GLENYS PATTERSON

FINDINGS ON ECONOMIES OF SCALE IN HIGHER EDUCATION: IMPLICATIONS FOR STRATEGIES OF MERGER AND ALLIANCE

ABSTRACT. Studies on economies of scale seek to establish at what size an institution functions at an optimal level of efficiency. Higher education mergers produce an increase in the scale and scope of an institution, and are commonly driven on an expectation of economic benefit. To what extent are greater value for money, savings in government expenditure, significant institutional financial benefit, achieved through the pursuit of economics-of-scale-focused policies? The paper investigates the varied findings of sixteen studies into economies of scale and scope in higher education, associated cost factors and cost/size relationships, and considers the strategic implications.

INTRODUCTION

Analyses of economies of scale in higher education relate the size (usually measured by the number of students) to the cost per unit of size. The primary focus of the size-cost relationship studies is, basically, to establish whether large institutions spend less than do small institutions, per full-time equivalent student (ftes); and hence to ascertain at what size an institution (or work unit, or higher education system) functions at an optimum level of efficiency. Most of the studies in this area recognise the inherent ambiguities and problems in establishing the size-cost relationship: defining the central concepts of 'cost' and 'economies of scale'; the relevant time scale for the observations; the constancy level of other factors. For example (Brinkman & Leslie 1986), the concept of cost has various meanings (fixed and variable, direct and indirect, historical and projected, institutional and personal) – as does scale (productive capacity, the quantity of output or activity); it can be hard to distinguish between long-run and short-run cost behaviour (with rapid change, new levels of activity may be using old levels of productive resources); and there are varied assumptions as to which items are held to be constant (input prices, input proportions, technology). Qualitative measures, such as value judgements on the quality of the educational experience, are generally not included in the research exercise, though may be mentioned. 'Economies of scope' refers to the degree to which complementarity

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among outputs results in lower per unit costs, when two or more outputs are produced simultaneously; i.e., economies of scope arise when it is cheaper to produce product *X* in conjunction with product *Y*, rather than each of these outputs separately (Cohn et al. 1989).

Higher education mergers produce an increase in both the scale and (usually) the scope of the institution. Mergers and other forms of alliance are often proposed and instigated in the belief that small institutions have high unit costs (are comparatively inefficient); that large universities have lower unit costs (operate much more efficiently); and that institutions should have a broad rather than a limited range of course offerings. At a national level, for example, the late 1980s Australian Government undoubtedly expected, and indeed stated, that in replacing the binary higher education system with a consolidated, unified system, economies of scale and scope would effect a reduction in unit costs. At an institutional level, proposals and decisions on merger and alliance are certainly also made in the expectation of economic benefit, sometimes for reasons of sheer survival. What evidence is there to support these beliefs? Is there scope for greater value for money, or for savings in government expenditure, through economies-of-scale-focused policies? Of what financial significance is an institution's pursuit of an economies of scale growth strategy direction? This paper investigates the findings of a number of studies into economies of scale and scope in higher education, associated cost factors and cost/size relationships, and considers the implications for strategies of merger and other forms of institutional alliance.

Studies on Size and Scope Cost Relationships

Brinkman and Leslie (1986) carried out a comprehensive review of studies on the size-cost relationship in US higher education. Their research results indicated: that on average, both two-year and four-year institutions experience positive returns to size; the most significant economies are most likely to occur at the lower end of the enrolment range (defined as up to 1000 fte students in two-year colleges, 1500–2000 fte students in four-year institutions); the actual range over which such economies are likely to occur differs according to the type of institution; the administrative costs area showed the greatest reduction, and instructional costs the least reduction, in unit costs; the evidence on whether large institutions typically experience diseconomies of scale was inconclusive; the extent of size-related economies or diseconomies depends on the scope of institutions' programmes, the salaries they pay, and how they use their resources. In general, it was found that both size and profile are relevant; that the number

of students enrolled is only one factor influencing unit costs, its influence often obscured by other factors, especially in medium and large-sized institutions; that institutions with narrowly focused curricula will usually cope more easily with small size than will those with greater curriculum breadth – i.e., small institutions may survive because they are specialised.

