The Economics of Instructional Revenue Sharing

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Introduction

The process of planning and budgeting for public institutions has been a topic of recent interest as budgetary constraints have mandated reduced funding for state agencies and publicly funded educational institutions. The most recent budget outlook in Minnesota suggests that funding for the University of Minnesota will be reduced significantly in the next biennium. This outlook is renewing the call for increased efficiency and cost control for publicly funded educational institutions such as the University of Minnesota. The authors have been involved with a project in which cost functions and economic relationships were examined within the College of Agricultural, Food and Environmental Sciences at the University of Minnesota. This paper is an extension of these efforts and attempts to address the questions relating to instructional revenue sharing.

Incentives for Managed Growth (IMG)

In an era of increased accountability and decreased resources in higher education there is increased pressure to adopt new financial models for improved management of key resources. Over the past six years the University of Minnesota has adopted a model that is called incentives for managed growth (IMG). IMG is an "administrative method for greater autonomy at the local level." This means the responsibility for managing revenue and expenditures will be placed at the collegiate and support unit level. It should be noted that public allocations are added to internal budget allocations, and these allocations may not be affected by IMG. The model acknowledges that internal cross subsidies will still be part of the budget allocations process, but can be viewed with much more clarity than under the previous central process. Values will still guide this process and these academic values will remain as part of the budget allocation process.

The IMG model applies to specific revenue generated by tuition and sponsored research activities. Under the tuition attribution model there are two types. The first form of tuition revenue relates to instructional activity and is called instructional tuition revenue. The revenue from these courses is assigned to the college that "owns" the course designator or subject. The other form of tuition that flows through the IMG model is registration tuition. This is tuition revenue generated by students in a given major associated with a given college. These two together make up the current tuition attribution model for sharing instructional revenue through the University of Minnesota.

The University of Minnesota's implementation of IMG also applies to indirect cost recovery (ICR) funds and the rules for distribution of these funds to colleges. ICR funds are very important to departments as they are used as an additional source of funds for everything from new faculty setups to funding operations. The current rules for distribution of ICR have 49.5% coming to colleges with central retaining 50.5%. It is up to each college to determine how those funds get distributed to departments. It should be noted that IMG brings ICR revenues and tuition under the control of the units that earn them.

Under the principles of IMG, 75 percent of the tuition revenue is attributed to the college providing instruction to the student and 25 percent of tuition revenue is attributed to the college enrolling the student. Tuition revenue follows the course designator. Funding transfers are used for shared cross teaching in which faculty teach in other departments, colleges or interdisciplinary programs. In these cases, a single collegiate unit is identified as the unit

incurring the cost of instruction. The University of Michigan allocates 85 percent of tuition to the Responsibility Center providing instruction and 15 percent to the Responsibility Center of student enrollment. Indiana University provides 100 percent to the unit providing instruction.

More complex Responsibility Center Management (RCM) models have been found at Indiana University and the University of Michigan. This new budget method has been limited to tuition, space, indirect cost recovery (ICR) and state support. It comprises less than 20% of the total budget. This new financial model represents what appears to be a trend towards aligning revenues with expenditures, which is driven down to the lowest management level possible.

