Reviewer’s report

Title: Using Data Envelopment Analysis to Measure the extent of Technical Efficiency of Public Health Centres in Ghana

Version: 1 Date: 11 July 2008

Reviewer: Dan Friesner

Reviewer’s report:

General Overview

This paper uses DEA to analyze technical efficiency for a randomly collected sample of 89 hospitals in Ghana. The authors find that sixty percent of these hospitals are inefficient. They also find small differences in hospital efficiency by geographic location. They conclude that public policies should be enacted to improve efficiency in hospitals. Given the economic and health conditions within the country, the authors argue that any resources saved by increased hospital efficiency could be reallocated within the health care industry to improve quality of care, patient access and/or health outcomes.

In general, I think this paper has the potential to provide an important contribution to the literature. As the authors themselves state, the economic and health conditions in Ghana are such that any misallocated or inefficiently spent hospital funds likely have severe implications for the health of the country’s population. As such, this paper represents an important first step in raising awareness and quantifying the magnitude of the problem. However, it is my opinion that the paper does need a thorough and extensive revision before it is suitable for publication in the BMC series of journals. To this end, my comments have been provided below. Because DEA is a very standard technique (and they use one of the most standard packages available today), I believe that their analytics are, with a few exceptions, fine. As such, I will focus more on the organization, logic and flow of the manuscript itself.

Minor Essential Revisions

The paper needs extensive editing to clean up all of the grammar and spelling errors. On my first reading of the manuscript alone, I found more than 20 such errors. This isn’t a really big deal from my perspective (there are probably a few typos in this report as well), but too many errors detract from the quality and persuasiveness of the paper, and consequently should be addressed. On the other hand, since the authors will likely have to re-write a few sections of the paper, it also probably isn’t necessary to describe these errors in the current version of the manuscript. They can be addressed as the authors tend to more pressing issues.

Major Compulsory Revisions
Background Section

1. In the second paragraph of this section, there are no citations for the first few sentences, and from the nature of the works cited I presume that the citations at the end of the paragraph pertain to the final sentence. Please add a citation or two to establish that efficiency is, indeed, a concern of policy-makers, and that African countries have reached a limit on health care funding.

2. Please be careful in paragraph three of this section. It seems to this reader that you are overselling the results and implications of your paper. Your paper doesn’t address whether the standards are being met, nor whether they are truly “removing the burden of primary level care…” I suggest re-writing this paragraph, focusing first on what you are actually going to do with this analysis, and then secondly focusing on extensions of this paper (i.e., the issues mentioned above).

Country Profile Section

1. This section was, for the most part, both informative (especially given the international readership of the Journal) and well-written. However, in the second paragraph of this section, please add a couple of sentences to elaborate on the implications of the division of the country into health districts, etc. You mention there are implications, so what are they?

2. In the final paragraph, a number of important statistics are missing, and need to be filled in. How many community and sub-district hospitals are there? Approximately how many private sector providers are there? Do the private providers specialize in mostly outpatient care (i.e., clinics) or are they hospitals? Also are the terms “hospital” and “public health centers” used interchangeably, or do they refer to different types of providers? From the current manuscript, it is difficult to tell.

Literature Review Section

1. There is no literature review section in this paper?! The literature review is, in fact, scattered throughout the Methods, Results and Discussion sections. All of the articles you cite later on that use DEA to assess hospital efficiency (particularly for hospitals in African countries) should go in here, with a brief description of what they found. This gives the reader an immediate “guestimate” about how efficient one might expect hospitals in Ghana are, by inferring from these other previous studies. It also helps frame your research problem more effectively and gives it additional validity. Also, in later sections, focus on comparing and contrasting your results with these previous studies, and less time explaining what the other studies found. En totem, you need to move all of the literature review into a new section between the County Profile and the Methods sections. In later sections, simply compare and contrast your results with the literature.

Methods/Data Section

1. Why did the authors choose to collect data on 89 hospitals (14.3% sample)?
Why not 90 hospitals (14.6%) or 93 hospitals (15% sample)? The authors should briefly explain why they chose to collect exactly 89 hospitals; it is an odd choice.

2. The authors make no significant attempt to adjust for quality and/or casemix in their analysis. I understand that data collection limitations may be an issue here, and that the information may not be available. As such, the authors need to explicitly mention this limitation both here, as well as in the conclusions section. They should also mention why they couldn’t collect the data and cite several related articles that have the same limitation. The inputs and outputs are standard for this literature (especially for developing countries), but similarly limited, and I suggest that the authors do the same thing for inputs and outputs that they did for the lack of quality/casemix measures.

3. After you summarize your input and output measures, you should create tables with descriptive statistics for each of these measures and discuss them intuitively. Do not break them down by efficient/inefficient and postpone discussing them until the results. Given the nature of DEA, this adds absolutely nothing to the discussion. Instead discuss them earlier, and break them down by other factors, such as (but in no way limited to) geography, the type of hospital (community, sub-district, etc.) and discuss how the inputs and outputs differ based on the type of facility being examined. This will help motivate later analyses concerning whether efficiency differs by the type of firm.