Is there scope for savings in government expenditure through economies of scale in higher education? An Australian review of efficiency and effectiveness in higher education presented data indicating that, as a higher education institution grows, the average *per capita* cost declines, falling steeply up to about 2000 full-time equivalent students, continuing at a decelerating rate up to a critical size somewhere in excess of 10,000. The review gives a clear example of the impact of enrolment growth and amalgamation on average size and cost in Australia's [former] advanced education sector. Between 1975 and 1986 the average size of the Colleges of Advanced Education more than doubled, from 1234 to 3286 ftes, as the number of institutions reduced from 81 to 45; while operating grants per ftes fell 12%, from $A6795 to $A5981. The report concluded that the size of the institution is the major determinant of the level of average cost; and that both the number and size of institutions are therefore critical in determining the higher education system's average cost per student. It went on to observe that

> Since the marginal cost of additional students (as well as the average cost) is lower in the larger institutions, it would be cheaper to increase their size further and reduce the size of the smaller institutions, ultimately eliminating them altogether. Economies of scale would dictate a policy direction of maintaining a few very large institutions to minimise government expenditure. Conversely, a policy of redistributing numbers among existing institutions to provide for equal sizes would maximise costs. (Commonwealth Tertiary Education Commission 1986, pp. 57–61)

However, the private and social costs of an extreme economies of scale approach were acknowledged.

In addressing these economies and diseconomies of scale issues, Schumacher (1983, pp. 70–71) argued that the educational objectives of higher education could not be successfully met in very large-scale institutions. He concluded that, optimally, a university is both most economic and successful at medium size – containing between about 1500 and 4000 students. He also observed that because at this medium size, "there would have to be more of them [than if large size] they could be evenly dispersed geographically, thus providing a necessary cultural and intellectual resource throughout the country" – a qualitative system advantage. However, it remains very difficult to quantify the qualitative aspects of scale in cost/benefit terms.

The main implication of Sear's (1983) findings on the application of economies of scale to costs in higher education is that economies of scale in universities are indeed never exhausted, that average costs fall indefinitely as student numbers rise – and hence there is no *economic* case for establishing new universities. Sear does go on to concede that this line should not be pushed too far. Blaug's (1983) allied conclusion on the issue is that unless critics can actually quantify the educational advantages of being small, the economic case for larger higher education institutions 'will sweep all before it'. Among the critics, Watson (1988) maintains that the economic benefit claims for larger institutions are largely unsupported by research evidence. Drawing on experience in the Canadian higher education system, he offers examples of diseconomies of scale, such as restrictive decision-making processes and obstructive system controls in large institutions. However Watson gives very limited quantified support for his position, mentioning only studies on secondary schools. He favours a 'fitness of purpose' system diversity, with a range of institution size.

A number of studies have given close attention to analysis of the cost functions in higher education, and the implications for scale relationships.

The Throsby (1986) and Heaton and Throsby (1997) studies on Australian universities use estimates from cost data from which specifically identifiable research expenditure has been removed, but including resources used jointly for teaching and research – i.e., full costs, not tuition-only costs, aligning with the per student funding allocation. Throsby's (1986) scale relationship findings indicate that average costs fall quite steeply at first, reach a minimum level at around 13,000 fte students, and increase slowly thereafter. He concludes from this that, if unit cost is the criterion, then expansion of demand is best accommodated at the smaller and middle-range universities. Throsby's estimates of the cost differences for three broad subject areas (arts-type, science-type, med-type) found med-type courses to be about twice as expensive as arts-type courses. Hence the most pronounced effect on unit costs is the combination of small size and high proportion of science-based departments. Lowest costs are for medium-sized universities with a strong arts/social science emphasis. Large universities with a high concentration of science-based subject areas (e.g. Melbourne, Queensland) keep average unit costs down through economies of scale, but have relatively high marginal costs because of no scope for further scale economies.