Table 1. Tuition and Instructional Activity Analysis

Tuition and Instructional Activity Analysis
By Department

	(A)	(B)	(C)	(D) = B+C	(E)	(F)	(G) = A-(D+E+F)
	O&M	Instructional Tuition (75%)			Grad Reg	Ugrad Reg	O&M State
Department	Allocation	Undergrad	Graduate	Total	Tuition (25%)	Tuition (25%)	Subsidy
Department A	$1,200,050	$455,791	$202,101	$657,892	$87,183	$0	$454,975
Department B	$414,757	$35,799	$40,191	$75,990	$17,255	$0	$321,512
Department C	$525,631	$100,380	$46,125	$146,505	$51,889	$0	$327,237
Department D	$1,112,139	$269,307	$95,821	$365,128	$58,879	$0	$688,132
Department E	$497,676	$33,222	$115,751	$148,973	$38,200	$0	$310,503
Department F	$1,260,133	$547,617	$279,949	$827,566	$52,695	$0	$379,872
Department G	$873,303	$288,060	$53,527	$341,587	$47,186	$0	$484,530
Department H	$378,709	$42,855	$87,852	$130,707	$25,687	$0	$222,315
Department I	$1,441,224	$1,020,944	$164,534	$1,185,478	$62,601	$0	$193,145
Department J	$650,495	$169,226	$94,506	$263,732	$30,974	$0	$355,789
Central Services	$1,200,000	$0	$0	$0	$0	$1,020,484	$179,516
Subtotal	**$9,554,117**	**$2,963,201**	**$1,180,357**	**$4,143,558**	**$472,549**	**$1,020,484**	**$3,917,526**

Column Definitions:

(A) O&M Allocation = Annual instructional allocation received by each department

(B) Undergraduate Instructional Tuition = Instructional tuition generated by undergraduate students taking courses

(C) Graduate Instructional Tuition = Instructional tuition generated by graduate students taking courses

(D) Total Instructional Tuition = 75% of the total tuition generated by courses

(E) Graduate Registration Tuition = 25% of the total tuition generated by graduate student majors

(F) Registration Tuition = 25% of the total tuition generated by undergraduate student majors

(G) O&M State Subsidy = The difference between the O&M allocation and the instructional tuition

Economics of Instructional Revenue Sharing

A model can be constructed to analyze instructional revenue sharing. This model is similar to a production possibility frontier in economics (See Figure 1.) A fixed allocation of resources creates two instructional options. One is to instruct students from other departments by offering attractive service courses with available teaching and other resources. The second option focuses on attracting students in departmental majors with instruction of major-related courses being primary. Costs and revenues are associated with each option. Knowledge of the cost structure underlying courses is necessary to produce this comparison. The graphical view of this model is shown in Figure 2.

Cost Relationships in Instructional Revenue Analysis

The authors have completed an analysis of cost functions as they affect departments and colleges. In a paper presented at the 2002 AAEA meetings, a comparison of different cost functions estimations were presented. The three models were linear, log and translog functional forms. For the purpose of this analysis and to reduce the model to its simplest form, the linear form will be used in the model presented later. The implications of this model are that marginal and average costs are assumed to be constant over the range of analysis. In particular, the cost functions will be derived for teaching only as a method of analyzing the cost of service courses and an instructional mission, which does not concentrate on the cost of supporting collegiate majors. This cost function will be estimated for different departments based on fixed and average costs of instruction. It should be noted that the fixed costs of instruction range from $300,000 to

over $1 million for departments in the College of Agriculture , Food and Environmental Sciences. The marginal/average costs range from $40 to over $135 per Student Credit Hour. Two departments will be used in the analysis. One department has concentrated on offering service courses to other departments, while the second department has focused on attracting undergraduate majors. For departments with a mission focused on undergraduate majors, a separate cost function is estimated with fixed and variable cost components to capture the cost effects of increasing the number of majors. Although the method of administering programs varies in terms of administration, a typical programs generates costs related to secretarial, space, coordination at the faculty and staff level, and advising which may be done by an undergraduate division arrangement(joint) or individual faculty advisors with the attendant labor costs. A spreadsheet table captures these costs in the Appendix.

