6 A preliminary analysis of hospital costs

Key points

- Hospitals are commonly compared in terms of their costs, so measuring how well hospitals minimise their costs is attractive for policy.
- There are significant limitations to the quality and availability of financial data available for this analysis. These include a lack of:
  - consistent data on capital costs, particularly for public hospitals
  - medical costs of doctors exercising their rights of private practice in public and private hospitals
  - consistent data on staffed beds between public and private hospitals.
- On the basis of available data, Australian hospitals have the potential to reduce some operating expenditures by about 7 per cent in the short run, without any change to their external policy environment.
- For the various components of hospital costs included in this analysis, there was no significant difference in the cost efficiencies between public, public contract, for-profit private, and not-for-profit hospitals.
- The analysis and results illustrate the current limits to comparing hospital costs.
- More robust and consistent cost data would enable estimates of the factors that influence costs and cost efficiency to be produced in the future.

This chapter presents the results of the Commission's attempt to estimate the determinants of hospital costs of Australian hospitals. A summary of the Commission's approach is given in section 6.1. The factors that affect costs are summarised in section 6.2. The efficiency scores derived from this estimation are presented in section 6.3. The scope for future improvement in measuring the determinants of costs is given in section 6.4.

6.1 Summary of the Commission's approach

The Commission used stochastic frontier analysis (SFA) to estimate the determinants of hospital costs in Australia. A brief introduction to SFA is given in chapter 2, and a more detailed discussion is in appendix C.

The cost variable used for this analysis is operating expenditure (excluding interest payments, depreciation and medical practitioner costs). The variables used to explain cost include:

- hospital outputs
- quality of outputs
- input prices
- patient-risk characteristics
- hospital characteristics.

The rationale for the inclusion of these variables is described in chapter 2 and appendix C. A description of the available data, summary statistics, and expected signs of the coefficients is given in chapter 3.

As detailed in chapters 2 and 3, the estimated cost models are based on the following specifications:

- translog function form
- weighted dataset to represent the true population
- an exponential distribution for the efficiency term
- all four years of data are pooled into a single cross section.

Data limitations

Unfortunately there were a number of major data issues that significantly limit the usefulness of the analysis and any results. These are summarised in chapter 3, and include the following:

- A lack of capital costs — there are no consistent data available on capital costs, such as interest and depreciation for land, buildings and equipment, particularly for public hospitals. Capital costs were consequently not included in the dependent variable nor was a price of capital calculated. This is a problem

experienced in other similar studies involving Australian hospitals (Wang, Zhao and Mahmood 2006; Yong and Harris 1999).

- A lack of medical costs — medical costs are not collected for doctors exercising their rights of private practice in public and private hospitals. Medical costs were accordingly excluded from the dependent variable data. The lack of medical costs also precluded the calculation of an average wage and salary for medical staff.
- Collinear price indexes — the prices of hospital pharmaceutical supplies, medical and surgical supplies, and other hospital supplies were only available at a national level in the form of price deflators. These proved to be highly collinear and were subsequently excluded from the analysis.

Apart from under-reporting the dependent variable, the absence of capital costs also meant that it was not possible to calculate an average cost per unit of capital — that is, a price of capital.

The effect of excluding medical costs and staff and practitioners from the study implies that hospitals do not substitute between other hospital inputs and their medical workforce.

To account for the lack of capital data, the number of staffed beds in a hospital was included as a proxy for hospital capital. Apart from concerns regarding the suitability of beds as a measure of capital (chapter 3), including a variable for capital is akin to assuming that capital is fixed and that the estimated cost function is a short-run function. While using a short-run cost function circumvents the problem of a lack of capital price data, the estimated results necessarily mean that they are only relevant for the short run.

6.2 Estimation results

The coefficients of explanatory variables indicate how that variable influences the data-constrained measure of operating expenditure.

For each of the first-order input price and output variables, a positive coefficient indicates that costs increase with an increase in that variable. Conversely, a negative coefficient suggests that costs decrease with an increase in that variable. The expected signs for each of the explanatory variables is explained in chapter 3.