Lloyd, Morgan and Williams (1993) also found wide cost variation across subject areas, as well as between different levels of degrees, and between research-based and coursework-based study. Undergraduate tuition is shown as half as expensive, postgraduate research tuition about

five times as expensive, as postgraduate coursework tuition. Heaton and Throsby (1997) comment on the difficulty of separating expenditure on postgraduate research from expenditure on staff research, and the substantial contribution to research made by postgraduate students, especially in the physical sciences. Citing Heaton (1996) they also note that the least-cost scale of Australian university in 1994 was about 10,000 fte students. Both this and the Throsby (1986) study found evidence of diseconomies of scale for large institutions. In terms of economies in tuition costs, Heaton and Throsby (1997) conclude overall that the current Australian university size of about 11,500 fte students is 'about right'; that any expansion of higher education should be within the smaller institutions, or by creation of new institutions, rather than any further expansion of the existing large universities. They estimate that the cost saved through a decrease of one ftes in a university of 25,000, would be about twice that saved through a similar reduction in a university of 10,000 (p. 19). But they do point out that resource costs represent only part of the total social opportunity costs of higher education, and that policy needs to be based on analysis of all costs and benefits.

An investigation into the inter-university differences in cost per student in the UK (Johnes 1990; Johnes & Taylor 1990) used a unit cost definition of the ratio of total expenditure on academic departments in the university to the number of fte students in the university. A particularly interesting result is that there was no measurable relationship found between the size of a university and its unit costs – suggesting the absence of scale economies or diseconomies (at least in the [then] size range of UK universities). The subject mix factor explained about 70% of the inter-university variation, with a further 10% explained by the student/staff ratio, the latter having a significant negative effect on cost per student. The student mix (percent of undergraduate students) is significant only when all 45 universities are included in the analysis. Without three of these universities (City, UMIST and Ulster), the effect of the student mix variable is uncertain. Other variables – the staff mix (age and seniority), the degree mix (honours/ordinary, taught/research), research activity, and (as noted) university size, were found to be unrelated. Using the study's 1987/88 cost data on subject areas, costs per student varied from £1555 in law, to £8980 in veterinary science. The subject mix factor has considerable import for decisions on merger and alliance partnering.

The mix of part- to full-time students is another cost factor to consider, a mix which can vary considerably between institutions. Doyle's (1993) review of two studies which applied an Activity Based Costing methodology, and involved three Australian universities, found that the total cost

of part-time students was significantly higher than full-time students in terms of cost per fte student unit. This applied for each of three different course types: undergraduate, postgraduate coursework, and postgraduate research. The studies demonstrated that while most academic teaching activity is a variable cost related to ftes load, almost all university administrative and support costs, and university overheads, are driven not by ftes load, but by student numbers. Again, this has import for merger decisions, where the part-/full-time mix may be different in the merged institution.

As noted, the UK cost studies (Johnes 1990; Johnes & Taylor 1990) did find the student/staff ratio to be a significant cost per student variable. But class size is a factor commonly overlooked in statistics of the various higher education cost analysis studies, although it is sometimes mentioned in passing. Recognising this gap, the Nelson and Hevert (1992) time-scale investigation in a US university focused on the impact of class size on economies of scale. They suggest that the failure to include this as an explanatory variable could be responsible for the lack of consensus in estimates of marginal costs and scale economies. Nelson and Hevert found that the failure to incorporate average class size gives an upward bias to estimates of economies of scale. Their results indicate that it is possible for institutions to achieve significant scale economies where output is expanded by increasing class size; and constant returns to scale where output is expanded holding class size constant. A 50% increase in class size would reduce marginal cost by an average of 23% for lower level undergraduates, 15% for upper level undergraduates, and 6% for graduate students. However the authors do note that their findings ignore the effects of class size on the *quality* of education.

Abbott (1996) tested the question of whether mergers achieve economies of scale and scope. The study focused on 'before and after amalgamation' average costs per student and student/staff ratios, in a group of Australian colleges of advanced education. Findings are compared with some colleges that were not involved in the amalgamations. The results indicated that little financial gain was made from administrative economies, and only then after several years had elapsed. It was not certain that these savings could in fact be attributed to the merger process. The cost savings that did occur arose mainly because of the increase in the ratio of student to academic staff members. The author concluded that the mergers' greatest contribution was the creation of institutions that were adaptable enough to transfer resources out of contracting areas (for example, teacher education) and into expanding areas (such as business studies, computing, applied sciences). This enabled institutions to use their facilities to full capacity, and thereby achieve economies of size.