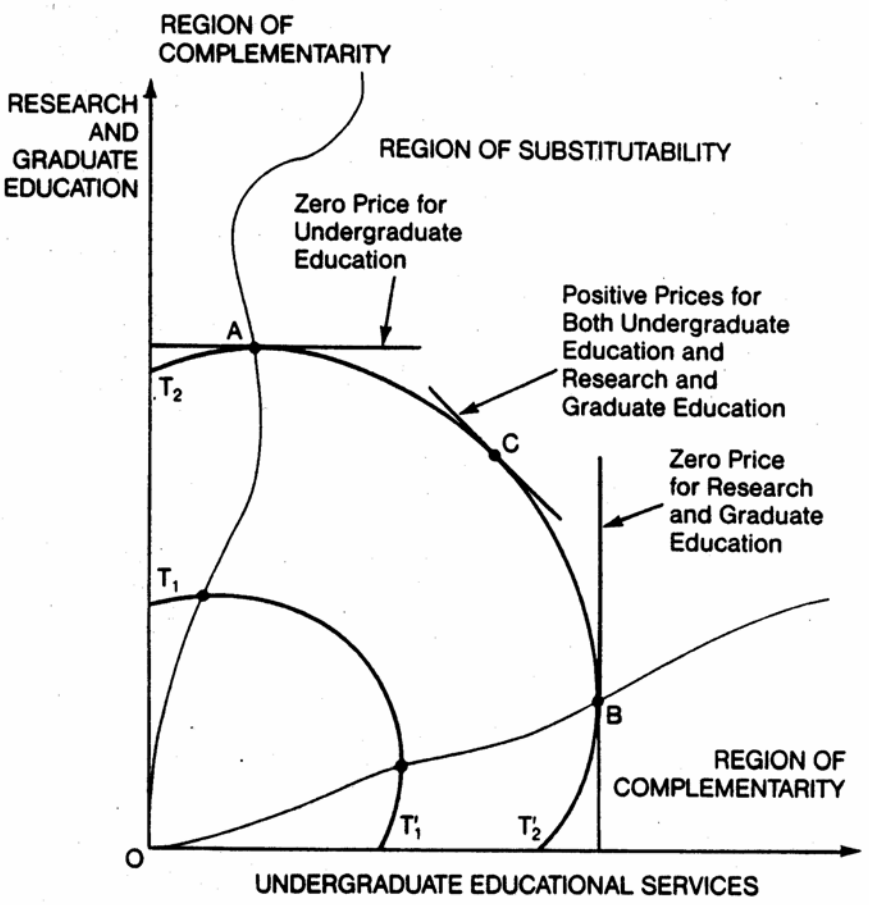

FIGURE 2. Combinations of undergraduate education and of research and graduate education showing the regions of complementarity and the region of substitutability

Source: Reprinted from Figure 1 in Nerlove (1972). ©1972 by The University of Chicago.