For each of the variables that are squared, the coefficient describes the rate at which a variable increases or decreases costs. For example, if the coefficient of a first-order variable has a positive sign and its squared term is negative, it suggests that the variable increases costs at a decreasing rate. In the case of the second-order output variables, if the coefficient is positive it suggests the presence of diseconomies of scale, and a negative coefficient suggests the presence of economies of scale.

Ownership variables

The ownership variables are not included in the frontier equation, but are regressed against the inefficiency error term (appendix C). The coefficients of the various binary variables in the inefficiency equation identify which hospitals are further away from their respective benchmarking frontier. While, the coefficients of these binary variables are not reported due to commercial-in-confidence concerns, their sign and statistical significance are reported. Specifically, a positively-signed coefficient indicates that a hospital characterised by that variable is further away from its frontier. That is, the hospital is further from its minimum level of cost for its current output level. This distance represents the extent of their inefficiency. The associated significance level of the coefficients verifies whether any differences in efficiency scores between hospitals are significant or not.

Coefficient results

Table 6.1 presents the results for the preferred model using the translog function with operating expenditure as the dependent variable.

There are significantly fewer significant variables explaining operating expenditure, than there were variables explaining hospital output (chapter 5). The most likely reason for this is the poor quality of data. As noted, there are concerns over the measurement of costs, especially the prices of non-labour hospital inputs.

Cost per allied and diagnostic staff is significant in both its original and squared form. The coefficient on the original variable suggests a significant negative relationship between the cost per allied and diagnostic staff and hospitals costs and is the opposite to the expected sign of the coefficient. This result could possibly suggest that there are issues with the quality of the labour expenditure data. It presents a further reason to be careful with the interpretation of the efficiency results.

Table 6.1 **Results of short-run cost function, 2003-04 to 2006-07[a]**

	Coefficient		*Standard error*	*z-value*
Frontier equation				
Input prices				
Cost per diagnostic and allied health staff member	-0.0708	***	0.0246	-2.88
Cost per diagnostic and allied health staff member – squared	-0.0236	**	0.0119	-1.99
Cost per nursing staff member	0.0111		0.0122	0.91
Cost per nursing staff member– squared	-0.0098	**	0.0041	-2.41
Inputs				
Beds	0.3114	***	0.0257	12.13
Outputs				
Acute separations	0.4081	***	0.0504	8.11
Acute separations – squared	0.0531	***	0.0077	6.90
Pregnancy & neonate separations	0.0324		0.0215	1.51
Pregnancy & neonate separations – squared	0.0804	***	0.0108	7.48
Mental & alcohol separations	-0.0029		0.0176	-0.17
Mental & alcohol separations – squared	0.0229	**	0.0096	2.39
Other separations	0.0061		0.0208	0.30
Other separations – squared	0.0612	***	0.0092	6.68
MDC 1 separations	0.0037		0.0311	0.12
MDC 1 separations – squared	0.0134		0.0198	0.68
Accident & emergency occasions of service	0.2145	***	0.0447	4.80
Accident & emergency occasions of service – squared	0.2536	***	0.0551	4.60
Pathology and radiology occasions of service	-0.0037		0.0338	-0.11
Pathology and radiology occasions of service – squared	0.0074		0.0316	0.23
Dialysis & endoscopy occasions of service	-0.0541		0.0385	-1.40
Dialysis & endoscopy occasions of service – squared	0.0046		0.0078	0.58
Allied health & dental occasions of service	0.0158		0.0287	0.55
Allied health & dental occasions of service – squared	0.0460	**	0.0234	1.96
Mental, alcohol & psychiatric occasions of service	-0.0001		0.0294	0.00
Mental, alcohol & psychiatric occasions of service – squared	0.0086		0.0130	0.66
Outreach & district nursing occasions of service	0.0072		0.0270	0.27
Outreach & district nursing occasions of service – squared	0.0538	***	0.0179	3.00
Other outpatient occasions of service	0.0195		0.0395	0.49
Other outpatient occasions of service – squared	0.0616		0.0384	1.60
Quality				
HSMR	-0.0497	**	0.0202	-2.46
HSMR – squared	0.0159	**	0.0062	2.57
Input prices – cross terms				
Cost per diag and allied staff with cost per nursing staff	-0.0450	***	0.0145	-3.10
Outputs – cross terms				
Acute seps × Preg & neo seps	-0.0726	***	0.0191	-3.81
Acute seps × Mental& alc seps	0.0658	***	0.0172	3.83