Lloyd, Morgan and Williams (1993) also evaluated the cost savings arising from amalgamations of Australian higher education institutions, looking both at economies of scale and economies of scope. Institutions were categorised into seven representative types. *Economies of scale*, though 'modest cost gains', were found to be 'quantitatively much more important' than economies of scope. Estimates of overall scale economies ranged from 3.6% to 15.3%, with greatest economies found for large/extra large universities amalgamated with a small or medium university or with a college. (Amalgamations between large universities were excluded from the estimates.) *Economies of scope* estimates were found only for amalgamations of a college amalgamated with another college or with a small or medium university. The largest economy was 3.1%, for a teachers' college with a technical college, other economies were much lower. For amalgamations involving a large or extra large university diseconomies of scope always occurs. A measure of the *economies of amalgamation* combines the effect of economies of both scale and scope. It measures the proportionate change in total costs when institutions are merged. Confining the analyses to the Australian amalgamation types which did occur (universities with colleges, and colleges with colleges), the estimates of economies of amalgamation ranged from 3.6% to 13.1%. All the amalgamations considered result in cost savings. Greatest economies of amalgamation were found for large/extra large universities amalgamating with colleges (noting that these all involve some diseconomies of scope). The smallest economies of amalgamation were for the smallest institutions.

Lloyd et al. (1993, pp. 1089–1099) conclude that their findings 'cast doubt on the alleged benefits of the many amalgamations which have occurred'. They note too that it has been assumed that the quality of output is constant across institutions and is unrelated to class size and student mix. But if larger classes do lower the education quality, then 'the observed cost savings are overstated'. Also not considered are the additional costs of a geographically dispersed institution. The authors point out that the cost and other gains from amalgamation (such as wider choice of subject) can be achieved in other ways, from other forms of co-operation and alliance.

Research analysis by de Groot et al. (1991) on US research universities found 'considerable' economies of scale for the teaching and research processes, and unlike Abbott (1996), found even larger economies of scale for the supportive services. Their estimates also showed economies of scope for the joint production of undergraduate and postgraduate tuition.

Fielden (1991) has examined the potential savings alongside the extra costs of a merger. Potential economies from mergers usually target

the duplication of staff, superfluous building space, duplicated library purchases, and central administrative overlaps such as meetings, ceremonies and publications. The potential costs of mergers were identified as relating to the levelling up of conditions of employment, relocation compensation, redundancy, inter-site transport subsidies (and other split-site expenses), integration of information technology systems, redesign of procedures and paperwork, legal and professional fees relating to merger, redesign of publicity material, modifications to buildings, removal costs and management time. While the economies would appear to have ongoing impact, several of the diseconomies are one-off factors related to the merger process itself. However, Fielden concluded that the net resource implications suggest that few, if any, recurrent economies result from mergers, and that disentangling merger-induced efficiency gains from the impact of other externally induced financial stringency factors would be virtually impossible. He asserts that the justification for mergers must therefore be strategic and academic, not predicated on the prospect of economies.

Interestingly, the common assumption that a (or 'the') primary motive behind institutional mergers is to achieve cost efficiencies through economies of scale, was not borne out in a study of 30 UK mergers between 1987 and 1994. Rowley (1997) found that the 'key drivers' for the (major partner) extant higher education institution were: academic compatibility/complementarity, strategic direction, the desire to be the main provider in the region, portfolio enhancement, entry to new markets. Economies of scale, and cost efficiencies, were well down in the list of 'secondary drivers'. For the merging partner institution, survival was a key driver, looming financial struggle a secondary driver. Rowley notes that her data supports Fielden's (1991) recommendation, in that the mergers in the study were 'academic and strategic, and not predicated upon the prospect of cost savings'; although this surely has application mainly to her extant institutions, not so much to the minor joining partner.

