Measuring What Matters: A Program's Financial Health

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Abstract

The economic analysis of academic program financial health draws from microeconomics, higher education finance, and institutional research. Yet with the growing pressure on universities to demonstrate the financial sustainability of their programs, the theoretical and analytical literature on this remains relatively sparse, and there has been no substantial guidance that has matched the institutional complexity found across the higher ed landscape. This paper develops a unified conceptual and methodological framework for evaluating program-level profitability. Specifically, it provides guidance to produce program-level contribution margin across undergraduate, graduate, and professional degree programs at three hypothetical archetypal institutional types: a large public research university (Greenfield State), a highly tuition-dependent private business school (Meridian Business University), and a small endowment-wealthy liberal arts college (Harrington College). Drawing on the economics of multi-product firms, marginal cost theory, and higher education finance and program evaluation, the paper argues that the institutional practice of treating all programs as equivalent to their cost centers is analytically insufficient and misleading. A framework grounded in marginal analysis, combined with the accounting of fixed cost subsidization and spillovers, provides a more thorough and justifiable basis for institutional decision-making. Institutional researchers will find this paper useful as a theoretical foundation and a guide for building program-margin estimates.

1. Introduction and Theory: The Complexities of Program Finances in Academia

Universities have unique organizational structures, especially American institutions. They simultaneously *produce* education, research, public service, and offer a 'student experience' that is akin to a consumer good/service. And all of this is done through a complicated network of the same organizational units, using the same faculty, facilities, and charging tuition and fees to the same students. A professor who teaches an undergraduate introduction to economics course on Friday morning could easily advise a doctoral dissertation in the afternoon, and submit a National Science Foundation grant over the weekend. And then on Saturday evening, they might teach a class in the weekend Executive MPH Program. Over just two days, this member of the faculty has contributed to four distinct institutional outputs, with a complex revenue and cost structure, some of which may not be easily disentangled from the others. And yet, the need for academic and administrative leadership to evaluate the financial performance of individual academic programs has never been greater. Accreditors ask whether programs are sustainable. Boards want to know which programs are subsidizing others. Provosts and deans are asked to justify the continued investment in small or declining programs. This paper is a guide on how to answer those questions honestly and transparently at any given institution – and the difficulties an institutional researcher or financial officer may face when doing so.

The paper is written from the point of view of this institutional researcher's lived experiences and learned lessons. Working in institutional research in a mid-sized private university in the Northeast, our office was asked to develop a program-level financial analysis framework as a response to the immediate aftermath of the COVID pandemic. The immediate enrollment rebound that followed allowed us some time to develop some of the framework, data gathering strategies, and refine some of the methodology with significant feedback from an array of stakeholders involved – from department chairs, deans, and provosts to the finance team. And as such, the framework is flexible enough to support graduate program review, curriculum change modeling, tuition model changes, and board-level financial stress testing. But the analytical challenges that emerged in this work are something likely faced by any institution that attempts to evaluate program-level financial performance without a clear theoretical model of what the relevant unit of analysis is, what costs should be allocated to it, and what the resulting figure actually means. A program that appears to run at a deficit may be subsidizing institution-wide fixed costs that would simply move to other programs in the event of closure. A program whose margins make it appear healthy may be generating revenue at the expense of a service-providing department that is systematically undercompensated and whose contributions are being overlooked. And a program whose financials improve following an enrollment decline may simply be the beneficiary of reallocation, not genuine efficiency improvements. This is not to say

there is one universally right way of allocating revenues and costs, but this paper will attempt to lay out the most important factors that need to be considered.

Any rigorous analysis of university program finances should begin from the recognition that a university is not a single-product firm. It is a multi-product entity that produces undergraduate and graduate degrees, research publications, clinical services, continuing education, and public engagement. And all of this is done using the same shared inputs of faculty, infrastructure, and institutional reputation. The industrial organization literature on multi-product firms, summarized in Becker and Lewis (1992) and extended by Cohn and Cooper (2004) to higher education specifically, provides a basis to understanding why universities offer such breadth of programs. The key condition behind economies of scope is that the joint production of two outputs is cheaper than producing each separately. This is what explains why the same universities that award bachelor's degrees also house doctoral programs, even when those doctoral programs generate no net tuition revenue. Bernard, Redding, and Schott (2010) identify how optimizing multi-product manufacturing firms make profits on only a few of their many products and adjust their portfolios dynamically - what they call product switching. Universities behave similarly, if more slowly. Conzelmann et al. (2024) find that the four-year institutions do respond to labor market signals in their program offerings, with response elasticities around 1.3, while Light (2025) documents that course supply adjusts inelastically to demand shifts, with new courses rather than revisions to existing ones driving most curricular change. The practical implication is that institutions actively manage their program offerings, but do so with high switching costs and slow and delayed responses.

The appropriate analytical approach for evaluating program financial performance within this framework is marginal analysis, or the contribution margin framework from managerial accounting. The important question in the analysis should not be whether a program covers its fully allocated costs, but whether it covers its marginal or avoidable costs - the expenses the institution incurs specifically because the program exists, and which it would genuinely avoid if the program closed. In the short run, a program with a positive contribution margin, where revenue exceeds its avoidable costs, is financially preferable to its absence, even when its fully allocated margin is negative, because its revenue is contributing to covering some of the fixed overhead that would otherwise fall entirely on the remaining portfolio. Middaugh (2001) established this framework for higher education instructional cost analysis, and Horngren, Datar, and Rajan (2015) emphasize this principle - that discontinuation decisions should be made on avoidable costs, never on fully allocated costs.

The higher education finance literature adds important institutional context to this theoretical foundation. Bowen's (1980) revenue theory of cost proposes that universities raise all the money

they can and spend all the money they raise. This has important implications although empirical evidence has been mixed (Martin and Hill, 2014; Archibald and Feldman, 2011). If this were true, it would mean that even financially successful programs start to accumulate cost at or near the rate at which they generate revenue, which means that positive contribution margins are often thinner than they can be. Archibald and Feldman do present an alternative explanation. They argue that the demand for high-skilled, labor-intensive academic work has led to higher costs compared to other related fields which have seen increases in technology-assisted productivity. This is quite clear in research-heavy doctoral programs, which exhibit the strongest Baumol effect, while professional master's programs are open to more opportunities for scale economies through adjunct instruction and online delivery and lower costs. A fuller discussion of the theoretical and empirical literature, including discussions of higher education platforms and sophisticated Activity-Based Costing systems and dashboards; of allocation of resources by quality and cross-subsidization; and on economies of scale in higher education appears in Appendix A.

The paper is meant to be a practical guide for other IR practitioners to follow (or use as a springboard to start analysis) but also provides a theoretical framework to explain and educate when the results must be communicated and justified. The remainder of this paper is organized as follows. Section 2 introduces the three institutional archetypes used throughout the paper: Greenfield State University (large public research), Meridian Business University (tuition-dependent private), and Harrington College (endowment-wealthy liberal arts) and describes the analytical consequences of each revenue model. Section 3 develops the conceptual framework for undergraduate program analysis, with particular focus on the service-course problem and the different logic of department-level versus program-level cost attribution. Section 4 presents the graduate program framework, including professional master's programs, funded doctoral programs, and research laboratories. Section 5 addresses program closure and marginal analysis. Section 6 covers cost structure, revenue diversification, and institutional partnerships. Section 7 is a practitioner replication guide. Section 8 discusses strategic implications and recommendations by institutional type followed by the conclusion. A thorough discussion of the literature is presented in Appendix A. Simulated datasets for all three institutional archetypes are provided as a supplementary appendix for workshop participants and practitioners who wish to practice the methodology on synthetic data.

2. Three Institutional Archetypes

2.1 The Three Archetypes

Before proceeding further into a discussion of program finance and providing useful advice for financial analysis of academic programs at higher ed institutions, it is important to make explicit one of the most obvious difficulties in any such generalizable guide. This is the extraordinary array of different colleges and universities that make up the American higher education system. The challenges and questions faced by a senior IR fellow at a large public R1 land-grant university will be quite different from those faced by her counterpart at a small tuition-dependent private liberal arts college. These differences arise from how costs are allocated to students and classes, to which revenues are attributable to programs versus not, to decisions on how research dollars are made part of the equation. And this will lead to very different resulting margin figures in the institutional decision-making process. To illustrate this heterogeneity, for the remainder of this paper, I use three institutional archetypes that were deliberately constructed to represent distinct points on the revenue and cost spectrum.

The first archetype is Greenfield State University, a large public research university with approximately 35,000 students. It is a land-grant university in a large state, organized around an agriculture and life sciences school, an engineering school, a law school, and a college of arts and sciences. Greenfield State recieves roughly 40% of its operating revenue from tuition, 25% from state appropriations, and 25% from grants and contracts (primarily NIH, NSF, and USDA grants). It has a substantial endowment, most of which is restricted in ways that limit its use. Its graduate programs include funded doctoral programs in the natural and social sciences, large professional master's programs in engineering, and a dental school that operates on a semi-independent financial basis.

The second archetype is Meridian Business University. MBU is a small private institution with approximately 4,500 students, of whom roughly 2,500 are graduate students enrolled primarily in business-related master's programs - MBA (online and on-campus), an executive MPH program, and a set of specialized master's degrees in data science, entrepreneurship, marketing, human resources, and supply chain management. Meridian draws approximately 85% of its operating revenue from net tuition, making it highly sensitive to enrollment fluctuations in any major program. Its endowment is small with only a few large donation campaigns in recent years having propped it up. It also has a small liberal arts undergraduate college that is nominally separate but financially integrated with the graduate business programs, depending on the latter for significant cross-subsidy.

The third archetype is Harrington College, a small but prestigious 200-year institution. Harrington is a highly selective liberal arts college with approximately 2,800 undergraduates along with a small set of residential graduate programs in the arts and humanities (creative writing, archaeology, poetry and American studies). The institution has a large endowment relative to its size, which generates approximately 55% of operating revenue from investment returns. Its tuition revenue, while nominally high, is heavily discounted. The average net price paid by students is roughly 50% of the sticker price. Harrington does not depend on its graduate programs for financial survival; indeed, those programs operate at a persistent deficit that is understood as a strategic investment in faculty recruitment and culture, partly funded through restricted funds and donations for these specific purposes.

Institutional Type	Tuition %	Endowment / Investment %	State Approp. %	Grants & Contracts %	Other %
Highly Tuition-Dependent Private (Meridian Business University*)	75–90%	5–10%	0%	1–5%	1–10%
Endowment-Wealthy Liberal Arts (Harrington College*)	20–35%	40–60%	0–2%	5–10%	5–15%
Large Public Research University (Greenfield State University*)	18–30%	5–10%	20–35%	20–35%	10–20%

Figure 1. Revenue Model Comparison: Three Institutional Archetypes

*Archetypes are hypothetical and constructed with ranges consistent with NACUBO and IPEDS data.

