Program and Graduate Cost Model:
An Australian Case Study

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Abstract

The Australian Higher Education system has changed markedly particularly since mid 1988 when a White Paper entitled 'Higher Education, Policy Statement" was released by the then Minister for Employment, Education and Training, Mr Dawkins. A clear trend has been the rapid transformation from the "Ivory Tower" outlook towards a more externally oriented focus encompassing a more corporate structure and with increasing privatisation of higher education. In a 1993 address on the Future of Australian Higher Education, the then Federal Minister stated that cost effectiveness and graduate unit cost constituted important criteria for determining where future higher education places will be directed from the Australian Government. Such criteria require the measurement of program and graduate unit costs. This paper develops a model for the calculation of direct, non-direct and capital components of program costs per unit load and applies it to a case study institution. It then extends this model to the calculation of graduate cost per student.

Introduction

In order to enhance resource allocation decision-making, it is important for universities to carefully monitor institutional costs. Linke (1991) suggests that performance indicators such as the cost per Equivalent Full Time Student Unit (EFTSU) are intended to measure the relative achievement of institutions and the constituent organisational units against their respective aims.

However, recent studies have largely focused on cost analysis of higher education in terms of cost centres or academic organisational units. For instance, Doyle (1991) applies activity costing approach to a survey of faculty costs. Beasley (1993) has recently given increased impetus towards the measurement of program and graduate unit cost by suggesting that future higher education places might be re-directed from universities experiencing lower performance. Although the demand for program and graduate cost studies is increasing, there is a dearth of past Australasian studies in this area.

Whilst it is acknowledged that Selby-Smith (1972) and Sharma (1986) have undertaken research in this field within the Australasian region, those studies are dated. It is the purpose of this paper to consider the issue of estimating program and graduate unit costs using an Australian case study university.

Program Cost Model Development

The program cost model developed has three components, namely, direct teaching unit cost, non-direct unit cost and capital unit cost which then sum to provide the total unit cost for a particular program. It is noted that the annual expenditure of equipment has already been taken into consideration within the direct and non-direct teaching cost components. The sub-cost models for each of the three components are described below.

Direct Teaching Cost Model

An institution has several direct teaching cost centres. Within Australian universities, these cost centres have traditionally been known as academic departments or schools. Further, consider a course which generates P1 to PN, proportion of EFTSUs which are taught by teaching department 1 to N respectively (these are analogous to the technical coefficients utilised in Northern America). As indicated by the DEET cost studies undertaken in 1989, Higher Education costs tend to vary by discipline, course level and whether the program is offered in the cooperative mode. Indeed, DEET has used the three commissioned

studies to develop relative weights for these various factors. Application of such weights will provide us with the cost per weighted EFTSU for each academic department. namely, C1 to CN for academic departments 1 to N respectively. The technical coefficients need to be modified by the DEET factors to generate weighted coefficient (W1) as follows:

W1 = RI x PI where RI is the DEET coefficient.

After establishing these weighted units for each program, they are then multiplied by the departmental weighted unit cost to obtain the overall cost for each program. The cost per EFTSU for course J is hence given by:

DJ = Σ WI x CI

Non-Direct Teaching Costs

It has been assumed that the non-direct teaching cost per weighted EFTSU is constant across all departments. The model can be extended whereby different cost drivers for non-direct teaching expenses could be used (for example, Buildings, Grounds and Services, costs could be apportioned on the basis of building space). However, whether the more complex data requirements for such an extended model are justified in terms of gains in accuracy is an issue which needs to be assessed by future researchers. The non-direct cost model is as follows:

- 1992 expenditure figures were obtained for non-direct teaching cost centres from the DEET financial statistical return (note: only government funded expenditure was considered).
- The higher education non-direct teaching total cost figure was divided by the total weighted EFTSU in terms of Government funded load for the University to obtain a weighted unit cost factor.
- The total non-direct teaching cost per weighted EFTSU was then multiplied by each of the technical coefficients mentioned under the direct teaching cost model to compute the non-direct teaching cost per EFTSU for the program.

Calculation of Capital Costs

Capital costs for each program were calculated as follows:

- Calculate square metres per weighted EFTSU (MWI) for each teaching department. Non-direct teaching spaces were absorbed into the teaching departments on the basis of proportion of weighted EFFSU.
- The University's building costs were amortised over 40 years at current interest rates (assume 6.5%), as required by DEET.
- The amortised building cost per square metre for the case study institution as a whole was calculated (BCI).
- The capital cost per weighted EFTSU for each of the departments was obtained by taking the product MWI x BCI.
- The amortised capital cost per weighted EFTSU for each of the direct teaching cost centres was then applied to the technical coefficients to obtain the capital cost per EFTSU for each program.