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Table 6.2 (continued)

	Coefficient		*Standard error*	*z-value*
Acute seps × Other seps	-0.0707	***	0.0238	-2.97
Acute seps × MDC 1 seps	0.0313		0.0305	1.03
Acute seps × Acc & emerg sv	-0.0880	***	0.0193	-4.56
Acute seps × Path & rad sv	-0.0057		0.0261	-0.22
Acute seps × Dial & endo sv	0.0153		0.0162	0.95
Acute seps × Allied & dental sv	0.0115		0.0204	0.57
Acute seps × Mental, alc & psych sv	0.0253		0.0231	1.10
Acute seps × Outreach & dist nurs sv	-0.0392		0.0259	-1.51
Acute seps × Other outpatient services	0.0250		0.0219	1.14
Preg & neo seps × Mental& alc seps.	-0.0432	***	0.0108	-4.02
Preg & neo seps × Other seps	-0.0367	***	0.0100	-3.67
Preg & neo seps × MDC 1 seps	-0.0162		0.0171	-0.95
Preg & neo seps × Acc & emerg sv	-0.0159	*	0.0085	-1.87
Preg & neo seps × Path & rad sv	-0.0162		0.0120	-1.35
Preg & neo seps × Dial & endo sv	-0.0150	***	0.0048	-3.11
Preg & neo seps × Allied & dental sv	0.0040		0.0126	0.32
Preg & neo seps × Mental, alc & psych sv	0.0181	**	0.0087	2.08
Preg & neo seps × Outreach & dist nurs sv	0.0020		0.0089	0.23
Preg & neo seps × Other outpat sv	0.0179		0.0127	1.41
Mental & alc seps × Other seps	-0.0124		0.0145	-0.86
Mental & alc seps × MDC 1 seps	-0.0870	***	0.0243	-3.58
Mental& alc seps × Acc & emerg sv	0.0145		0.0141	1.03
Mental& alc seps × Path & rad sv	0.0029		0.0172	0.17
Mental & alc seps × Dial & endo sv	-0.0063		0.0098	-0.65
Mental & alc seps × Allied & dental sv	0.0192		0.0164	1.17
Mental & alc seps × Mental, alc & psych sv	-0.0124		0.0133	-0.93
Mental & alc seps × Outreach & dist nurs sv	-0.0189	*	0.0110	-1.72
Mental& alc seps × Other outpat sv	-0.0091		0.0169	-0.54
Other seps × MDC 1 seps	0.0165		0.0223	0.74
Other seps × Acc & emerg sv	-0.0047		0.0129	-0.36
Other seps × Path & rad sv	-0.0052		0.0121	-0.43
Other seps × Dial & endo sv	-0.0475	***	0.0083	-5.70
Other seps × Allied and dental sv	0.0228	*	0.0133	1.72
Other seps × Mental, alc & psych sv	-0.0115		0.0110	-1.05
Other seps × Outreach & dist nurs sv	0.0128		0.0111	1.15
Other seps × Other outpat sv	0.0228		0.0150	1.52
MDC 1 seps × Acc & emerg sv	0.0342	*	0.0184	1.85
MDC 1 seps × Path & rad sv	0.0198		0.0294	0.67
MDC 1 seps × Dial & endo sv	0.0483	***	0.0136	3.55
MDC 1 seps × Allied and dental sv	-0.0398	*	0.0229	-1.74
MDC 1 seps × Mental, alc & psych sv	-0.0253		0.0242	-1.05
MDC 1 seps × Outreach & dist nurs sv	0.0022		0.0286	0.08
MDC 1 seps × Other outpatient services	-0.0279		0.0294	-0.95
Acc & emerg sv × Path & rad sv	-0.0257	*	0.0148	-1.73

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Table 6.3 (continued)