2.2 Revenue Mix and Its Analytical Consequences

Figure 1 illustrates how fundamentally different these three institutions are in their financial architecture and also how difficult it is to make a general model. The composition of an institution's revenue is the primary determinant of which analytical methods are appropriate, which cost allocation approaches to consider, and when a program's contribution margin becomes a signal that demands strategic action versus one that can be noted and set aside. Understanding these downstream implications is, in some respects, the most important analytical preparation an institutional researcher can do before building a single table.

At Greenfield State, the most important consequence of the revenue mix is that tuition alone is an incomplete and potentially misleading picture of any program's financial contribution. A doctoral program in soil science, funded by USDA competitive grants, may generate no net tuition revenue - its students receive full stipends and tuition remissions that cost the institution money rather than generating it - but simultaneously produce hundreds of thousands of dollars in facilities and administrative cost recovery that flows into the university's or the laboratory's operating fund. The same program trains graduate students, who lead undergraduate laboratory sections in plant biology and agriculture, providing low-cost labor whose value to the undergraduate programs is real but invisible in any tuition-only analysis without considering the department as a whole or through some set internal transfer pricing. And the faculty who lead that program attract large grants that fund shared research infrastructure serving dozens of other programs across the college. An IR analyst who evaluates the soil science doctoral program purely on its tuition contribution will conclude it is a financial liability. An analyst who includes F&A recovery, TA labor transfer pricing, patent and licensing royalties will reach a more accurate conclusion.

The state appropriation component introduces another complication that has no equivalent at private institutions. At Greenfield State, the state appropriation is allocated internally across schools and departments through an internal budget model. It could be a performance-based model or a central allocation formula, and the way that model distributes the appropriation affects every program's margin. A department that receives a generous appropriation allocation will appear to be in a good financial position compared to a department that receives a small allocation even if the programs and departments look otherwise identical. The institutional researcher at a public university must understand the internal budget model as thoroughly as the external revenue flows, because the former shapes the latter's interpretation at the program level.

At Meridian, the consequences of an 85% tuition dependence are unambiguous. There is no grant revenue to cross-subsidize tuition-losing doctoral programs, no state appropriation to buffer the impact of a bad recruiting year, and no meaningful endowment return to allow for revenue shortfalls in programs. When a master's program at Meridian loses 20 students out of a 100-student program, that is an enrollment fluctuation that cannot be sustained in the long run and immediately there might be pressure to reduce the operating budget. The analysis might be simpler, but each decision and number must be calculated precisely. The discount rate applied to financial aid, the treatment of revenue-sharing obligations to OPM partners, the allocation of instructional cost – all these choices can shift a program's apparent margin from positive to negative or vice versa. It is imperative to be accurate because the financial margin for error is lowest.

At Harrington, the 55% endowment contribution ensures that the program contribution margin framework serves a different strategic purpose than at the other two institutions. The endowment buffer at Harrington prevents any immediate dire consequence, even for a poorly performing program. However, it is still important for accountability and maintaining an honest bookkeeping of where each program stands, so that the college's plans are strategic rather than a blank check subsidy for any and all programs that reflect faculty intellectual pursuits. Harrington drawing $800,000 to $1,200,000 from its endowment annually to sustain an archaeology doctoral program and a creative writing MFA might be making a genuine strategic choice about its endowment income or might be meeting the requirements of said restricted funds.

Considerations	Greenfield State (Public R1)	Meridian Business Univ. (Tuition-Dependent)	Harrington College (Endowment-Wealthy)
Primary revenue driver	State appropriations. + grants + tuition	Net tuition	Endowment distributions + net tuition
How quickly does the institution respond to enrollment decline?	Moderately. State funding provides a buffer; grant programs insulate some departments entirely	Immediately. Each lost student is a lost dollar with no significant institutional cushion	Slowly. Endowment absorbs short-run shocks; strategic decisions are made over years
When does a program's contribution margin become important?	When grant activity also declines; for professional master's programs, below-breakeven enrollment	At or near breakeven threshold - every program must contribute to covering shared costs	Rarely for existing programs; more relevant for new program investment decisions
Can a program with a negative margin be sustained?	Yes - if it generates F&A recovery, licensing revenues, TA and research value	Only briefly and with deliberate subsidy rationale; or strategic considerations.	Yes, with additional endowment distribution
Primary risk to program financial stability	Federal grant funding declines; state appropriation cuts, significant enrollment declines	Any sharp enrollment decline	Endowment returns volatility or mismanagement, restricted donor funds

Figure 2. How the revenues differ across institutional archetypes

2.3 Cross-Subsidization and the Program Portfolio

One of the most important insights in higher-ed (and multi-product firms in general) is the necessity of cross-subsidization within any university's program portfolio. No institution, not even the most financially disciplined tuition-dependent private, operates a portfolio in which every program covers its own fully allocated costs. Some programs will always generate contribution margins in excess of their direct and indirect costs, and some programs will always fall short. The question is not whether cross-subsidization exists, but whether the institution understands it clearly enough to manage it deliberately to match its own strategic goals.

At Greenfield State, cross-subsidization works in several directions. For example, professional master's programs in engineering, business analytics, and public health with full-tuition students, low amounts of financial aid and relatively low per-student instructional cost generate surpluses that help support the arts and sciences doctoral programs whose tuition revenue is negative or zero. This is not an accident; it is a rational and strategic institutional decision. The doctoral programs in humanities and social sciences generate intellectual diversity, the teaching assistant labor pool, and the scholarly reputation that makes Greenfield State a R1 research university rather than a state polytechnic. Cheslock and Gianneschi (2008) identify this pattern of cross-subsidization at a national scale, finding that professional schools are the primary net contributors to the internal cross-subsidies that sustain arts and sciences doctoral programs across the American research university system.

At Meridian, the cross-subsidization structure is smaller in scale but equally important in its consequences. The graduate business programs, whether the MS in Data Science, the MS in Human Resources, the MS in Supply Chain Management, generate the strongest contribution margins in the institution's portfolio, because they attract international students and employer-sponsored students, most of whom pay full tuition without institutional aid. These margins help cover a substantial share of the central administrative overhead; they subsidize the undergraduate liberal arts college whose domestic student population carries significant financial aid discount and also absorb the indirect cost burden of the smaller and less financially robust graduate programs.

At Harrington, the endowment itself subsidizes the entire institution, and within that broad subsidy, it disproportionately supports the programs and departments that could not sustain themselves on tuition revenue alone: small humanities majors, the graduate programs in creative writing and doctoral program in archaeology, the resident artists and visiting scholar programs that are central to the liberal arts college's identity and heavily marketed but generate no tuition at all. A program's contribution margin being negative isn’t necessarily a problem, because the other programs are also being subsidized.

2.4 A Preview of the Analytical Framework

The practical tool that this paper develops for measuring the contribution margin of individual programs is a simplified three-table profit-and-loss model. It is briefly sketched here before the paper separates into the undergraduate analysis (Section 4) and the graduate analysis (Section 5), so that readers have basic structure in hand before encountering the specific complications that arise in each educational context. The full development of the framework appears in the later sections, with additional explanation, and example dataset linked in the appendix.

The three-table structure is built around a simple but important principle: revenue calculations, cost calculations, and the P&L summary should be calculated and maintained as separate analytical layers, not collapsed into a single table. This separation allows flexibility for the plethora of revenue models that might be applicable for the different programs but also makes the overall P&L model correctable quickly when needed. When an issue is discovered - and they will be discovered during the development of the analysis - the institutional researcher will be poised to identify exactly which layer is affected, what its magnitude is, and which programs are affected, without rebuilding the entire model. When a methodological choice change is necessary, such as a change in the revenue-sharing ratio or an additional revenue source, those changes will advance from the relevant table to the final summary and allow for quick and clean explanations.

Table	What It Contains	What It Produces	Changes by Institution Type
Table A: Revenue	Gross tuition and fees; institutional financial aid; tuition waivers; OPM or partner revenue-share deductions; attributable non-standard revenues, grants, patent and licensing royalties, state appropriations	Net program revenues - the institution's true marginal revenue generation by the program after all discounting and revenues attributed	Greenfield adds F&A recovery and grant revenue streams. At Meridian will include OPM deductions, while Harrington will add direct endowment distribution to programs.
Table B: Costs	Instructional costs (faculty salaries and benefits); course load fractions; headcount shares for cross-listed sections or by student programs; lab and facilities costs, distributed indirect costs; direct program costs	Total direct program costs and total allocated costs, assigned to the program	At Greenfield: indirect costs must be net of F&A recovery. At Meridian: workload fractions are the critical variable. At Harrington donor-funded faculty lines may appear at zero cost to the program
Table C — P&L Summary	Net revenues minus program costs; allocated indirect costs, overall margins; enrollment headcount; margin per credit or headcount	Program contribution margin and overall margins	The summary Table is structurally identical across all three institution types; only the inputs and their interpretation differ

Figure 3. The Three-Table P&L Framework — Structural Overview

Table A calculates the program's actual revenue base. We begin with gross tuition and fees as billed to students and proceed through a sequence of deductions such as institutional financial aid, tuition waivers, and any revenue-sharing obligations to external partners to arrive at net program revenue. This breakdown of the steps also identifies key optimization levers that the programs and the institution have in terms of controlling revenue and allows individual consideration of each component. For example, institutional financial aid is a deliberate competitive investment, and programs with high discount rates such as a full-time MBA program competing for excellent applicants are trading off net revenue for higher quality students. employee and partnership tuition waivers are a benefit obligation, not a revenue source, and tracking them separately from financial aid clarifies the program's true financial contribution. In particular, if there are programs with high enrollment, but that is largely driven by non-tuition generating employees, it allows all stakeholders to be aware of the impact of this benefit. The revenue calculations also allow for other revenue sources, which for master's programs might not be common, but for graduate doctoral programs would include everything from grant overheads/indirect cost recovery and other non-standard revenues such as patent and licensing royalties.

At this stage if additional revenue sources exist, they should be added to calculate the program's net program revenue. At Greenfield State, this Table A thus incorporates non-tuition revenue streams such as F&A recovery from research grants, clinical revenue for health professions programs, and any endowment distributions or gifts restricted to specific programs. At Meridian, Table A would include the OPM deduction for online programs, which can reduce the institution's per-student revenue from an online cohort by as much as 30 to 60 percent relative to the gross figure. At Harrington, Table A is comparatively uncomplicated for most programs, but the graduate programs in creative writing and archaeology require an explicit accounting of the additional support from endowment draws that partially offsets their costs. This promotes transparency and makes clear how much the programs are valued by the university.

Table B is then used to calculate the program's costs. The primary task is allocating faculty compensation - the largest cost driver in virtually every academic program - to each program in proportion to the fraction of instructional effort devoted to it. This allocation is performed at the individual faculty member level if possible, using pay-period payroll or annual salary data combined with course assignment records and workloads, and it is the most technically demanding step. If granular faculty salary data is not available, then asking HR for average salaries by department or faculty type is the next best alternative. Table B also includes other direct program costs such as travel, marketing, administrative and clinical staff costs. Lastly, it allocates the institution's indirect costs - central administration, library, IT, facilities - across programs using either a headcount or credit-hour allocation, for overall margin calculations, but

this should only be used for reference. The distinction between costs that are genuinely avoidable if the program or department closes and costs that are simply allocated from the institutional overhead pool is critical and must be differentiated and communicated in Table B.