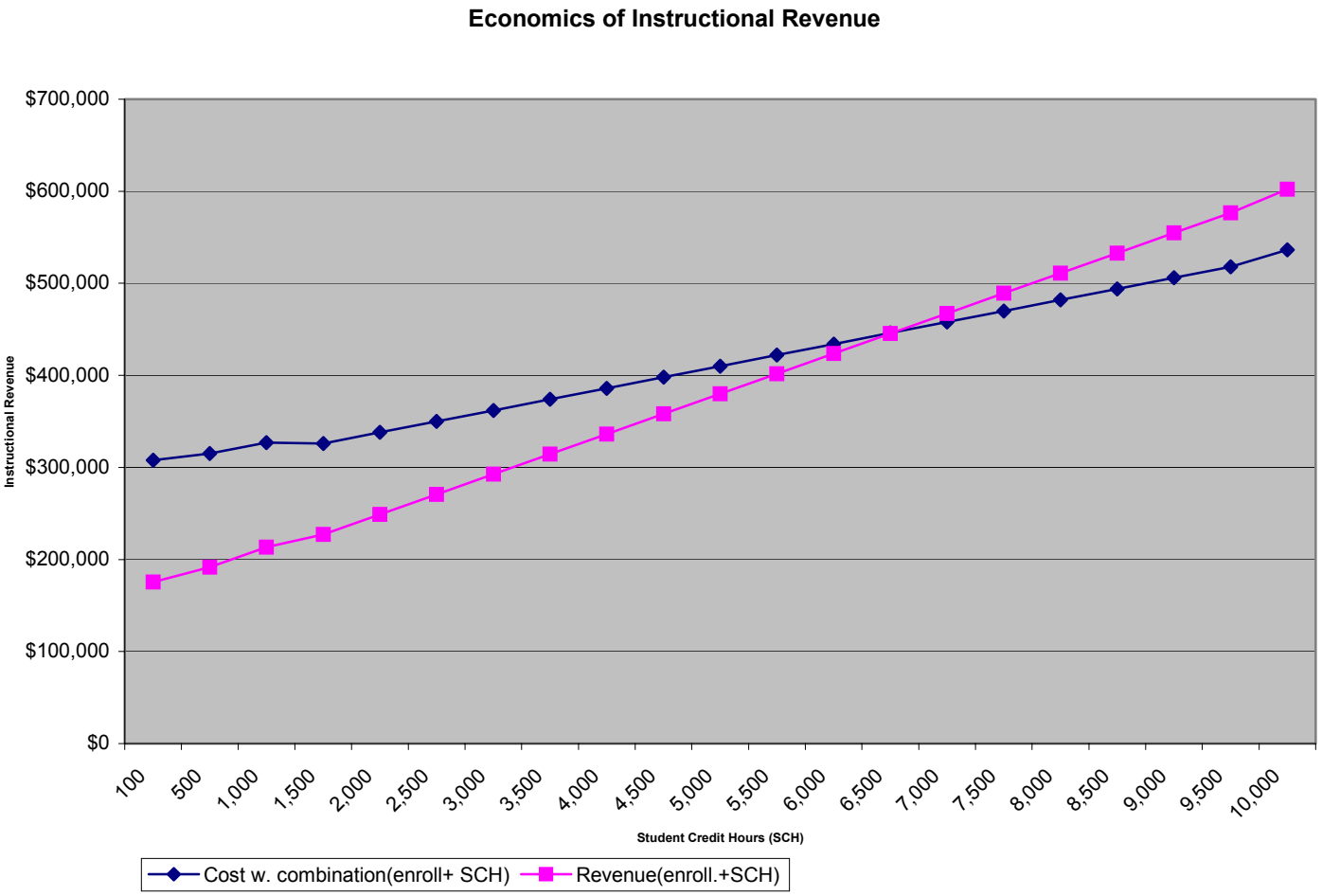

Figure 2. Economics of Instructional Revenue

The equations in this model consist of a tuition frontier, which reflects the 25% allocation of tuition income for the units performing instruction and the 75% allocation to the unit enrolling the student. It should be noted that in cases where the unit enrolling the student also teaches the student that 100% of the tuition stays within the unit. In general, this situation is reserved for departmental/unit courses taken by students in the major. The number of credits associated with this option will probably range from 25 to 45 credits. The remainder of the credits would be taken in other units as theme, electives or other courses. One strategy already undertaken would be to require students to take more courses within their major field, reducing elective courses. Other strategies would be to increase enrollment in service courses taken by large enrollment majors. This strategy would involve crafting desirable courses and teaching them at a low cost. Department teaching resources could be allocated in this manner. The Department of Rhetoric at the University of Minnesota appears to be following this strategy, also using adjunct faculty or graduate students to perform instruction. Departmental teaching resources could also be allocated to teach students majoring in a program within that collegiate unit. This would entail the recruitment of students and costs associated with that recruitment. Also advising and other duties must be performed by departmental faculty and dedicated staff. The cost of maintains an undergraduate office consists of salary, space, advising time, and supplies/equipment costs. The equations in the model segregate these costs into fixed and variable components. The model equations are shown in Appendix 1.

The assumption of fixed or finite resources, especially teaching related, suggests that the fundamental choice is between using teaching resources to teach service courses or, alternatively, to focus resources on building enrollment in departmental majors with the attendant demands on

teaching, staff support, space and advising resources. The cost of attracting new enrollees also involves advertising and other communication expenditures.