Review and Implications of the Findings

The research findings reveal both areas of agreement and of difference, as well as aspects which are inconclusive. Most of the studies in the higher education size/cost relationship area observe a decrease in costs per ftes unit as output increases, at least up to a point; and find the greatest per unit economies are obtained at the lower to medium end of the enrolment range. Costs decrease at a decelerating rate, up to a critical size at which most of the economies have been gained, for the particular institution type

and profile, then diseconomies may set in, over the upper size ranges. But other conclusions are of a constant or a 'never exhausted' return to scale, and there was a 'no cost/size relationship' finding. Diseconomies of scale in the upper enrolment ranges are acknowledged by about half of the studies; others (as indicated) found diseconomies never set in, or there is no cost/size relationship; or the estimate on diseconomies is inconclusive. Some studies pinpointed modest economies of scope, one particularly noted diseconomies of scope in large universities, and several gave emphasis to the significance of institution profiles and subject cost variation. One estimate found scope economies between undergraduate and graduate tuition. Other factors of cost relevance are the part- to full-time student mix, the student level mix, the significance of the student/staff ratio and class size aspects, and capacity usage levels.

Higher education policy proposals and implications put forward were often conflicting: maintain a few very large institutions and eliminate the small ones; there is no economic case for establishing new universities; a fitness for purpose system diversity is best; expansion is best at the smaller/middle range; create new rather than expand large institutions; more medium rather than few large institutions can be more geographically dispersed. Most of the studies recognised the relevance of the social and private costs involved in higher education scale issues, and the effects on quality of education. Several concluded that changes to higher education should be based on a full cost/benefit analysis which has considered all the social costs and benefits involved.

To what extent can these cost relationship findings be of use for institutional and system decision-making? Strategies of alliance, whether voluntary (initiated by the institution) or involuntary (initiated by government) are commonly proposed and engendered on an expectation of economic benefit. Invariably, the expectation is that amalgamation, whether it be consolidation (the combining of two or more institutions to form a new institution) or an acquisition type (where a dominant institution absorbs another) will lead to economies of scale cost efficiencies of operation. Yet specific data analysis in support of these expectations is usually scant or missing. Martin and Samels (1994), advisors on the ways and means of successful academic mergers, include 'accomplish economies of scale' as one of their ten core principles of merging colleges for mutual growth. Claiming that merger-prompted duplications appear in 'hundreds of areas', they focus strongly on reductions as a key strategy by which to achieve the economies – but give no hard data examples.

Supporters, advocates and drivers of higher education mergers and other growth strategies do tend to overestimate and emphasise the bene-

fits, but underplay the cost. The findings outlined here at least question (though do not disprove) several of the most common merger and growth beliefs and assumptions: that small institutions are inefficient; that large institutions are most efficient; that institutions should have a broad range of educational offerings; that amalgamations will lead to cost savings. The actual strategic costs and benefits can be very difficult to quantify. Many alliance benefits, such as 'best practice' processes, transfer of knowledge, reduction in market uncertainty, increased student choice, are indirect. Larger classes may lower the quality of education output; the additional cost of servicing a geographically dispersed campus is frequently overlooked; and the complex cultural, human and emotional costs and benefits of merger process and outcome are not at all easy to calculate. Alternative forms of co-operation, such as consortia-type joint teaching, resource, and research arrangements, may achieve economies of operation without the financial and social costs of the merger process.

On the economies/diseconomies of scale and scope issues, it is interesting to draw on Odum (1992, p. 543) who observes, in relation to human ecology and the net-energy concept, the so-called complexity theory, that 'communities and systems, whether natural or human-made, as they become larger and more complex, require more of the available energy for maintenance. For example, when a city doubles in size, more that double the energy (and taxes) is required to maintain order'. Overall, one must agree with Schumacher (1983) that there is no simple answer to the question of how big a university should be. The issues surrounding economies of scale in higher education are complex, and should not be considered from a single level (unit, institution, system) perspective, or a single likely effect. Basic quantitative measures do not adequately reflect the qualitative objectives of higher education; and there remains the overriding difficulty of attempting to measure higher education 'products' in monetary terms.

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Massey University
Private Bag 11 222
Palmerston North, New Zealand
E-mail: G.Patterson@massey.ac.nz