Table C summarizes the model. It brings in net program revenues from Table A, minus total program costs from Table B, resulting in the program contribution margin, and further subtracting the allocated indirect costs results in the overall margin. It is important to emphasize what these figures imply. A program with a negative margin on Table C may have a large positive contribution to the institution's indirect cost coverage that is being obscured by the way the overhead allocation was constructed. Similarly, a program that may have a slightly negative program margin might still be contributing positively to the health of the institution, and any closure would have a far more damaging effect. The remainder of this paper develops the framework in detail for undergraduate and graduate programs, and then extends it through scenario analysis, closure modeling, and institutional partnership advice. Readers who are most interested in the application to graduate programs can proceed directly to Section 4; readers whose primary concern is undergraduate financial analysis should start with Section 3, before proceeding to Section 5 where there is a detailed discussion on the calculation of costs for Table B.

3. Undergraduate Financial Analysis: Programs vs Departments, Service courses and the issues with revenue and cost attribution

3.1 Why Undergraduate Programs Require a Fundamentally Different Framework to Graduate Programs

The analytical framework that is relatively straightforward for a graduate Master's program financial analysis with clearly defined curricula cannot be applied directly to undergraduate programs. The reason is fundamentally different program structures. Whereas undergraduate students do not take their courses exclusively within their major, a graduate student takes almost all their courses in their department. A Computer Science undergraduate major at Greenfield State will complete approximately 120 credit hours of coursework over four years, of which perhaps 40 credits (or fewer) will be Computer Science courses. The remaining 80 credits are likely distributed across required core courses like mathematics, statistics, writing, general education requirements, and electives. If we assign the full net tuition revenue generated by that student to the Computer Science department or the Computer Science major, while assigning the costs of their non-major courses to other departments, we systematically overstate Computer Science's financial contribution and understate that of every department providing service courses. If we assign the partial instructional cost associated with teaching those courses to the Computer Science department or major, then we are methodologically sounder, but the financials and costs are now divorced from the administrative and organizational elements of the institution that are determining those costs. And then there are the political and prestige considerations in the inter-department setting.

Thus, the allocation of the revenues and costs of these general education courses and electives is not just a simple technical consideration. Consider the departments that are most essential to a functioning university curriculum and teach the most students in any given university. The Math department at Greenfield State teaches 5,000 to 6,000 undergraduates each year as part of their general math requirements and is probably one of the most financially productive undergraduate units in the institution. It teaches calculus to engineering and physics majors, statistics to social science majors and business students, and quantitative reasoning to students across the general education curriculum. Yet on a naive program-level analysis that assigns revenue only to students who declare *Math* as their major, the department appears to serve a tiny student population - perhaps 250 students in a university of 35,000 with 20,000 undergraduates. Understandably, its costs appear wildly disproportionate to the number of Math majors. Even if we assign fractional instructional costs to the students' majors, the disconnect between the department's actual instructional contribution and its apparent financial performance is one that can raise much ire.

The English and Writing department presents a similar case. Almost every large and small university has a writing requirement for undergraduates (sometimes more than a single class) that is staffed by the English department. It is likely the single most widely enrolled course in the institution in any given semester. And these classes are often capped to small sizes to provide a more enriching learning environment that allows instructors to provide direct feedback with several writing-focused professional associations such as Conference on College Composition and Communication (CCCC) and the Council of Writing Program Administrators calling for caps of 15 or 20. In our example, at Greenfield State, first-year writing might involve 200 sections each semester, each capped at 20 students, representing between 3,600 to 4,000 in enrollment, with a teaching load typically handled by a combination of tenured faculty, non-tenure-track lecturers, and graduate teaching assistants. A naive attribution of net tuition revenue to a student's program/major would completely overlook the presence and impact the English and Writing department has in the undergraduate experience. If English is not given credit for the service revenue it generates, its financial picture is severely distorted.

The solution to this problem is not straightforward, and there are three broad options.

1. The first is one I already alluded to above, a credit-hour-based revenue and instructional cost allocation to the student's program/major. The single biggest drawback is it marginalizes departments which offer popular electives and general education requirements. Imagine attending a 1,300-student Intro to Psychology class in a large auditorium as an undergraduate and the potential revenue generated by this class not being attributed to the department teaching the class even when a third of the undergraduate population is taking the class as an elective. Under this revenue and instructional cost approach, very little of this revenue would have been attributed to the Psychology department, even though it was likely the most financially successful class in the whole university.

2. The second approach would be one in which the revenue is assigned to departments based on the credit hours they teach to the students enrolled rather than the department of their program. Under this model, a mathematics department that teaches 15,000 student credit hours per year is assigned the gross and net tuition revenue for those credit hours regardless of what major the students are enrolled in. This approach correctly captures the department's instructional contribution, but it severs the link between program choice and revenue. A student's decision to major in engineering rather than mathematics generates the same revenue for the mathematics department regardless.

3. The third approach is a hybrid model that splits revenue between the granting program department and the teaching department, either through explicit transfer pricing (the major pays the service department for instruction) or through a shared revenue pool that is distributed partly to the declared majors (and their departments) and partly to the department teaching.

3.2 The Department-Level Approach for Undergraduate Analysis

Given the ubiquity of the service-course problem, and how prevalent general-ed and open electives are to most undergraduate curricula in American institutions, the latter two options are more internally coherent and less likely to distort incentives or raise misgivings among the relevant constituents. Thus, the financial analysis of undergraduate programs is ideally constructed at the department level rather than the program (major) level, and the analysis should organize revenue attribution around credit hours taught rather than number of declared students in a given program or major. As shown in Section 4, this is a significant departure from the graduate program framework, and it reflects a fundamental difference in the educational model: graduate students typically enroll specifically for their program and take most or all of their courses within a single program, while undergraduates are less certain about their particular interests, may change programs and majors, and are faced with a curriculum that is distributed.

A department-level undergraduate analysis at Greenfield State would proceed as follows. Here, the level of access to data will be important in the approach that is taken. If the institutional researcher can collect student-level tuition revenue, financial aid, enrollments, and individual faculty salaries and workload, they can calculate the net tuition revenue and cost of instruction for each student, in each class, and aggregate to the selected level. If this detailed breakdown is not available from student accounts/bursar, there are simpler alternatives too. First, calculate the total student credit hours (SCH) taught by each department in a given academic year, or if possible, broken down by course level (100, 200, 300, 400, graduate) and course type. Second, calculate a net tuition rate per credit hour which may vary by level and student type, or calculated as the institution's overall net tuition per credit hour for undergraduates, adjusted for any program-specific fee structures. Third, calculate the department's net tuition revenue as total SCH taught multiplied by net tuition per credit hour. Fourth, subtract the department's total cost (faculty salaries plus benefits, other direct program costs, department administrative salaries, other attributable indirect costs). The resulting figure is the department's program contribution margin - its net financial contribution to the institution through its teaching activity. An overall margin can also be calculated by further

subtracting the allocated administrative costs, though that figure should only be used for context and explained as such.

This approach has several advantages. It correctly recognizes the service role of departments like Mathematics, English, and even Economics which would appear as major cost centers under a declared-major revenue model but appear as significant revenue generators under a credit-hours-taught revenue model. It captures the financial consequences of enrollment shifts - a rise in engineering enrollment at Greenfield State that requires additional sections of multivariable calculus generates additional revenue attributed to the Mathematics department, even if no additional mathematics majors are declared and can be used to justify the appointment of additional tenured faculty, providing a basis for resource allocation decisions. After all, a department that teaches many credit hours to students across the university should have a stronger claim to instructional resources than one that teaches exclusively to its own small major, all else equal.

The framework thus helps identify issues that are invisible in any program/major-level analysis. Consider another example, the situation of a Political Science department at Harrington College that has twelve tenured faculty, approximately 80 declared majors, and a role providing courses to an international relations minor, a public policy certificate program, and the general education sequence '*society & us*'. Under a declared-major revenue model, the department appears to have high costs that are difficult to justify for so few students. Under a credit-hour model, those twelve tenured faculty members are teaching approximately 2000 student credit hours per year across all their course offerings, serving not just the 80 majors but also an additional 400+ students in service courses. The department's contribution margin thus calculated would look significantly different.

3.3 The Problem of Minors, Certificates, and Co-Curricular Credentials

The growth of academic minors, certificate programs, and stackable micro-credentials brings up similar issues in undergraduate financial analysis if it is driven only by a declared-major revenue model. A minor in Data Science at Meridian, for example, draws students from the business, psychology, and economics majors, each of whom is paying tuition attributed to their primary major while also consuming courses in the Data Science department. The minor generates additional enrollments, without generating additional net tuition revenue, since the student is already enrolled. From a departmental contribution-margin perspective, the Data Science department is teaching additional credit hours to students whose tuition is already attributed to another major. This creates the same resource allocation problem. If the Data Science department at Meridian is to accommodate 150 additional students by opening up additional sections and incurs additional instructional cost, at least part of the revenue must be attributed

to the department or otherwise, the department has no incentive for it to do so. This is why the credits-taught revenue model is the appropriate framework here.

The practicaly takeaway is that the rise of interdisciplinary and micro-credentials tends to increase the financial contribution of these additional departments relative to their share of declared majors, and any analysis that ignores this will systematically undervalue those departments.

3.4 Five Undergraduate Programs Across the Three Archetypes

To make this framework concrete, let's consider five undergraduate programs or departments and examine their financial characteristics across the three institutional archetypes. The goal is to identify the features that determine financial performance and the challenges an IR professional may face.

Program / Major	Institutional Type	Service Load Challenge	Key Cost Driver
Computer Science	All types	Only fraction of student credits in dept; large service to engineering, business, etc.	Lab infrastructure, tenure-line faculty in high-demand market
Nursing / Health Sciences	Tuition-dependent, regional	Minimal service obligation; students take science prerequisites in other departments	Clinical placement coordination; simulation lab; licensure exam costs
English	All types	Very high service load for entire institution	Large adjunct/NTT faculty pool for composition; tenure-line for lit courses
Mathematics	All types	High service load through calculus, statistics like English	Tenure-line plus large adjunct/TA pool; high section counts
Biology	Public research, tuition-dependent	Moderate service — pre-med requirements drive large enrollment in gateway courses	Laboratory sections are expensive per student; tenure-line research active

Figure 4. Undergraduate Program Financial Characteristics by Institutional Type

Several patterns become immediately evident. The Computer Science, Math, and English departments exemplify the attribution gap. These departments teach an enormous service load to students pursuing minors, dual degrees, and general education requirements, but if the revenue is attributed to the student's primary major rather than to CS, Math or English departments, they will consistently appear more expensive relative to the declared majors. At Greenfield State, where the Engineering school and College of Arts and Sciences negotiate transfer prices for service courses, this attribution gap is at least partially addressed. At Meridian, where such inter-unit transfer pricing does not exist, the Computer Science, Math and English faculty carrying heavy service loads appear as a cost burden. At Harrington College, the picture is a little different where the English department, as part of the humanities tradition, is central to the values of the institution that have nothing to do with its financial contribution. The creative writing MFA program – a graduate program that attracts famous visiting faculty and 'authors in residence' operates at a consistent deficit that is subsidized from endowment and restricted donor funds. The deficit does not matter at Harrington, whereas at Meridian, the same program would be unjustifiable.