The model shows the relationship between the revenue frontier with the 75/25 sharing of tuition revenue and combined cost equations for service teaching and management of the majors/programs. Based on the analysis of data available, it would appear that the 25% tuition share for programs in comparison to cost related to this activity would require a breakeven of over 100 students and other opportunity costs. Linear functions have assumed for this analysis. A key assumption is that a fixed revenue frontier constrains the level of each activity. In other words, the teaching and other resources can only manage certain levels of teaching measured in student credit hours or enrolled majors measured in terms of student numbers in each major. A department such as Applied Economics could support a level of teaching of about 5,000-7,000 student credit hours per year or alternatively the enrollment of 250-400 students in departmental majors. Academic appointments also involve extension/outreach activities as well as research. Realistically, only 25-75% of a faculty member's time could be spent on teaching activity. Once this level of commitment has been reached, measured by a course load of 1-2 classes per year or a level of 30-50 courses per year, additional resources would need to be added. These resources could be in terms of adjunct instructors or graduate students. However, the quality of delivered instruction would be significantly reduced at this point.

Variables which affect this analysis would include course size, tuition levels, and the effect of tuition plateaus based on full time student status, and the existence of tuition differentials for different classes of students (such as out-of-state students).

Dynamic Analysis of Tuition Attribution Model

Over time, an expansion path is delineated by the proper combination of service courses and major enrollment as resources are added or, as is currently the case, the shrinkage of resources by retirements and retrenchments. Increasing fixed costs by 15%, variable costs by 4%, will show a dynamic analysis. The resources expansion will permit 100 more majors and 2000 more SCH. Figure 3. shows this comparison.