Model for Computing Costs Per Graduate

Beasley (1993) stated that 1994 Commonwealth outlays on higher education are approximately $4.4 billion and Australia is producing some 110,000 graduates each year, and hence the average public unit cost is

$40,000. Such a simple calculation may provide a reasonable first approximation for overall graduate unit cost, but it would not be a valid method at the program level. The basic reason for this is that the current expenditure would cover not only graduating students but also the cost of those who are part way through their program. Therefore, some degree of sophistication is required in the measurement of graduate unit cost of program.

Ideally graduate unit cost for a particular program would be computed by following a cohort from initial intake into a program to graduation, identifying total expenditure on the cohort (this would include cost of failure, that is, expenditure on students who have dropped out prior to the completion of the program) and then expressing this as a quotient of the number of graduates. The effort required in undertaking such a measurement is prohibitive. A simpler model could be used as follows: let TC denote the cost per EFTSU (including direct cost, indirect cost and capital cost) for a particular program as measured using the model described in section 2 above. Suppose the length of the program is L and its attrition rate is A, then the cost per graduate is given by the following formula:

$$\text{Cost per graduate} = L \times TC/(1-A)\uparrow L$$

It is noted that the above is not an ideal model and that some refinements can be made to it. In particular, the denominator should ideally represent the course completion rate, but this is difficult to obtain since not all students complete programs in minimum time. It is suggested that such a modification be considered by future researchers.

Application of the Cost Model to a Case Study University

The direct teaching cost allocation model developed above is applied for testing and validation purposes to compute the cost per EFTSU of the Bachelor of Applied Science (Mathematics and Computer Science) program offered by an Australian University of Technology in 1992. It is noted that the teaching unit of analysis is the academic department and not the faculty.

The technical coefficients (P1) for the program contained in Table 1 show that five academic departments contribute to the teaching of this program. This suggests the importance of the phenomenon of service teaching within universities organised in terms of a matrix structure. Table 1 indicates that the direct cost per EFTSU of the degree program in Mathematics and Computer Science was $5,320 (in approximately 30 June 1992 prices).

Table 1

Service Department	**Pi**	**Ri**	**Wi**	**Ci**	**Direct teaching cost $**
Computer Science	0.38	1.6	0.61	3060	1,870
Mathematics	0.41	1.3	0.53	3290	1,740
Mathematics (Industrial Experience)	0.13	0.3	0.39	3290	1,280
Accounting	0.04	1.0	0.04	4060	160
Marketing	0.01	1.0	0.04	2940	120
Economics	0.03	1.0	0.04	3740	150
Direct program cost per EFTSU					*5,320*

Note: Unless otherwise indicated the service department contribution relates to non-industrial experience teaching.

Similarly the non-direct cost per EFTSU and capital costs are derived as per the model described above for the same program. Table 2 reveals that the total cost per EFTSU for the Bachelor of Applied Science (Mathematics and Computer Science) program in 1992 was $7640. This table suggests that approximately 70% of the total cost of the program related to direct teaching activities, 24% of the costs related to contributions from non-direct teaching cost centres and only 6% of the costs related to “bricks and mortar”.

Table 2

Item	1992 cost per EFTSU $
Direct teaching	5,320
Non-direct	1,800
Capital costs	520
Total cost	*7,640*

In order to compute the graduate cost for the Bachelor of Applied Science (Maths and Computing), the Bardsley software (Bardsley, 1991) was run to obtain the attrition rate for the undergraduate program. Bardsley software suggested an attrition rate of approximately 13% for this program for 1992. Given that the length of this program is three years, the application of the above developed graduate cost model suggests that the graduate cost per student for the program is approximately $34,800.

It is necessary to validate this model through more extensive application. Although such validation is beyond the scope of the current study, there are some positive indicators in respect to this matter. Firstly, it is noted that the cost per graduate is in the same ball-park as the figure derived by Beasley. This provides some degree of confidence in the program and graduate cost model. Further, the direct teaching cost component of the model was discussed with the Dean of the faculty. It is noted that the faculty itself had undertaken independent computations of this nature using more disaggregate information (including staff time and the like). The Dean suggested that this result was within 5% of those derived by the method described here. This provides added confidence in the model developed within the paper.

Conclusion

The external political environment in Australia suggests that the Federal Government will allocate and re-allocate resources to the universities on the basis of criteria proposed by a senior Government Minister in 1993. In particular the then Minister for Education has signalled that program and graduate unit cost represent important cost efficiency criteria for the allocation of Commonwealth Funded Places in Australia. There is therefore an urgent need for institutional researchers to monitor such costs and to advise university management on corrective action, if required.

This paper has developed a model for the computation of direct, non-direct and capital components of program unit cost. It has also extended the model for the estimation of graduate unit cost. Initial model validation suggests that the model yielded results within 5% of expectation. However further testing of the model is required and recommended. In this way it is possible to develop an instrument which could be very useful in university management.

The model developed is relatively simple particularly with respect to non-direct costs. It is recommended that further work be undertaken with respect to the absorption of such costs (for example, by using cost drivers), in order to ascertain whether the added complexity and greater data requirements are justified in terms of accuracy gains.

References

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