This observation points to an important consideration when choosing the appropriate parameters for the model. At a highly tuition-dependent institution like Meridian, where every dollar of net tuition is required to cover operating costs, the contribution margin of each program is an important signal about institutional financial health. At Harrington, where endowment returns provide a substantial buffer, the contribution margin is one input among many into resource allocation decisions, and a program with a negative margin may be entirely appropriate.

4. Graduate Program Analysis: Revenue, Cost, and the Funded Doctoral Program

4.1 Why Graduate Programs Offer Cleaner Program-Level P&L Analysis

Before developing the analytical framework for graduate programs in detail, it is important to reiterate why the graduate analysis of the program is easier than the undergraduate context described in the earlier section. The difference lies in the design of the program curriculum. A graduate student enrolled in a hypothetical MS in Data Science program at Meridian Business University will likely complete most of her coursework within the Data Science department. This could be all 36 of 36 credits, or at most include one or two pre-approved outside electives. Thus, the department that offers her program is also the department delivering instruction for her courses, and the faculty whose salaries are being allocated to her program are, on the whole, the people teaching her in the classroom. This alignment between enrollment, instruction, and cost is what makes the program-level P&L framework quite easy to calculate at the graduate level.

This is not to suggest that graduate programs are completely free of complications, such as cross-teaching and the attribution complications described in the undergraduate context. Cross-listed courses, shared faculty between graduate and undergraduate sections, dual degrees across departments and multi-program instructors all introduce the same fractional allocation problems at the graduate level that we have encountered in the undergraduate analysis. But these are complications at the margins, for a small fraction of cases, rather than a fundamental feature, as in the undergraduate model. A graduate program financial analysis that allocates faculty costs by course load fraction and graduate headcount share will capture the instructional costs with reasonable accuracy, which is simply not true for the undergraduate analysis.

4.2 Faculty Cost Allocation

Given the availability of detailed faculty salary and university costs data, the allocation of faculty costs to graduate programs is a technically complex process. Faculty compensation is typically the largest cost driver in any graduate program, bar costs such as expensive laboratory equipment and operation costs for specific graduate programs in the sciences, engineering or health-related fields. The allocation of this instructional cost can determine whether a program appears financially healthy or financially distressed. The appropriate methodology depends on the nature of the faculty member's teaching assignment, the relationship between the teaching faculty and the program being analyzed, and - in the case of clinical programs - the relationship between the teaching and supervised practice components of the curriculum.

For programs staffed primarily by faculty who teach exclusively within that program, the allocation is relatively straightforward. Total faculty compensation, which would be salary plus benefits, with average benefits calculated by type or tenure, is assigned to the program in

proportion to the fraction of the faculty member's teaching workload devoted to that program. A professor who teaches two three-credit graduate seminars per semester, all within the same master's program, and is supposed to teach at a 2-2 load within that program, thus has her entire compensation allocated to the program's cost.

The situation becomes more complex for faculty with mixed teaching assignments. If an assistant professor in Psychology is teaching two graduate sections, and two undergraduate sections, their salaries are allocated 50% each to the undergraduate and graduate sides. A professor at Meridian who teaches one section of MBA-level organizational strategy, one section of undergraduate management principles, and two modules in the Executive MPH program each year has her costs distributed across three programs. The appropriate allocation should be a fraction of her total teaching load devoted to each program. In the financial analysis of the undergraduate programs, the costs should be assigned to the department under which the class is taught barring any internal transfer-price agreements. This is a more transparent approach than assigning costs using headcount-weighted allocation and is reflective of how teaching workloads are stipulated in faculty contracts. The analysis can be more thorough if granular student-level or student-section level tuition data is available, as the corresponding costs could then be allocated at the student-section level and aggregated accordingly. This approach has the advantage of incentivizing departments for cost-efficiencies in class sizes, penalizing low-enrollment classes by calculating a higher associated student-section cost for that class.

This approach has important implications that are important for programs in enrollment decline. A graduate program whose faculty teach exclusively within that program, whose teaching assignments have not been diversified across the curriculum, carries the full cost of those faculty when enrollment falls. A program in occupational therapy at a regional institution whose enrollment has declined from 55 students to 22 over five years still carries the full salary and benefits obligations of the faculty who were hired when the program had significantly higher enrollment. Unless those faculty members can be credibly redeployed to teach in other programs such as clinical supervision work, interprofessional health education classes, health sciences electives, the program's margin will deteriorate in direct proportion to the enrollment. Conversely, programs whose faculty teach across multiple courses and programs create a diversified revenue base for their compensation costs - a decline in one program's enrollment could be offset by stable or growing enrollment in the others, and the faculty cost does not appear as a burden on the declining program alone.

4.3 Indirect Cost Allocation: The Per-Credit and Per-Headcount Methods

Every graduate program necessitates the use of shared institutional resources, whether it's the Dean's office, central administration, library services, information technology, facilities, advising and student services, and the many other functions that are essential to the provision of higher education in a modern American university without those costs being directly assigned to any particular program. These indirect costs must be distributed across programs in any complete P&L analysis to provide context on how much programs are able to cover some of these costs form their program contribution margin. This process can be quite tedious if trying to assign a fair fraction of costs to each program, and in practice there is an argument for fairness versus ease of implementation.

Two allocation approaches are most common:

1. A headcount-weighted based allocation that assigns indirect costs to programs in proportion to their share of total institutional enrollment, on the theory that each enrolled student imposes roughly equal demands on shared services regardless of how many credits they carry.

2. Credit-hour or FTE-based allocation that assigns costs in proportion to the program's share of total student credit hours or FTE, on the theory that instructional activity is directly related to the production of credit hours, and thus strongly correlated to the demand for shared resource consumption.

Neither is universally correct, and it may well be that a mixed approach works best at some institutions, where the appropriate approach depends on the specific cost being allocated.

For example, at a tuition-dependent institution like Meridian, a credit-hours weighted allocation is probably an appropriate choice for costs related to instructional delivery such as library resources, academic computing, advising load. However, a headcount-weighted allocation is more appropriate for student services costs such as health center utilization, student affairs, career services appointments, financial aid administration, admissions. Even if institutions choose one allocation approach and apply it uniformly for simplicity, as long the choice is documented and correctly applied, the indirect costs should be somewhat consistent unless there are vastly different enrollment patterns between programs.

At Greenfield State, the indirect cost allocation problem is considerably more complex because the institution must also manage the allocation of facilities and administrative (F&A) costs associated with research grants. The federal government negotiates F&A cost rates with each research university, and the resulting indirect cost recovery that can represent hundreds of millions of dollars annually at R1 institutions, is overhead revenue that offsets the burden on academic programs. A program-level P&L at Greenfield State that allocates indirect costs but does

not account for the F&A recovery generated by that program's research activity will produce a misleading picture of the program's true financial contribution to the institution. The appropriate treatment is to show both the gross indirect cost allocation and the F&A recovery as separate line items in Table B or in Table B and Table A respectively.

4.4 Funded Doctoral Programs and Research Laboratories

Perhaps the most analytically challenging category of graduate programs is the fully funded doctoral program - the PhD in biochemistry, the PhD in comparative literature, the PhD program in civil engineering. In these programs graduate students pay no net tuition and instead receive stipends that represent direct institutional costs. In strict accounting terms, these programs have negative gross tuition revenue by construction, the institution pays students to attend.

How this is analyzed depends critically on the institutional type, and this is one of the most important instances of the general principle we have established throughout this paper. At Greenfield State, fully funded doctoral programs should be evaluated as strategic investments that generate returns through multiple channels. First, doctoral students provide low-cost instructional labor as teaching assistants, staffing the high-enrollment service sections and labs in Mathematics, Chemistry, and Biology that are essential components of the undergraduate curriculum. The value of this TA labor can be measured as the cost of replacing those sections with adjunct or tenure-track faculty. This might not immediately be a part of a standard tuition-based P&L framework but should appear in a measure of the implicit revenues of the doctoral program, either through the value of an established internal transfer price, or the implicit cost of a replacement by an adjunct faculty. Additionally, doctoral students provide research labor on faculty grants, enabling principal investigators to sustain research programs at a scale that would be impossible with faculty effort and salaried post-docs alone. Third, and most consequentially for the P&L analysis, every dollar of direct research cost funded by a federal grant generates indirect cost recovery at the institution's negotiated F&A rate, typically between 50 and 65 cents per direct dollar at major research universities. A doctoral student supported on an NIH training grant, an NSF fellowship, or a USDA research award generates F&A recovery that flows to a general fund, partially and sometimes substantially offsetting the direct cost of the student's stipend and tuition remission.

Research laboratories and organized research units present a similar challenge and warrant the same institutional-type-dependent treatment. A computational genomics laboratory at Greenfield State may carry an annual budget of several million dollars, consisting of federal and industry grants, equipment funds, graduate student stipends, and postdoctoral researcher salaries. The laboratory trains doctoral students, generates F&A recovery, produces publications that enhance the department's national reputation and faculty recruitment capacity, and

contributes to the institution's eligibility for large federal grants. It generates no direct tuition revenue. A financial analysis framework that evaluates this laboratory on the same P&L basis as a professional master's program will thus be imprecise, and it will need to account for all of these additional sources of revenue. For research labs there might be additional relevant questions that need to be answered, not just whether the instructional costs are covered, but whether its grant portfolio is growing, whether its F&A recovery exceeds the cost of the shared infrastructure costs, and how much patent and licensing royalties it is bringing in. [1]

4.5 Example Graduate Programs Across the Three Archetypes

Figure 6 provides eight example graduate programs against the three institutional archetypes, identifying the structural features that determine financial performance in each case. The table is deliberately illustrative and hypothetical, discussing some general cost dynamics for each program type, not to produce specific financial figures that would require institution-specific data.

