased in 1426 when compared to 1422.

Further statistical analysis using Pearson correlations (Table 2) shows no significant correlation between the input and output indicators in MOH during the designated period, except for a positive correlation between the number of Pharmacists and the number of Lab.T, Pearson correlation = .885; *P< .05*.

Table 2. Statistical Correlations between input and output variables in MOH, 1422-1426.

Variables	No. of Physicians	No. of Nurses	No. of Allied Health	No. of Pharmacists	No. of Administrative Staff	Total Input
BOR	.221	.417	.662	-.356	.703	.419
Inpatients	.736	.878	.788	.572	.709	.810
Operations	-.192	-.080	.208	-.633	.321	-.028
OPDv	-.301	-.059	.165	-.614	.268	-.065
HCCv	-.608	-.708	-.530	-.647	-.422	-.6230
Lab. T.	.636	.633	.385	.885[*]	.329	.593
Rad. T.	.580	.628	.654	.231	.556	.594

[*] *P <.05*

Discussion and Implications of the Study

In a developing country such as KSA, the government provides health services free of charge to all citizens. Logic would have it that an increase in input should lead to an increase in output. Citizens and bureaucrats also have the impression that the more the government spends, the more services the public will receive. The findings of this study do not support these conclusions, but rather concur with previous studies: increased input is matched by fall in production.

Although one of the most difficult issues in complex service organizations like the MOH is the measurement of productivity, because of the presence of multiple input and output, (Asmild and Paradi, 2007); one might predict four hypothetical relationships between input and output. These are: 1) the more input, the more output, 2) the more input, the less output, 3) output will be increased in the same level of input increase, or (4) the same output, can be produced with less input. Only relationships number two and four can apply to the findings of this study. Therefore, we can strongly argue that MOH could have achieved almost the same output in 1426 with the input of 1422, or should reach at least the same increase in percentage of output that are matched with the increased percentage in input.

Increased hiring in administrative positions can be attributed to political pressure to hire more Saudis. There is, however, no data available on the total percentage of Saudis working in the MOH. Saudis represent 18% of physicians, 40% of nurses, and 69.7% of allied health personnel in the MOH. Hiring administrative staff instead of medical personnel represents Gammon's notion of productive staff being replaced by nonproductive personnel. It is obvious that Gammon's Law has left its print on the MOH.

Using medical terminology, this could be called "bureau-pathology". Its symptoms can be described as too much fat in governmental institutions, more

resources sucking in, unfit output, compared to input, and self-replicating over years. With the advancement of medical technology, it is expected that the demand for ordinary human resources as well as for administrative jobs will be less, and those most in demand will be employees skilled in advanced technology. Re-trainning some MOH administrative staff to work in cutting edge medical technology seems to be of great importance to employees, beneficiaries, and the government. Downsizing through early retirement might be another alternative to control such growth in administrative positions.

The total fertility rate in KSA is 3.68; infant mortality rate is decreasing, with 18.5/1000 live birth, annual growth rate for Saudis is 2.4 and the population is expected to reach 33 Million by 2020. Furthermore, the portion of the population over 60 years of age will increase, and life expectancy at birth is expected to reach 77 by 2020 (MOH, 1426). Urban development and changing life styles of Saudis have caused many new medical problems, and are expected to provoke more health difficulties in the near future. (Ministry of Economy and Planning, 2006). All these demographic factors indicate that expenditure on health services should be utilized in a way that prepares health institutions to meet such demands and expectations.

Recommendations

To alleviate the problem of Gammon's Law, the MOH should freeze hiring in administrative positions. Position appropriations by the Ministry of Finance should be allocated first to medical positions, at least for the coming five years. This would allow a controlled growth of positions that increase expenses but contribute little to the nature of service of the MOH.

Public hospitals must apply the concept of performance measurement according to specific key performance indicators, based on clear goals and objectives. While MOH can have its own measurement, it would be more objective and transparent if an independent body verified the evaluation results for more credibility (Faucett and Kleiner, 1994). This study should also be applied to private hospitals. If they proved to be more productive according to Gammon's Law, the MOH should consider privatizing public hospitals.

While it is expected that other governmental health providers, such as the Ministry of Defense and Aviation, National Guard, Ministry of Interior, and other public hospitals, do not differ from the MOH in terms of its resource utilization, it is recommended to repeat this study on these organizations. As has been mentioned in the limitations of the study, quality is not included in this study, and understanding that the MOH nature of service includes preventive and rehabilitation goals, research on quality-productivity as a linked variable,

and other variables that can be thought of as output are worth doing in the Saudi health sector, within the framework of Gammon's Law.

Although the study provides an insightful picture of resource utilization in the MOH, the findings should be viewed with caution for two reasons: first, the study depended on MOH yearly statistical books, which only present achievements. Output might have been worse in reality where information is doubtful, as in most developing countries. Nevertheless, the study is based on the premise that having a little knowledge is much better than having nothing. Second, input and output measurement is a difficult subject for an objective evaluation in a complex service organization. The study focused only on main indicators that can be measured according to the available data. Other practical indicators that might increase our understanding in this area are left for future research.

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المصروفات والإنتاجية:
اختبار لقانون جامون في القطاع الصحي العام السعودي

معدي محمد آل مذهب

أستاذ مشارك – قسم الإدارة – كلية إدارة الأعمال

جامعة الملك سعود – الرياض – المملكة العربية السعودية

المستخلص. تهدف الدراسة إلــى اختبـار قــانون جـامون حــول المدخلات والمخرجات في القطاع الصحي السعودي، وزارة الصحة على وجه الخصوص، وتتبع أهميتها مــن إشــارة الأدبيــات إلــى ضرورة إجراء مثل هذه النوعية من الدراسات، خاصة أنه لم يُعثـر على أي دارسة سابقة عن المملكة في هذا المجال. وقد تــم جمـع البيانات من الكتب الإحصائية الصادرة من وزارة الصحة للأعــوام ١٤٢٢هـ–١٤٢٦هــ. وقد تم إدخال البيانات في الحاسـب الآلــي، ومعالجتها باستخدام برنامج (SPSS). وأشارت نتائج الدراسة إلى أن هناك أدلة كافية توضح أن قانون جامون ينطبق على وزارة الصحة السعودية إلى حد كبير. فبينما ازدادت المدخلات، نقصت المخرجات بشكل عام، كما أن نسبة الوظائف الإدارية عالية فــي وزارة تُعنــى بتقديم الخدمات الطبية في المقام الأول، وقد اتفقت نتــائج الدراسـة الحالية مع نتائج دراسات أخرى مشابهة في دول متقدمه. واقترحت الدراسة اختبار القانون على منظمات صـحية عامـة أخـرى فـي المملكة، مع الأخذ في الحسبان الربط بين الإنتاجية ونوعية الخدمــة في ظل قانون جامون، وقد تضمنت الدراسة بعض المحددات التــي يجب التنبه إليها.