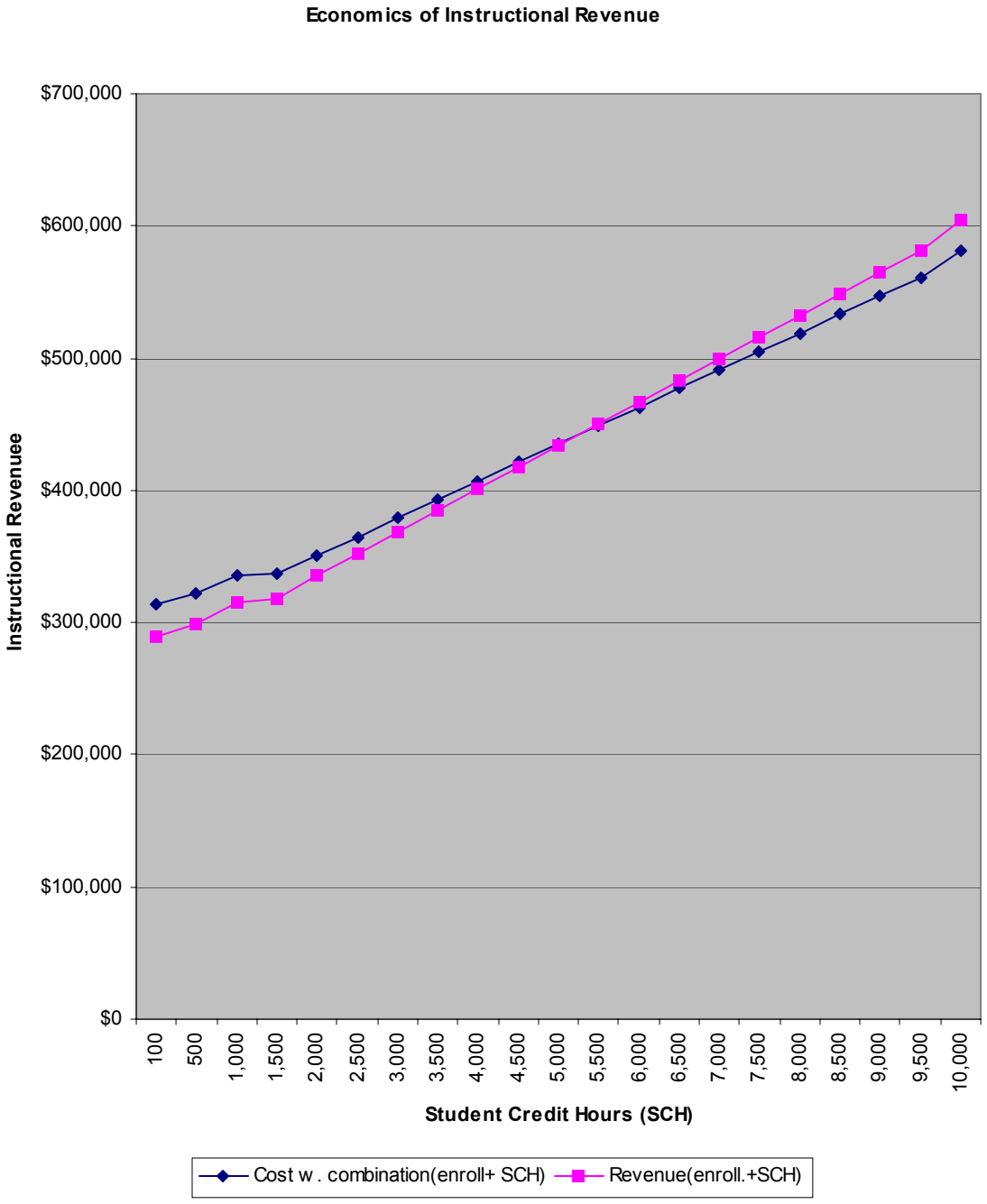

Figure 3. Economics of Instructional Revenue

The dynamic model shows a new expansion path with more SCH from service course and less majors using the assumptions listed

It should be note that the breakeven level of revenue and cost occurs at a higher level- about 5,000 SCH. In other words, an increased number of majors, almost 300, are required to bid resources away from service instruction. It appears that beyond this level, service teaching is far more profitable then increasing the number of majors. Other issues arise relative to increasing the number of people in a major. Placement of graduates may represent a barrier to further enrollments, given the occupation demand for graduates with a specific type of training. Also, internships and the ability to provide service to graduates may be limited and constrains further growth. Physical limitation for space may also affect this decision.

Other Extensions of the Model

Other axis may be added to the model. One would be research commitment. Another would be outreach commitment. These added dimensions would be superimposed on the model by altering the equations to reflect additional revenue and costs from these activities and adding revenue from Enterprise taxing and Indirect Cost Recovery. The interplay between activities such as research and teaching in a land grant setting also provides a unique opportunity to instruct students in various areas of research. This dimension would be quality, not quantity related. Graduates who possess these abilities would find a wider range of opportunities to be available to them.

The Undergraduate Research Opportunities Grant program at the University of Minnesota is such a program. It provides research funding for projects proposed by students.

The unique mission of land grant colleges, which involves teaching, research and outreach, provides a fertile ground for analysis of unit strategies. Thus far, we have discussed only the implications of two strategies, which involve expansion of service courses and increased recruitment of undergraduate majors. Both strategies focus on the undergraduate population.

A related issue deals with the recruitment of graduate students and provision of outreach or extension activities. Clearly, the recruitment of graduate students is tied to the level of research funding, but also teaching assistantships. Teaching assistantships can be used to support graduate students and are dependent on the level of teaching-mainly undergraduate. Teaching assistants have been used to augment instruction in some areas where faculty are either unavailable or perhaps unwilling to instruct certain levels of courses. Our analysis does not discriminate between service courses and departmental courses. It could be assumed that either type of course could involve graduate teaching assistants. Service courses may well be more highly enrolled and involve more commitment from graduate students. It is not clear whether merely increasing the undergraduate enrollment would increase the need for graduate teaching assistants automatically. It would take a large increase in enrollment to warrant additional teaching assistants.

The increase in outreach activities does not usually involve an increased use of research or teaching assistants. A unit would have to justify their involvement through research activities where funds can be requested for these purposes.

Previous work by the authors in estimating cost functions suggests that a certain level of undergraduate and graduate education is complementary (Volkwein,et al,1992). The effect on cost functions as a result of the aforementioned strategies would appear to be closely related to the complementary of the three missions. If a department were short of teaching resources, a strategy would be to purchase/salary buyout these resources from those with extension/research appointments. In the long run, however, these activities would constrain research output and future grant awards. More research will be needed to investigate these connections.

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