Several patterns in Figure 6 deserve elaboration beyond what the table can contain. The MS in Data Science is the most attractive position in the graduate program portfolio with high per-student net tuition, frequent full-rate-paying international enrollment, full-time credit loads driven by F-1 visa requirements, and a delivery model that scales well. These features combine to produce strong contribution margins in favorable market conditions. The structural vulnerability, however, is equally clear - any program whose financial viability depends substantially on international enrollment is exposed to a large category of risks whether it be immigration policy,

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[1] At Harrington College, the picture is entirely different. The graduate programs in creative writing and archaeology - generate essentially no external research revenue and produce no meaningful F&A recovery unlike a R1 research university. The stipend support these programs provide to students comes primarily from endowment distributions and donor gifts restricted to those programs. The financial case for sustaining them rests on considerations that do not appear anywhere in a standard P&L analysis - the role of illustrious graduate programs in attracting distinguished faculty who would not consider positions at an institution without graduate programs, the reputational signaling to prospective high-quality undergraduate students and donors that scholarship and creative work is an important part of the Harrington experience, and the direct contribution of graduate students to the instruction of the undergraduate community in terms of TA work and seminars taught. These are genuine benefits, and only partially quantifiable in financial terms, and should be noted as such. Any attempt to evaluate Harrington's creative writing program on the same basis as Meridian's MS Data Science program will reach conclusions that are akin to comparing apples to oranges.

geopolitical instability, recession in home countries that are entirely outside the institution's control.

Program	Institutional Type	Revenue Structure	Key Cost / Complexity	Margin Characteristic
MS Data Science	Tuition-dependent private, public R1	High per-student net tuition; often 50+% international enrollment	Faculty shared with Computer Science; cost attribution across departments	Strong and profitable in stable conditions; susceptible to immigration policy shifts or external factors
MBA (Full-Time)	Business school, R1	Moderate net tuition after merit aid competition; mixed FT/PT enrollment	Adjunct-heavy or overload-based instruction; brand investment in rankings	Positive at scale (20+ per cohort); thin at small cohort sizes
MS in Occupational Therapy	Regional tuition-dependent, health-focused	Predominantly domestic enrollment; limited due to licensure demand	Clinical placement coordination is intensive and expensive; fieldwork supervisors represent direct cost	Often positive at scale; bottleneck is clinical site availability, not tuition revenue
MFA Creative Writing	Liberal arts college, small private	Low per-student net tuition; small cohort (8–15 students annually)	Distinguished visiting faculty and thesis supervision labor-intensive; low section sizes	Typically, contribution-negative; sustained by prestige, donor funding, and faculty recruitment rationale
MA Archaeology	Public R1, small liberal arts	Very low enrollment; some students on TA/RA fellowships generating no tuition revenue	High faculty mentorship ratio; excavation-season fieldwork logistics and equipment costs	Almost always negative in strict P&L; sustained by disciplinary mission, NEH grants, and F&A at R1s
DMD / DDS (Dentistry)	University-affiliated professional school	High gross tuition; patient clinic revenues are supplemental but significant	Clinical faculty at near-market dental salaries; simulation labs and clinic infrastructure; accreditation (CODA)	Highly capital-intensive; long-run viable only with patient revenue; margin sensitive to clinic and faculty turnover
PhD Programs (funded)	Public R1, private research	Zero or negative tuition; stipends and tuition remissions are direct institutional costs	RA/TA stipends; dissertation advising load; research lab access; benefits for doctoral students	Always net negative in tuition P&L; financial case rests entirely on, reputation, F&A, and TA labor value
Executive MPH (Public Health)	School of public health, R1, regional	Mix of employer-sponsored and self-funded students; many pay full rate; weekend/hybrid format	Module-based delivery with visiting practitioners; direct program costs in event logistics	Breakeven typically 14–18 students per cohort; strong positive contribution above that threshold

Figure 6. Graduate Program Financial Characteristics by Institutional Type

5. Marginal Analysis and the Closure Question

5.1 The Fixed Cost Fallacy in Program Closure Decisions

A simple mistake to make during a program financial analysis is the conflation of fully allocated costs with marginal costs in the context of the closure of a program. When a board member or administrator looks at a program margin report and sees that the MFA in Creative Writing is running at a deficit of $200,000 per year, the instinctive reaction is that closing the program would recover $200,000. However, this is a miscalculation. The correct question is not what the program costs in total, but which of those costs actually disappear when the program closes. The overall net revenue loss is, however, immediate and complete.

The cost structure of any academic program consists of two fundamentally different categories. The first is avoidable costs or variable costs. These are expenses that exist solely because the program operates and would disappear if it were closed. These include adjunct and visiting faculty who would not be reappointed, program-specific marketing and recruiting expenditures, accreditation fees that are specific to the program, dedicated administrative staff whose positions would be eliminated, and any direct program costs such as budgets, travel, and recurring equipment purchases or maintenance. These are the costs that a marginal analysis properly counts as the savings from closure. The second category is allocated costs: charges that the institution distributes to the program from its general overhead - central administration, facilities, library services, IT infrastructure - but that do not necessarily change when the program closes. None of these costs are saved by closure; they are simply reallocated to the remaining programs, which now carry a larger burden from the same shared infrastructure. But in between these costs are faculty instructional costs – tenured faculty who, unless there are drastic redundancies, might be teaching different sections and courses in other programs in the same department or different department.

Thus, the general principle that applies to all three institutional archetypes is that the revenue lost from program closure is immediate, while the cost savings are partial and often delayed. A graduate program that generates $350,000 in net tuition revenue while appearing to run a deficit one year under full cost allocation and even a small deficit in a program margin contribution analysis may still be having a positive effect on the institution’s finances. Closing it removes the revenue without proportionally removing the costs. This is the mechanism by which graduate programs even those whose fully allocated margins appear thin or negative contribute, and it is why the closure invariably produces a more negative net financial outcome than the program margin figure would suggest.

An example will help make this more concrete. Suppose the Executive MPH program at Meridian Business University enrolls 16 students in its current cohort and generates net revenues of $360,000. Its direct program costs and salaries for the professionals and tenured faculty who deliver the program, event and logistics costs for the residential weekend intensives, add up to a total of $210,000, producing a margin of $150,000. If we include the distributed share of the school's central administration costs of $140,000, a board member might see an overall margin of $10,000 and be concerned. But a decomposition of costs is far more useful. The actual avoidable costs – the cost of the adjuncts and visiting faculty, the event and logistics budget, and the dedicated program coordinator position only sum to approximately $140,000. Against the $360,000 of revenue that disappears, the net impact of closing the MPH program is a negative impact of roughly $220,000 in the institution's overall financial position. The $350,000 in allocated costs does not imply a $350,000 savings when the program closes; only $140,000 is saved and the rest is redistributed across other programs in the school.

Component	Program P&L (Current State)	Closure Impact (What Changes?)
Student net tuition revenue (16 students × ~$22,500 avg net tuition)	+ $360,000	– $360,000 Lost immediately on closure.
Tenured faculty salaries + benefits	– $70,000	Not saved. Faculty remain employed.
Adjunct salaries + benefits; Event and food	– $140,000	Avoidable: + $140,000 saved
Program Contribution Margin	= $150,000	
Distributed Indirect Costs	– $140,000	
Overall Program Margin	**= $10,000.**	Not the savings from closure.
Immediate Net Impact of Closure	**– $220,000**	– $360,000 revenue + $140,000 avoidable savings)

Figure 7. Program Margin vs. Closure Impact for Executive MPH, Meridian Business University

This has critical implications for how such analysis must be presented when communicating to a wider audience. An analysis without explicit decomposition into avoidable and allocated costs is incomplete, and likely to cause confusion, and poorly weighted decisions. A much more transparent approach where the decomposition is presented along with the net impact of closure is a better approach.

5.2 The Breakeven Framework and Its Limitations

Breakeven analysis identifies the minimum enrollment at which a program generates a non-negative contribution margin. This is one of the possible outputs of the P&L framework. It converts the financial picture from a snapshot of current or past performance into a forward-looking analysis about enrollment targets, and it provides a metric that academic administrators, admissions officers, program directors, and finance can use in discussions about program development and resource allocation.

For a program with a mix of full-time and part-time students, the breakeven headcount equals the program's total costs less any non-tuition revenue (grants, endowment and restricted donor funds, appropriations) divided by the average net tuition revenue generated per enrolled student.

Program Costs = Non-tuition revenues + Net tuition revenues

Tuition Revenues = Headcount × Avg. Net Tuition Revenues per Student

Avg. Net Tuition Revenues = [(Share FT × Avg FT Credits) + (Share PT × Avg PT Credits)]

× Net tuition per CH

$$\text{Breakeven Headcount} = \frac{Program\ Costs - Non\ tuition\ Revenues}{Avg.\ Net\ Tuition\ Revenues}$$

This also allows for sensitivity analysis or scenario analysis. Using this approach, we can plan out what might happen for the Executive MPH at Meridian with a 70 percent full-time and 30 percent part-time split, where full-time students average 24 credits and part-time students average 12, and net tuition of $1,350 per credit hour. The average revenue per student is approximately $27,540. Plugging this into our equation above, we can calculate a breakeven of roughly thirteen students with indirect costs fully allocated.

There are several important limitations here. The first is the assumptions of constant average net tuition. This might not hold in practice because the last few students recruited might need higher financial aid. The second limitation is the assumption of costs and non-tuition revenues being fixed, which might be true for certain enrollment ranges, but beyond a certain threshold as new sections are required, there is a large jump in costs. Thus, the cost function becomes a stepwise function.

Third, the breakeven analysis evaluates a program at its current cost structure, but in strategic planning, it might be hard to predict if the cost structure or demand changes, for example, the fraction of full-time to part-time students, or if recruitment costs go up.

6. Cost Structure, Revenue Diversification, and Institutional Partnerships

6.1 Cost Structure Across Institutional Types

The cost structure of academic programs is not uniform across institutional types, and this heterogeneity has important implications for the interpretation of program margin figures and for the design of institutional responses to financial pressure. The most important structural dimension is the labor cost composition: the fraction of program costs that are genuinely fixed versus variable — or, in the managerial accounting language we have been using, allocated versus avoidable — depends critically on the faculty appointment profile of the program's instructional staff, which itself reflects the institution's hiring practices, tenure culture, and reliance on contingent and clinical faculty.

At Greenfield State, a large fraction of instructional costs in professional master's programs are variable in the medium term, because these programs rely heavily on clinical faculty and visiting instructors appointed on renewable annual contracts. When enrollment declines sufficiently to justify reducing the number of course sections, the reappointment of these contingent faculty can be declined and the corresponding salary cost is genuinely avoided. This creates substantially more short-run cost flexibility than is typical at smaller institutions. The graduate programs in arts and sciences, by contrast, rely predominantly on tenure-line research faculty whose salaries and benefits obligations are fixed regardless of enrollment fluctuations. The result is an institution with internally heterogeneous cost flexibility — relatively flexible in its professional programs, quite rigid in its doctoral and research programs.

At Meridian, the balance tilts toward fixed costs even in professional master's programs. The institution is small enough that most course sections are taught by core faculty, many of whom hold tenure or multi-year contracts, and the adjunct economy that provides cost flexibility at Greenfield State is a smaller fraction of total instructional capacity. This means that Meridian has considerably less short-run cost flexibility, and that enrollment declines in individual programs carry larger per-program financial consequences. The appropriate analytical response to this asymmetry is to build breakeven analyses with explicit attention to the fixed-cost floor — the minimum allocated cost the program will carry regardless of enrollment — and to present that floor as a financial commitment the institution is making to the program that requires enrollment to justify it.