	Coefficient		*Standard error*	*z-value*
Acc & emerg sv × Dial & endo sv	-0.0178		0.0115	-1.54
Acc & emerg sv × Allied and dental sv	-0.0147		0.0145	-1.01
Acc & emerg sv × Mental, alc & psych sv	-0.0159		0.0157	-1.01
Acc & emerg sv × Outreach & dist nurs sv	0.0245	*	0.0138	1.78
Acc & emerg sv × Other outpat sv	0.0160		0.0144	1.11
Path & rad sv × Dial & endo sv	-0.0101		0.0070	-1.45
Path & rad sv × Allied & dental sv	-0.0067		0.0084	-0.79
Path & rad sv × Mental, alc & psych sv	0.0366	**	0.0148	2.48
Path & rad sv × Outreach & dist nurs sv	-0.0034		0.0091	-0.37
Path & rad sv × Other outpat sv	-0.0327	***	0.0106	-3.09
Dial & endo sv × Allied & dental sv	-0.0187	**	0.0083	-2.24
Dial & endo sv × Mental, alc & psych sv	0.0066		0.0045	1.48
Dial & endo sv × Outreach & dist nurs sv	0.0101		0.0063	1.61
Dial & endo sv × Other outpat sv	0.0039		0.0095	0.41
Allied & dental sv × Mental, alc & psych sv	-0.0029		0.0081	-0.35
Allied & dental sv × Outreach & dist nurs sv	0.0173	**	0.0078	2.22
Allied & dental sv × Other outpat sv	-0.0101		0.0112	-0.91
Mental, alc & psych sv × Outreach & dist nurs sv	0.0028		0.0067	0.41
Mental, alc & psych sv × Other outpat sv	-0.0036		0.0103	-0.34
Outreach & dist nurs sv × Other outpat sv	0.0023		0.0096	0.24
Input prices & outputs – cross terms				
Cost per diag. staff × Acute seps	-0.0484	***	0.0181	-2.67
Cost per diag. staff × Preg & neo seps	0.0297	***	0.0079	3.75
Cost per diag. staff × Mental & alc seps	0.0277		0.0195	1.42
Cost per diag. staff × Other seps	0.0436	***	0.0119	3.66
Cost per diag. staff × MDC 1 seps	-0.0283		0.0199	-1.42
Cost per diag. staff × Acc & emerg sv	0.0509	***	0.0122	4.16
Cost per diag. staff × Path & rad sv	-0.0184	**	0.0076	-2.44
Cost per diag. staff × Dial & endo sv	0.0357	***	0.0110	3.26
Cost per diag. staff × Allied & dental sv	0.0085		0.0090	0.94
Cost per diag. staff × Mental, alc & psych sv	-0.0051		0.0095	-0.54
Cost per diag. staff × Outreach & dist nurs sv	-0.0346	***	0.0076	-4.56
Cost per diag. staff × Other outpat sv	0.0105		0.0086	1.22
Cost per nursing staff × Acute seps	0.0550	**	0.0220	2.50
Cost per nursing staff × Preg & neo seps	-0.0150		0.0093	-1.61
Cost per nursing staff × Mental & alc seps	-0.0077		0.0122	-0.63
Cost per nursing staff × Other seps	-0.0364	***	0.0094	-3.86
Cost per nursing staff × MDC 1 seps	0.0144		0.0193	0.75
Cost per nursing staff × Acc & emerg sv	-0.0443	***	0.0119	-3.71
Cost per nursing staff × Path & rad sv	0.0230	***	0.0067	3.44
Cost per nursing staff × Dial & endo sv	-0.0137	**	0.0054	-2.53
Cost per nursing staff × Allied & dental sv	-0.0061		0.0090	-0.68
Cost per nursing staff × Mental, alc & psych sv	0.0149		0.0091	1.64
Cost per nursing staff × Outreach & dist nurs sv	-0.0208	***	0.0077	-2.71

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Table 6.1 (continued)