Methods/Efficiency Section

1. Based on the writing, I think the authors have confused (dis)economies of scale with (in)efficiencies of scale. Economies/diseconomies of scale refer to the u-shaped nature of the average cost function, and in many cases actually assume technical efficiency for a firm to lie on the average cost curve. But here you aren’t dealing with costs per se (since you don’t have input prices, and thus can’t talk about the allocative aspects of cost efficiency), and thus are actually referencing scale efficiencies. Please clarify this discussion.

2. Also, please explicitly mention that your study doesn’t address allocative and cost (or economic) efficiency because you don’t have input price data. If you have the data, allocative inefficiency is equally as important and interesting as technical efficiency. It’s the data limitations that typically make technical efficiency the norm.

3. In the third paragraph, please check the language of the paragraph to ensure you haven’t accidentally made a mistake. The font size changes in this paragraph, and the language is similar (though not exactly identical) to that used in Coelli’s manual. It may just be that this paragraph was not cleaned up prior to submission (authors revising drafts and passing them back and forth, etc.).

4. The authors severely downplay the usefulness and extent to which the literature employs SFA. It’s OK to use DEA and not SFA, that’s not my issue. But there are certain attributes and detriments to each method, and the authors don’t spend enough time discussing i) when SFA is and is not the optimal choice (i.e., functional form misspecification and mis-specifying the distribution of the efficiency and error terms) and ii) the limitations of DEA. With regard to the latter, it’s way more complicated than simply stating that DEA requires a “large” sample.
How large of a sample you need is dependent on the number of inputs and outputs used in the analysis (the “curse of dimensionality”). Additionally, even if you have a “large” sample, you still can’t use DEA scores as dependent variables in regressions, as the rate of convergence is too low to provide meaningful results (see about 5-10 articles written by L. Simar and P. Wilson, both together and in conjunction with other authors). In short, about all you can do with DEA is nonparametric hypothesis testing, even if you have a large sample. What I suggest is the authors add to this section (a paragraph or two) to fully address the attributes and detriments of each method.

5. In the paragraph containing equation (2), the authors do not spend enough time justifying why an input oriented approach is the correct one to use here. I suggest incorporating footnote 3 into the text, expanding it with a few more sentences, and adding some citations of similar papers that use this orientation.

6. I think the authors are confused about the time frame of their analysis; at least that is the impression I get from their writing. They argue that because their analysis is short run, they can ignore scale efficiency and use constant returns to scale (CRS) instead of variable returns to scale (VRS). I think this is backwards. In the long run, technology is variable, as are ALL inputs, and so the firm can adjust the scale of operations to make maximum use of the technology and the nature of the production process. Thus, constant returns to scale is acceptable in the long run. On the other hand, in the short run firms are locked into technologies, have fixed inputs, or other constraints etc., which prevent them from fully utilizing the scale of their operations to varying degrees. Thus, you need VRS technology and scale efficiency in the short run to adjust for these differences and issues across firms. This is the whole point of the scale efficiency concept; the firm is efficient in a scale sense if they are i) on an efficient frontier and ii) AT the point where the CRS and VRS technologies are the same (the point of tangency between the CRS and VRS frontiers). Scale inefficiency implies a difference between CRS and VRS, in which case one works with the VRS technical efficiency scores. This is why most of the literature focuses on VRS technologies and also examines scale efficiency in the short run. I would suggest the authors do the same in this paper. If they choose not to, then they need to spend a tremendous amount of time motivating why they used CRS (especially since DEAP provides CRS, VRS and scale efficiency scores simultaneously). Additionally, working with the scale efficiency concept gives you a second metric to analyze for policy prescriptions.

7. I agree that congestion efficiency is not, nor should it be, a central theme of this paper. However, your justification for this is not convincing, and should be clarified a bit.

Results Section

1. As mentioned earlier, descriptive statistics disaggregated by efficient and inefficient firms is not informative, especially when one uses DEA. The inefficient firms will, by definition, over utilize all inputs (in an input-oriented analysis) proportionally. Again, it isn’t wrong, just not very informative.

2. As a reader, I am more interested in whether or not efficiency varies based on
other characteristics, such as (but again, not limited to) location, the type of hospital, etc. Thus, Figure 2 is most interesting. To the extent your data allow, you may want to expand this type on analysis, either with bar graphs, 2x2 contingency tables (with corresponding chi-square tests of homogeneity) or some other appropriate means.

3. As a reader, I understand that there are inefficiencies, and potentially differences in inefficiencies based on hospital characteristics. I also understand that the literature has found similar trends. What is more interesting, and you should expand in your manuscript, is a practical discussion of why these differences might occur (don’t just cite the literature). The statement in your conclusions about a lack of MIS expertise, for example, would fit well here, but would not completely address this issue.

4. In the third paragraph of this section, please be careful with the writing here. The first time I read this paragraph, I thought you were referring to an output-oriented production process (where outputs are chosen not taken as given), not an input-oriented production process (which you actually estimate). You may want to consider rephrasing the verbage here to prevent other readers from misunderstanding your point.

Conclusions Section

1. This section should not contain policy implications (such as the MIS comment). It should summarize principle findings, and (which you have not done yet) discuss the limitations of your analysis and provide some suggestions for future work on this topic. Please expand the conclusions to address the latter two issues.

Level of interest: An article of importance in its field

Quality of written English: Needs some language corrections before being published

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:

I declare that I have no competing interests.