Cost Category	Avoidable on Program Closure?	Allocation Basis (Graduate)	Allocation Basis (Undergraduate)
Direct faculty salaries + benefits	Partially - adjuncts only; TT/tenured are fixed in short and medium term	Course load fraction × grad headcount share	Course load fraction × UG credit hours taught
Program director / chair stipends	Partially - leadership costs may persist across programs	Fully to program if dedicated; shared pro-rata if multi-program	Pro-rata across department courses taught
Distributed indirect costs (central admin, IT, library)	No - largely fixed; reallocate to remaining programs	Headcount percentage of total graduate enrollment	Credit-hour percentage of total undergraduate enrollment
Facilities and space costs	Only if dedicated space is physically vacated	Dedicated program space + pro-rata shared space	Classroom utilization rate × credit hours delivered
Advising and student services	Partially - FTE-linked; some positions survive closure	Graduate student headcount	Undergraduate student headcount
Clinical placement coordination	Yes, if dedicated staff or stipends to preceptors	Direct program attribution; per-rotation cost	N/A for most UG programs; applicable in Nursing, Allied Health
Marketing and recruiting	Yes — program-specific campaigns are fully avoidable	Direct program attribution	Direct major attribution; shared general marketing pro-rata
Research and lab infrastructure (R1)	No — grant-funded labs persist; central research infrastructure is fixed	F&A recovery offset against program cost; RA stipends direct	Undergraduate research program allocation

Figure 8. Cost Allocation Framework by Category and Institutional Type.

6.2 Online Program Managers and Revenue-Sharing Partnerships

The growth of Online Program Manager arrangements over the past decade has introduced a new element in a typical graduate program's revenue structure. Under a typical OPM arrangement, the external partner - companies such as 2U, Keypath, Wiley Education Services, and others - provides marketing, recruiting, learning management system support, and often student services for an online version of a graduate program, in exchange for a share of net tuition revenue that typically ranges between 30 and 60 percent. From an enrollment perspective, the partnership may

appear to grow the program substantially. But the institution's net revenue per online student may be less than half of what it receives from an equivalent on-campus enrollment, and any analysis that does not make this distinction explicit will systematically overstate the program's financial performance. The correct approach is to deduct the OPM revenue-sharing obligation from the online segment's net tuition before constructing the program's revenue figure, and to report the gross and net figures side by side so that the institutional revenue from the online segment is clearly visible and differentiated.

Consider a hypothetical online Master of Public Health program at Meridian where an OPM partner recruits students and provides some technology or shared LMS infrastructure in exchange for 40 percent of net tuition. If a given cohort of 30 online students generates gross net tuition of $600,000, the institution's actual revenues total $360,000. This is substantially lower than the gross figure, and may even be below the level required to cover the program's fixed faculty and overhead costs even at a moderately generous enrollment level. An analysis that uses the first figure will give the program an apparently healthy margin; any analysis that uses the latter figure will correctly identify the program's true financial impact.

OPM arrangements also introduce contractual risks that extend beyond the current year's revenue calculation. These contracts typically run for multiple years, often with minimum enrollment guarantees or early termination penalties that can represent millions of dollars in liability. An institution that signs a long-term OPM contract when online delivery is expensive relative to what the partner can provide may find, several years later, that the cost of in-house delivery has fallen substantially.

6.3 When Ideal Data Is Unavailable

The analytical framework described in this paper assumes access to detailed payroll data, student-level financial aid records, and program-level enrollment data, as well as any other relevant additional data such as grant contracts and revenue breakdowns. While this data infrastructure is likely available at most large research universities and at a growing share of mid-size institutions, this might be beyond the reach of many smaller colleges, community colleges, and institutions outside the United States that may wish to adapt this framework. When ideal data is unavailable, the limitations should shape the methodological choices, but not prevent the analysis itself.

The most important principle in data-constrained analysis is explicit documentation of any assumptions and an honest discussion about their implications. Every major approximation such as the estimated fringe benefits rate, the average aid discount applied uniformly to all students in a program rather than at the student level, pooling some program-specific overhead costs with the institution’s indirect and administration costs, introduces small errors into the resulting

margin figure. While documenting this is easy enough, an honest discussion should involve some level of sensitivity analysis. After constructing the model using available and most plausible approximations, the institutional researcher should also vary the relevant assumption across a plausible range and identify how the conclusion changes. A program whose contribution margin is positive across the full range of assumptions is genuinely robust; a program whose margin changes sign with just a few tweaks of the assumptions has some uncertainty associated with the financial impacts of that program.

When detailed payroll data is unavailable, and if HR is reticent about sharing individual salary information, annual approximate salary by department and position could be a defensible substitute. This would be with the explicit acknowledgment that mid-year appointments, overloads, and large departmental variations may be misclassified. When student-level aid data by program is unavailable, applying an institutional average aid discount rate by enrollment category (domestic full-time, domestic part-time, international) is a reasonable approximation that becomes less accurate if program-specific aid strategies diverge significantly from the institutional average. When program-specific indirect cost data is unavailable or overly tedious, an allocation using headcount from the total institutional costs is a good alternative. Each of these approximations reduces precision, but none of them prevents the analysis from being useful.

7. Building the Analysis: A Practitioner's Guide

7.1 The Five-Step Workflow

Having developed the conceptual framework in the preceding sections, we turn now to the practical question of how an institutional researcher or finance professional actually builds this analysis from raw institutional data. The workflow below has been developed and refined iteratively through several years of implementation at a mid-size private university and has been repeated multiple years, with various extensions and applications. The framework should be considered a starting point that will require adaptation to the specific data systems and organizational context of any institution.

Step one is data collection, and it is the most organizationally demanding step in the workflow. The IR analyst needs four categories of source data: payroll/annual salary records including benefits, and faculty workload data; tuition and fee billing records by student and course for each term including any non-standard terms along with financial aid award data; any additional revenues, revenue-sharing agreements, or related costs that result from the program, such as grants, lab operational costs etc.; and central indirect costs with a pre-agreed allocation basis and calculation method to distribute it across programs and departments. The most important consideration at this stage is completeness. It is important to ensure that a model is not built on incomplete data that omits a term, or misses the cost of adjunct appointments, or does not appropriately collect and identify an OPM revenue-sharing agreement as this will produce answers that are incorrect.

Step two is constructing Table A, i.e. revenue calculation. Beginning with gross tuition and fees, a cascade of deductions that include institutional financial aid at the student level if possible, tuition waivers, OPM revenue-sharing, and adding any non-standard revenues produces the net program revenue. Each deduction or addition should appear as a separate column in the Table, not aggregated into a single net figure. This approach allows the analyst to identify easily which component of the revenue calculation changed when the margin figure changes from year to year. This is an essential capability that is particularly important when communicating the reasons for margin changes to relevant stakeholders such as program directors and deans who will naturally ask why their program looks different from last year.

Step three is faculty cost allocation. The analyst aggregates the relevant fraction of total salary from pay-period data or annual data, applies the standard fringe benefits rate, and then maps each faculty member to their course assignments for the year based on the expected workload as per their contract or university's standard contracts. If there are overloads or course releases for faculty, appropriate and consistent rules need to be applied to how they are treated. For courses

with mixed graduate and undergraduate enrollment, the headcount share is calculated and used to prorate the fraction of that course's cost that belongs to the graduate program versus undergraduate program.

Step four is indirect cost allocation. The analyst obtains the total indirect cost pool from Finance, confirms the agreed allocation basis, calculates each program's share, and adds the resulting distributed indirect cost to the direct faculty costs from step three. Step five is P&L assembly: total allocated cost equals the sum of direct and indirect costs, and overall program margin equals net tuition minus waivers less total allocated cost.

7.2 A Worked Example

The example that follows is drawn from a cross-listed seminar in the Department of Anthropology at Harrington College, designated ANTH 312. The course enrolls seven students: three undergraduates from different degree programs and four graduate students enrolled in three distinct graduate programs. The faculty member teaching the course, Professor Chen, is a tenured associate professor with a standard 2-2 teaching load and total annual compensation of $117,760 including benefits. ANTH 312 is one of four courses Professor Chen teaches in the academic year, meaning that precisely one-quarter of her annual compensation of $29,440 is attributable to this section.

The enrollment composition of ANTH 312 is shown in Figure 6. Three features of this roster are worth noting before the cost allocation is performed. First, the undergraduate students come from three different degree programs: Anthropology, Political Science, and History. Under the credit-hour-based revenue attribution model advocated in Section 3.2 of this paper, it is the Anthropology department that receives the revenue credit for this instruction, not the students' declared majors. Second, student S02, a Political Science major, holds a full institutional scholarship and generates zero net tuition revenue; yet her enrollment consumes one of seven seats in the section and contributes to the headcount base against which Professor Chen's salary is allocated. Third, students S06 and S07 are funded doctoral students whose tuition is fully remitted by the institution; like S02, they generate zero net tuition revenue, and like S02, their enrollment is not costless.

ID	Level	Major / Program	Gross Tuition	Aid / Remission	Net Tuition	Note
S01	UG	Anthropology	$4,500	$1,800	$2,700	Partial institutional aid
S02	UG	Political Science	$4,500	$4,500	**$0**	Full scholarship — zero net revenue
S03	UG	History	$4,500	—	$4,500	No aid — full price
S04	**GR**	MA Anthropology	$5,500	$800	**$4,700**	Partial aid
S05	**GR**	MA Global Studies	$5,500	—	**$5,500**	No aid — full price
S06	**GR**	PhD Anthropology	$5,500	$5,500	**$0**	Funded PhD — full tuition remission
S07	**GR**	PhD Anthropology	$5,500	$5,500	**$0**	Funded PhD — full tuition remission

Figure 9. ANTH 312 Enrollment and Net Tuition by Student

The allocation of Professor Chen's $29,440 section cost across the enrolled students proceeds in two stages, following the proposed methodology described in Step 3 of the replication guide in Section 7 of this paper. In the first stage, the cost is divided between the undergraduate and graduate student populations according to their respective headcount shares within the section. With three undergraduate students and four graduate students in a total enrollment of seven, the undergraduate share is 3/7 (43%) and the graduate share is 4/7 (57%). This yields $12,617 attributed to the undergraduate side of the section and $16,823 attributed to the graduate side. The undergraduate portion flows into the Anthropology department's instructional cost pool under the credit-hour attribution model, to be set against the net tuition revenue those three students generate for the department. The graduate portion must be further divided among the three graduate programs represented in the section.

In the second stage, the $16,823 graduate cost is allocated across the three graduate programs by their relative headcount within the graduate student population. MA Anthropology has one enrolled student, MA Global Studies has one enrolled student, and PhD Anthropology has two enrolled students — giving each program a headcount fraction of 1/4, 1/4, and 2/4 respectively. Applying these fractions produces an allocated cost of $4,206 for MA Anthropology, $4,206 for MA Global Studies, and $8,411 for PhD Anthropology. These allocations can then be compared against the net tuition revenue each program generates from its enrolled students to produce a section-level contribution margin for each program.