	Coefficient		*Standard error*	*z-value*
Cost per nursing staff × Other outpat sv	0.0142		0.0146	0.98
Quality & outputs – cross terms				
HSMR × Acute seps	0.0336	*	0.0188	1.79
HSMR × Preg & neo seps	0.0621	***	0.0196	3.17
HSMR × Mental& alc seps	0.0215		0.0157	1.37
HSMR × Other seps	0.0030		0.0151	0.20
HSMR × MDC 1 seps	-0.0435	**	0.0217	-2.00
HSMR × Acc & emerg sv	-0.0375	**	0.0175	-2.15
HSMR × Path & rad sv	0.0444	**	0.0174	2.54
HSMR × Dial & endo sv	0.0078		0.0126	0.62
HSMR × Allied & dental sv	-0.0170		0.0157	-1.08
HSMR × Mental, alc & psych sv	-0.0156		0.0134	-1.17
HSMR × Outreach & dist nurs sv	-0.0243	*	0.0144	-1.69
HSMR × Other outpat sv	0.0061		0.0172	0.35
Patient characteristics[b]				
Share of patients aged <1 year	0.0009		0.0029	0.32
Share of patients aged 1-4 years	0.0032		0.0037	0.87
Share of patients aged 5-19 years	0.0010		0.0032	0.33
Share of patients aged 60-69 years	0.0054	***	0.0017	3.22
Share of patients aged 70+ years	-0.0009		0.0007	-1.39
Share of patients from SEIFA 1	0.0002		0.0003	0.71
Share of patients from SEIFA 2	0.0000		0.0003	0.08
Share of patients from SEIFA 3	-0.0005		0.0003	-1.60
Share of patients from SEIFA 4	-0.0004		0.0004	-1.06
Share of patients with Charlson score 2	-0.0006		0.0006	-0.96
Share of patients with Charlson score 3	0.0017		0.0039	0.44
Share of patients with Charlson score 4	0.0075	***	0.0018	4.22
Share of patients with Charlson score 5	-0.0032	***	0.0009	-3.38
Share of patients with Charlson score 6+	0.0218	*	0.0119	1.83
Establishment characteristics[c]				
Located in major city	0.0343	**	0.0165	2.08
Located in outer regional area	-0.0028		0.0127	-0.22
Located in remote area	0.0813	***	0.0288	2.82
Located in very remote area	0.2180	***	0.0349	6.24
Surgical & other DRG separations	0.0012	**	0.0005	2.39
Public patients	0.0009		0.0006	1.38
Teaching hospital	0.0460	**	0.0206	2.24
Member of hospital network	0.0528		0.0325	1.62
High-level intensive care unit	0.0985	***	0.0217	4.53
Palliative care unit	-0.0326	**	0.0151	-2.16
Rehabilitation unit	0.0155		0.0128	1.21
Domiciliary care unit	0.0037		0.0114	0.32
Evans and Walker Index 2	0.2021	***	0.0520	3.88

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Table 6.1 (continued)

	Coefficient		*Standard error*	*z-value*
State or territory[d]				
NSW	0.0641	**	0.0267	2.40
Victoria	0.0998	***	0.0357	2.79
South Australia	0.1132	***	0.0431	2.62
Western Australia	0.0142		0.0345	0.41
Tasmania	0.3140	***	0.0409	7.68
Northern Territory	0.1110	**	0.0449	2.47
ACT	0.1095	**	0.0502	2.18
Year[e]				
2004-05	0.0103		0.0116	0.89
2005-06	0.0269	**	0.0121	2.22
2006-07	0.0195		0.0124	1.57
Constant	-0.6550	***	0.0880	-7.44
Inefficiency equation				
Ownership				
Private (vs. Public & Contracted)	np		np	-0.11
For-profit (vs. Not-for-profit)	np		np	0.19
Contracted (vs. Not contracted)	np		np	0.98
ln σ^2_v	np	***	np	-23.75
ln σ^2_u	np		np	
Model criteria				
Log likelihood (pseudo)	1 343.97			
Akaike Information Criterion (AIC)	-2 309.95			
Bayesian Information Criterion (BIC)	-1 271.29			
Degrees of freedom	1 611			
Number of observations	1 800			

a Data for 2003-04 to 2006-07, weighted by sample representation. All output and input variables are logged, mean-centred and normalised. Dummy variables for zero values included in regression but not reported. **b** Base categories are: share of patients aged 20-59 years; share of patients from SEIFA 5 (least disadvantaged); share of patients with Charlson score 1 or below (fewest comorbidities). **c** Base category is: located in inner regional area. **d** Base jurisdiction is Queensland. **e** Base year is 2003-04. Significance levels denoted as: * 10%; ** 5%; *** 1%. Standard errors are robust. Due to confidentiality restrictions, coefficient terms for ln σ^2_v and ln σ^2_u were suppressed by the ABS, because these values would enable the calculation of efficiency scores for individual hospitals or hospital groups. The ABS also deemed it necessary to suppress the coefficient terms of the ownership dummy variables. **seps**: number of separations. **sv**: number of occasions of service. **np** Not available for publication due to ABS confidentiality concerns.