Program	Students	Cost Allocated	Net Tuition	Section Contribution Margin
Undergraduate (aggregate)	3 students	$12,617	$7,200	+$4,583 (distributed across 3 UG departments via SCH model)
MA Anthropology	1 student (S04)	$4,206	$4,700	**+$494**
MA Global Studies	1 student (S05)	$4,206	$5,500	**+$1,294**
PhD Anthropology	2 students (S06–S07) Funded — full remission	**$8,411**	**$0**	**−$8,411 (bears 50% of graduate cost with zero revenue contribution)**
Section total	7 students	**$29,440**	**$17,400**	**−$12,040 (section runs at a deficit — this is expected for a small seminar)**

Figure 7. ANTH 312 -Cost Allocation and Program Contribution Margins

The MA Anthropology and MA Global Studies programs each produce a small positive contribution margin from this section even though both are small programs by enrollment. These margins are modest in absolute terms. The PhD Anthropology program, by contrast, produces a section-level deficit of $8,411 despite having the largest headcount share among the three graduate programs as expected. When an institution commits to funding its doctoral students, it simultaneously commits to bearing the instructional cost those students generate without the offsetting revenue that tuition-paying students provide. The cost is not avoidable. The section as a whole runs at a deficit of $12,040. This result might initially appear alarming, but it should be interpreted carefully. A single cross-listed seminar with seven students and a tenured faculty member's full teaching load is not expected to cover its fully allocated cost from section revenue alone. In fact, this is likely a structural feature of small seminar-format instruction at a liberal arts institution, and it is one of the reasons Harrington College depends on endowment income to subsidize a significant fraction of its instructional costs. The appropriate unit for evaluating financial performance is not the individual section but the program or department across its full portfolio of sections, some of which are larger introductory and gateway courses that cross-subsidize the smaller advanced seminars.

7.3 Communication and Governance

The most technically rigorous program financial analysis will fail to influence institutional decisions if it cannot be communicated to the audiences responsible for those decisions. This is a fundamental requirement of analytical practice that is frequently underemphasized in the methodological literature. The principles described here emerge from direct experience of what happens when program financial data is released without adequate framing, context, or audience stratification.

The first principle is audience-stratified reporting. Board members and senior administrators need a concise executive summary in which the key findings are stated in plain language, the avoidable cost is explicitly discussed along with any margin calculations, and the distinction between the program's contribution margin, overall margin and the estimated closure cost is differentiated. Program directors and deans need a more detailed program-level breakdown with trend data, enrollment context, and a detailed discussion of methodology because they are likely to ask detailed and challenging questions regarding some of the underlying assumptions of the model. Finance and IR staff need the full technical documentation including all data sources, additional intermediate tables, workload allocation decisions, indirect cost basis etc. These three different versions serve different purposes and different audiences.

The second principle is framing of counterfactual results. Any analysis that includes closure scenarios, breakeven thresholds, or deficit calculations will be read by at least some recipients as implicit guidance about what actions are being recommended. The analyst needs to ensure that it is stressed that the analysis is an accounting-based approach using historical data and not predictive in nature. Otherwise, presenting this data may generate confusion, defensive reactions from program directors, and institutional political dynamics that impede the decision-making process the analysis was intended to support. The clearest such framing is that these analyses show what the financial consequences of various scenarios would be and the historical pattern, assuming costs and revenues behave as modeled; they do not imply that any of those scenarios should occur.

The third principle is documenting changes. Program financial data changes over time: enrollment fluctuates, faculty positions turn over, departments consolidate and curricula change, and methodological corrections are necessary. Every time a margin figure changes from a previously communicated version, whether the change is due to new data, a corrected error, or a methodological improvement, it must be documented and communicated proactively to all stakeholders who received the prior figure. Allowing a program's apparent financial status to change without explanation between one presentation and the next will undermine confidence in

the entire analysis and can attract the kind of politically motivated questioning of methodology that the transparency of the framework is intended to prevent.

8. Conclusion

The financial analysis of academic programs is, at its best, a form of institutional self-knowledge — a structured and transparent attempt to understand the economic architecture of the university and to make that architecture legible to the people responsible for sustaining it. It is not, and should not be, a mechanical exercise in applying revenue-minus-cost formulas to rank programs by apparent profitability and discontinue those at the bottom of the list. The economics of multi-product firms, marginal analysis, and contribution margin accounting together point toward a more nuanced and more useful analytical practice: one that distinguishes carefully between fixed and variable costs, between short-run and long-run marginal analysis, between the contribution margin of a program and the fully allocated cost figure that appears in standard accounting reports, and between the avoidable costs that are genuinely saved by closure and the overhead that simply redistributes itself across the remaining portfolio.

The three institutional archetypes that have structured the analysis throughout this paper — Greenfield State University, Meridian Business University, and Harrington College — are artificial constructions, but they represent real institutional logics that any practitioner will recognize. They differ not merely in size or wealth but in the fundamental economic structure that determines which financial metrics are informative, which program decisions are genuine trade-offs, and what analytical framework is appropriate for the questions being asked. A contribution margin calculation that reveals genuine financial distress at a tuition-dependent institution like Meridian is a signal about the institution's short-run viability; the same calculation at Harrington, where endowment income provides a structural buffer, is a signal about the cost of a programmatic commitment that leadership is making deliberately and with full information. The appropriate analytical response to a negative contribution margin is therefore not the same at both institutions, and the practitioner who presents identical recommendations regardless of institutional type has not yet internalized the most important lesson of the analysis.

The undergraduate program analysis developed in Section 3 adds a dimension to the practitioner literature that has been underemphasized in existing work on program financial analysis: the service-course problem. This is not a minor complication but a fundamental structural feature of the undergraduate higher ed model that makes declared-major revenue attribution analytically unsound as a basis for resource allocation decisions. The mathematics department that teaches 15,000 student credit hours annually, where the majority to students who will never declare as mathematics majors, is doing financial work for the institution that is

invisible in any analysis organized around declared majors. Making that work visible — through a credit-hour-based revenue attribution model that assigns income to the department that delivers instruction rather than the program that enrolls the student — is both technically feasible and institutionally important.

Finally, the governance and communication principles articulated in Section 8 reflect a practical reality that the methodological literature tends to underemphasize: the quality of the analysis is a necessary but not sufficient condition for its institutional impact. The best contribution margin framework in the world generates no organizational benefit if its results are misinterpreted as closure recommendations, presented to boards without the fixed-cost narrative, or deployed by administrators who have already made their decisions and are looking for analytical cover. Building the vocabulary, the institutional relationships, and the reporting norms that allow program financial data to be used well is slow, incremental work — but it is work that falls directly within the institutional research mission, and it is ultimately what distinguishes a program financial analysis practice that influences strategic decisions from one that simply fills a reporting requirement.

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Appendix A: Theoretical Foundations and Expanded Literature Review

This appendix contains an expanded theoretical and literature review that originally appeared as Section 2 of the paper but had to be shortened for brevity in the paper itself. It is reproduced here in full for readers who wish to follow the theory in detail. The main text of the paper presents a condensed two-page synthesis of this material in Section 1.

A.1 The University as a Multi-Product Firm

It is important for any rigorous analysis of university program finances to start with the recognition that a university is not a simple single-product firm. It is a multi-product firm that produces a variety of outputs. This includes undergraduate degrees, graduate degrees, research publications, patents, clinical services, continuing education, and public engagement. In a broader sense, universities also provide ancillary services that are now an essential part of many students' college experience — dining, housing, athletics, alumni engagement. And all of this is done using the same shared inputs: faculty, administrative staff, physical infrastructure and land, and institutional reputation. The theory of multi-product firms, developed in the industrial organization literature, thus provides an excellent springboard for this analysis (Becker and Lewis, 1992).

The standard conditions for efficiency in a multi-product firm involve economies of scope: the cost of producing two goods jointly is less than the cost of producing them separately. Without diving too deep into the economics of industrial organization, this means it is cheaper for an institution to offer both an undergraduate and a graduate degree in Psychology, for example, than to have two separate institutions producing these two degrees. And universities exhibit precisely these features. Faculty members who teach graduate classes also deploy some of the same capabilities in their undergraduate teaching; research laboratories that train doctoral students simultaneously produce journal publications while doctoral students staff undergraduate sections. Or consider the reputation built by a highly ranked MBA program attracting applicants to other master's programs at the same business school, such as Public Administration or Human Resources. This logic extends further still — the residential university experience, a core component of undergraduate life, is better coordinated and delivered by the institution that owns the building than by dozens of private contractors. Titus, Vamosiu, and McClure (2016) find empirical evidence for economies of scale and scope in undergraduate education and some diseconomies of scale in graduate education in their study of public master's universities.

Bernard, Redding, and Schott (2010) show that optimizing large multi-product manufacturing firms offer many products, make profits on a few, and change their offerings quite

dynamically in response to market conditions and demand. This is called 'product switching,' and an obvious question is how prevalent this is in the higher education landscape. A growing empirical literature suggests that universities behave similarly, if at a slower pace and with considerably higher switching costs. Conzelmann et al. (2024), using institution-major-level labor demand data matched to alumni outcomes, find that the four-year sector does respond to labor market shifts in its degree and credit offerings, estimating response elasticities centered around 1.3 that grow with the time horizon — confirming that the response is real but delayed. Light (2025), examining over 700 course catalogs dating back to 1998, finds that universities' adjustment to course supply is inelastic in response to changes in student demand, and that existing course content remains largely unchanged while newly created courses drive the offering of new certificate programs, majors, and minors, and the retirement of those that have fallen out of favor.

Manova and Yu (2017) extend this analysis to quality heterogeneity in multi-product firms, showing that firms optimally allocate their highest-quality inputs to their highest-value products. In a university context, this implies that a rational institution allocates its most productive senior faculty to its high-value programs, not necessarily to its highest-enrollment programs. An important distinction must be made here — high value does not necessarily equate to revenue generation. This has direct implications for cost allocation and the calculation of program financial health. A highly paid senior professor who teaches one doctoral seminar and one large undergraduate lecture is not inefficiently deployed from the department's or the university's perspective if she is a highly productive researcher who attracts doctoral students and grants. Any cost accounting exercise that assigns the full salary to the undergraduate course and doctoral seminar without accounting for the grant revenue and F&A recovery she generates will produce a misleading result. Context is critical, and the methodological approach applied here must accommodate it.

Cohn and Cooper (2004) provide one of the more careful applications of multi-product cost theory to higher education, estimating a flexible cost function for U.S. universities and finding significant economies of scale and scope across the research and instruction outputs. Their work confirms the intuition that the joint teaching and research production arises out of an optimizing, cost-minimizing choice by the institution itself. For institutions where both instruction and research are vital - a department at an R1 institution with a large undergraduate enrollment and an active doctoral and research program - any attempt to evaluate either output in isolation is imperfect and should ideally incorporate both dimensions.

A.2 Marginal Analysis and the Contribution Margin Framework

Like most economists approaching the question of program financial viability, I lean toward the tools of marginal analysis. In the short run, a program does not need to fully covers its allocated indirect costs, but rather its marginal costs to justify existence. These marginal costs are the additional costs the institution incurs specifically because the program exists, and which it would avoid if the program closed. For practitioners in finance offices, the parallel concept is the contribution margin framework, borrowed from managerial accounting and product costing in manufacturing. A product's contribution margin is its revenue minus its variable (avoidable) costs; a positive contribution margin means the product is contributing to covering fixed overhead, even if it does not generate sufficient revenue to cover its full cost allocation.

The application of this marginal analysis to academic programs is not new. Middaugh (2001) used it as early as the turn of the millennium in his work on instructional costs and faculty productivity across academic fields, and it has since become standard in activity-based costing approaches to higher education. The basic structure is intuitive: every program has some costs that are genuinely avoidable if it closes — salaries of adjunct faculty who would not be reappointed, direct program costs like marketing and accreditation fees, dedicated administrative staff, technology costs, and in the physical sciences, laboratory consumables. These avoidable costs represent the true short-run marginal cost of the program. The remaining costs — tenured and tenure-track faculty salaries, shared administrative infrastructure, facilities — are fixed in the medium term regardless of whether the program operates. One caveat: 'short term' and 'medium term' are inherently fuzzy concepts. Institutions have offered buyouts, early retirements, and mass layoffs in response to severe financial pressure. But such examples are typically responses to existential financial circumstances, not routine program decisions. Generally, a program with a positive contribution margin is financially preferable to its absence, even if its fully allocated overall margin is negative — because the alternative is almost always worse.

The finance literature is explicit on this point: the decision to continue or discontinue a product should be made on the basis of its avoidable costs, not its fully allocated costs (Horngren, Datar, and Rajan, 2015). Yet in practice, university boards and administrators may be acting on fully allocated margins, only to be surprised by the financial consequences later. Institutions may over-attribute financial distress to programs that are in fact contributing positively to institutional cash flow, and systematically underestimate the true cost of closure. This paper is, in part, an attempt to correct that bias through transparent methodological documentation.

A further distinction relevant to the university context is the difference between short-run and long-run marginal costs. In the short run, the marginal cost of enrolling one additional student in an existing program with excess capacity is very low — a marginal increase in advising load, a

small increment of administrative overhead, some technology costs. In the long run, additional enrollment generates pressure to hire faculty and expand facilities, which involve genuinely incremental costs. The reverse is also true: enrollment declines do not immediately reduce costs. The implication for breakeven analysis is that a program under financial stress at its current enrollment may be quite viable at modestly higher enrollment, and the relevant question is whether the institution is willing to invest in enrollment-building — and whether there is a realistic demand for the investment to meet.

A.3 The Higher Education Finance Literature

The higher education finance literature offers a parallel and complementary tradition of program-level analysis, though it has historically been more descriptive than prescriptive. Bowen's (1980) revenue theory of cost proposes a contentious hypothesis: universities raise all the money they can and spend all the money they raise. This implies that institutional costs are primarily revenue-driven rather than efficiency-driven — costs rise when revenue rises and fall only when revenue falls. The political economy logic is clear: higher education institutions are not-for-profit organizations with no requirement to provide dividends, and their decision-makers optimize for excellence, prestige, and rankings rather than for margin. These incentives align with higher spending. The empirical evidence for Bowen's hypothesis is mixed: Martin and Hill (2014) find evidence for Bowen effects in public research universities, while Archibald and Feldman (2011) find evidence against them. The practical implication for program analysis is that even large, growing programs may tend to accumulate cost at or near the rate at which they generate revenue unless actively managed against that tendency.

Archibald and Feldman offer an alternative explanation for higher education cost escalation: the Baumol cost disease, in which the demand for high-skilled labor in labor-intensive institutions drives up costs without the productivity gains seen in other industries. At the program level, this has differential effects. Research-active doctoral programs exhibit the strongest Baumol effect, since their primary input — tenured faculty research productivity — is fundamentally labor-intensive and resists efficiency improvement. Professional master's programs are more amenable to scale economies through larger classes, adjunct instruction, and online delivery, though these efficiencies involve their own quality trade-offs.

The literature on program review and discontinuation is less extensive than one might expect given the practical stakes. Dickeson's (2010) framework for prioritizing academic programs is widely used in practice but is explicitly qualitative — it rates programs on dimensions like quality, centrality to mission, and external demand, with only a limited role for financial metrics. Cheslock and Gianneschi (2008) document the pattern of cross-subsidization between professional schools and arts and sciences doctoral programs at a national scale, finding that professional programs —

particularly business and engineering — are the primary net contributors to the internal subsidies that sustain humanities and social science doctoral programs across the research university system. This cross-subsidization is not a flaw in the financial architecture; it is a deliberate institutional arrangement. The contribution margin framework makes it visible and quantifiable.

A.4 Dashboards, KPIs, and the Analytics Infrastructure

The rise of institutional analytics platforms and business intelligence dashboards has significantly changed the context in which higher education data is viewed and acted upon. Where a decade ago an IR analyst might produce most financial reports once a semester, today's institutions increasingly expect near-real-time dashboards. Universities routinely maintain Power BI, Tableau, or internal SIS dashboards with program, enrollment, admissions, and outcomes data updated live or daily. This creates both opportunities and risks. The opportunity is clear: quick data enables faster response to emerging issues. If an international student enrollment decline is identified in September rather than the following May, the institution has time to adjust recruiting strategy, manage faculty workloads, and reallocate resources. The risk is equally real: faster data enables faster misinterpretation, premature conclusions, and overreaction. Financial planning and cost incurrence also play out over academic-year cycles, which makes integrating live financial cost data into a frequently updating program-margin dashboard genuinely challenging.

The rise of Activity-Based Costing systems and commercial higher education analytics platforms — including tools such as Helio Campus and Huron — has generated increasingly sophisticated program-level margin reports, providing interactive dashboards that break down calculations to the student-course level. These systems are technically well-polished. But it is important that their outputs not be misinterpreted by administrators, precisely because the distinction between contribution margins, avoidable costs, and fully allocated costs is essential to understanding the financial consequences of program decisions. This paper attempts to bridge the gap between the theoretical literature and the practitioner analytics tradition by providing both the conceptual grounding and the methodological guidance that these platforms often lack.

Pascarella and Terenzini (2005), in their comprehensive review of the college impact literature, observe that data in educational organizations tends to be used politically as much as analytically — introduced into strategic deliberations to support positions already formed, rather than to form positions through genuine inquiry. This concern applies with particular force to program financial data, which is often introduced into program review discussions precisely when closure or restructuring decisions have already been informally settled. The methodological transparency advocated in this paper is, in part, a structural response: when the assumptions underlying a margin, figure are clearly documented and accessible to all relevant stakeholders, it

becomes considerably harder to selectively invoke the data to support a predetermined conclusion.

Appendix B: Professional Degree Programs - The Dentistry School Problem

Professional doctoral programs such as the Doctor of Dental Medicine (DMD), Doctor of Dental Surgery (DDS), Doctor of Medicine (MD), Doctor of Pharmacy (PharmD), Juris Doctor (JD) present a financial analysis challenge that differs from professional master's programs. These programs operate with cost structures and revenue models that can be quite non-standard.

The dental school (or even the medical school) is a useful example, because its financial model is distinctive. A dental school has three categories of cost that do not appear in a conventional graduate P&L analysis. The first is clinical faculty compensation. Unlike tenure-line arts and sciences faculty, clinical dental faculty are typically compensated at rates that reflect — at least partially — the market salaries available in private dental practice. A clinical professor in restorative dentistry who could earn $280,000 per year in private practice will not accept a faculty position that offers $90,000. The resulting compensation structure is expensive per faculty member and is largely fixed regardless of student enrollment, because clinical teaching ratios must be maintained to satisfy Commission on Dental Accreditation (CODA) requirements that mandate small group sizes in clinical instruction.

The second distinctive cost category is simulation and clinical infrastructure. Dental education requires simulation laboratories equipped with dental chairs, digital radiography systems, and patient simulation mannequins before students' progress to treating live patients in supervised clinic settings. These capital investments — which run into the tens of millions of dollars at most dental schools — must be maintained, updated, and eventually replaced on a cycle that is determined by accreditation requirements and the pace of technological change in dental practice, not by enrollment trends. The per-student cost of simulation infrastructure is high when enrollment is small and becomes lower as enrollment grows, but it does not approach zero. More importantly, this cost is largely invisible in a headcount-weighted based indirect cost allocation, because the simulation labs are a direct program cost rather than a shared institutional overhead — they would not exist if the dental school did not exist, and they cannot be repurposed for other programs if the dental school's enrollment declines.

The third distinctive feature of the dental school P&L is the role of patient clinic revenues. Dental students treat patients under faculty supervision beginning in their second or third year, and the clinic charges fees for these services — generally at a discount to market rates — that represent a significant revenue stream that does not appear in any tuition-based analysis. At a well-managed dental school with strong community relationships and efficient scheduling, patient clinic revenues may cover a significant fraction of the clinical instruction cost, meaningfully improving the program's contribution margin relative to a model that considers only

tuition revenue. But clinic revenues are sensitive to factors that are outside the school's control: patient volume, insurance reimbursement rates, the pace at which students develop clinical competency, and the efficiency of faculty supervision. A dental school that loses a major community health partner, experiences a sharp decline in clinic patient volume, or faces CODA-mandated reductions in faculty-to-student ratios will see its clinic revenue fall and its per-student clinical instruction cost rise simultaneously.

At Greenfield State, which we have constructed as having a dental school operating within its College of Health Sciences, the financial analysis must therefore include four revenue streams: tuition, clinical fees, research grants (periodontology and oral biology faculty regularly attract NIH funding), and state appropriations for the public health component of the clinic's patient service mission. In any analysis we must explicitly decompose costs between the academic and clinical components of the program. The academic component such as instruction, simulation labs, and basic science teaching can be analyzed using the three-table framework with appropriate adjustments for the compensation premium of clinical faculty. The clinical component requires a separate analysis that incorporates patient volume, billing and collections efficiency, faculty-to-student ratio requirements, and the cost of maintaining CODA accreditation. Combining these two analyses to calculate a unified program P&L requires collaboration with the dental school's clinical operations staff in a way unlike with a typical professional master's program financial analysis.

The broader lesson here is that certain professional programs with significant clinical or practice components require analytical frameworks that extend beyond the standard P&L structure and might require a two-tiered approach. This is likely true for professional programs such as nursing, pharmacy, physical therapy, veterinary medicine, and social work which all have clinical placement or supervised practice requirements that introduce direct costs, revenue streams, and capacity constraints that do not appear in a tuition-based contribution margin analysis.