Source: Productivity Commission calculations based on unpublished ABS and AIHW data.

The total number of staffed beds, as expected, has a significantly positive relationship with a hospital's costs.

The number of acute casemix-adjusted separations and emergency department visits had a significant positive relationship with hospital costs for both the first-order and squared variables. The number of mental and alcohol separations, other separations,

allied and dental services and outreach and district nursing services, all had a significant positive relationship with costs for the squared variable.

The first-order HSMR variable has a significant negative relationship with total costs, while the squared HSMR variable has a significant positive relationship with costs, suggesting that costs are eventually influenced by poor quality output. Increasing a hospital's HSMR (that is, worsening hospital quality) will on average lead to an increase in the marginal cost of producing acute, pregnant and neonate separations and diagnostic services. In contrast, decreasing a hospital's HSMR will on average lead to a decrease in the marginal cost of MDC 1 separations, emergency department visits and outreach and district nursing services.

The coefficient results show that hospital costs are *higher* if they:

- are located in a major city or remote or very remote area (compared to an inner regional hospital)
- have university-affiliated teaching status
- have a level III intensive care unit
- treat relatively more complex cases as measured by the Evans and Walker 2 index.

The coefficient results, drawing upon the constrained data noted earlier, suggests that the socioeconomic profile of a hospital's patients do not have a significant relationship with the hospital's costs.

There seems to be a significant positive relationship between the percentage of patients between 60 and 69 years old (compared to the percentage of patients between 20 and 59 years old) with hospital costs.

The results also suggest that there is a significant positive relationship between the percentage of patients with a Charlson score of 4 and 6 and above (compared to the percentage of patients with a Charlson score of 1) with hospital costs. Interestingly there is a significant negative relationship between the percentage of patients with a Charlson score of 5 (compared to the percentage of patients with a Charlson score of 1) and hospital costs.

The coefficient results imply that there is a significant negative relationship between having a palliative care unit and hospital costs.

Note that state and territory binary variables are used to control for jurisdiction-specific factors (such as differences in data reporting methods or

regulatory settings) and should not be interpreted as an indicator of relative efficiency between the jurisdictions. Similarly, the year dummy variables are included to control for time-specific variations in the data that cannot be captured by the observed variables, and should not be interpreted as a time-dependent trend in hospital efficiency.

6.3 Preliminary cost efficiency scores

The efficiency score measures the distance of a hospital's current cost point from its respective benchmarking frontier (chapter 2). Under the specific assumptions of this model, and recognising the limits of the data, efficiency scores measure the extent to which a hospital could reduce its costs while still producing the same level of output. Specifically, a hospital with an efficiency score of 90 per cent could lower its short-run costs by 10 per cent to the best-practice amount while producing the same amount of output. This can also be interpreted to mean that this hospital is operating at about 11 per cent (or 100 divided by 90 per cent) above the minimum possible cost it could produce the same amount of output in the short run.

The preliminary efficiency scores suggest that on the basis of available data and its limitations, Australian hospitals are on average approximately 93 per cent cost efficient for those factors within scope of the analysis in the short run (table 6.2). This would imply that a hospital could on average reduce its costs by approximately 7 per cent in the short run while still producing the same level of output.

The available data seem to suggest that private hospitals are at their most efficient when they are small (94.4 per cent) or very small (94.2 per cent) compared to large (92.7 per cent) or medium (93.1 per cent) in size. Differences in the efficiency scores of public hospitals are less marked.

The second stage regression (inefficiency equation) suggests that on the basis of the available data, there is no significant difference between the short-run efficiency of different hospital types (public, for-profit, not-for-profit and public contract).

These scores compare favourably with other Australian studies using SFA to analyse hospital costs, though these studies use slightly different methods. Wang, Zhao and Mahmood (2006) found the mean cost inefficiency of NSW public hospitals in 1997-98 to be approximately 10 per cent, while Yong and Harris (1999) found the mean cost inefficiency of large Victorian public hospitals in 1994-95 to be approximately 3 per cent. Wang, Zhao and Mahmood include total beds in their analysis, however they use a cost function with more aggregated output groupings.

Yong and Harris include total beds in a second stage equation as a proxy for size rather than in the primary regression as a proxy for capital, instead assuming that variation in the cost of capital is unlikely to explain differences in recurrent expenditure between hospitals.

Table 6.4 **Preliminary cost efficiency scores by hospital ownership**

	Very large	*Large*	*Medium*	*Small*	*Very small*	*All sizes*
Public hospitals						
Mean	93.8	93.6	93.2	93.7	93.5	93.6
Median	94.6	94.0	93.9	94.3	94.6	94.4
5th percentile	87.6	88.6	87.8	88.0	86.5	87.2
95th percentile	96.5	96.4	96.5	96.5	96.8	96.7
Private hospitals						
Mean	93.7	92.7	93.1	94.4	94.2	93.5
Median	94.6	94.0	94.4	94.6	94.9	94.4
5th percentile	88.4	83.7	87.4	90.9	84.9	87.5
95th percentile	97.3	96.3	96.8	96.3	96.9	96.6
For-profit hospitals						
Mean	93.7	92.7	92.9	94.2	94.1	93.3
Median	94.7	93.9	94.1	94.6	94.9	94.3
5th percentile	87.5	86.7	85.8	89.5	84.9	87.4
95th percentile	98.6	96.2	96.7	96.4	96.9	96.6
Not-for-profit hospitals[a]						
Mean	93.7	92.6	94.1	——94.8——		93.8
Median	94.4	94.2	95.1	——95.2——		94.7
5th percentile	89.3	73.3	87.5	——92.9——		89.1
95th percentile	96.7	96.5	96.8	——96.1——		96.6
Public contract hospitals						
Mean	90.0	90.0	np	np	np	90.4
Median	92.3	92.3	np	np	np	92.4
5th percentile	75.1	76.8	np	np	np	78.3
95th percentile	95.5	94.3	np	np	np	94.6
All hospitals						
Mean	93.6	92.8	93.2	93.9	93.5	93.4
Median	94.6	93.8	94.0	94.5	94.6	94.3
5th percentile	87.3	85.6	87.4	88.4	86.5	87.1
95th percentile	96.6	96.3	96.6	96.4	96.8	96.6
No. observations	355	278	295	294	578	1800

a Small and very small size categories are aggregated for not-for-profit private hospitals due to ABS confidentiality requirements. **np** Not available for publication due to ABS confidentiality restrictions.

Source: Productivity Commission calculations based on unpublished ABS and AIHW data.

6.4 Scope to improve future efficiency measurement

As previously mentioned, there are a number of data items that are not reported or reported inconsistently which in turn limit the usefulness of the hospital cost analysis in this chapter. An improvement in the quality of such data would lead to a more robust measurement of cost efficiency.

Some of the data improvements necessary to improve technical efficiency are also relevant for the cost analysis (chapter 5). These include consistent reporting of total number of beds by public and private hospitals and a more detailed reporting of hospital facilities. Data improvements especially relevant to measuring the determinants of hospital costs include the reporting of capital costs, medical costs and pharmaceutical prices.

Capital costs include depreciation costs and the user cost of capital. The Commission has previously noted (PC 2009) that depreciation costs, interest payments (a component of the user cost of capital) and asset values (required for the calculation of the user cost of capital) are not currently reported consistently between jurisdictions or between public and private hospitals. An improvement in this area of reporting would remove the need to use total beds to estimate a short-run cost function. Depreciation and interest expenses could also be reported as a ratio per bed, to approximate the price of capital (Rosko and Proenca 2005).

There were no data on medical costs of doctors exercising their rights of private practice in public hospitals (in the National Public Hospital Establishment Database) and in private hospitals (in the Private Hospital Establishment Collection). The Commission chose to therefore exclude medical costs from the analysis. Medical charge data are available from the Hospital Casemix Protocol (HCP) collected by the Department of Health. Given difficulties faced in accessing other aspects of hospital data, the Commission chose not to access these data in the time available for this study. If these data were obtained, it would still be difficult to calculate a comparable price of medical labour for public and private hospitals, given the nature of the HCP data.