

ABSTRACT

Title of Dissertation: EXPLORING THE IMPACT OF EXPENSE
DISAGGREGATION AS A FINANCIAL
MANAGEMENT TOOL IN PUBLIC
INSTITUTIONS OF HIGHER EDUCATION
THROUGH A MIXED METHODS
APPROACH

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This mixed methods dissertation investigates the impact that cost-disaggregating tools like the Delaware Cost Study (DCS) have on the expenditure patterns at large, public research universities. It draws on public budgeting and higher education finance literature to form a theory of action that hypothesizes that expense management at such institutions will result in the internal realignment of resources but will not alter the total amount spent. The quantitative model employs a 15-year panel data set comprised of financial and operational activity data for 69 R1 universities to tests the influence of DCS participation against this idea. The primary quantitative outcome shows that total costs are indeed not altered by cost disaggregation efforts, but that spending at universities employing such approaches is, on average, higher for Instruction and Scholarships and lower for Institutional Support and Student Service activities than the spending at non-DCS participants. The results inform the

contrasting case selection strategy that highlights three similar constituted universities with differing quantitative results in an extensive interview-based qualitative analysis.

The interviews detail the varied positive and negative outcomes of the use of DCS and similar tools, sheds light as to why the quantitative results occurred at each university, and documents the commonalities. Recommendations derived from the combined results of the two research methods signal key tenets that policy makers may utilize to enhance the effectiveness of public financial management for large, complex state-sponsored universities.

EXPLORING THE IMPACT OF EXPENSE DISAGGREGATION AS A
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OF HIGHER EDUCATION THROUGH A
MIXED METHOD APPROACH

by

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Dedication

With enduring gratitude to Julianna Baker for the light she brings into the world and Cordelia Baker for inspiring me every day.

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List of Abbreviations

Carnegie Classification of Doctoral Institutions of Highest Research (R1)

Delaware Cost Study (DCS)

Delta Cost Project (DCP)

Difference-in-Difference (DinD)

Full-Time Equivalent (FTE)

Governmental Accounting Standards Board (GASB)

Institutional Research (IR)

Integrated Post-Secondary Education Data System (IPEDS)

National Center for Education Statistics (NCES)

Public Institutions of Higher Education (PIHE)

Research Public Institutions of Higher Education (RPIHE)

Responsibility Center Management (RCM)

State University of New York (SUNY)

Two-Way Fixed Effects (TWFE)

University of North Carolina System (UNCS)

U.S. Department of Education (ED)

Chapter 1: Introduction, literature review and research questions

A. Introduction

The cost of postsecondary education is currently of intense and increasing interest to the US populace. A recent Center for American Progress poll showed that over 70% of respondents agreed with the statement that a “College education is too expensive, and states should do more to ‘help people afford a college education without getting buried in debt’” (Washington Post, 2019) This poll represents a wider debate as presidential candidates have recently argued over the feasibility of “free college” and state governments work through the mechanics of offering various limited versions of this idea, which often share very little common ground (New York Times, 2019 and Pew Trust, 2019a). Throughout such discussions, two salient facts persist: one, the recurring call for state intervention indicates the public policy relevance of addressing this topic and two, a fundamental lack of clarity of what one means by “cost” in the world of higher education pervades the potential solutions. Exploring the junction of these concepts and shedding light onto the implications of defining the terms in play is at the heart of this dissertation.

It is clear why people focus on public officials to address college costs. While the post-secondary education market has a significant private sector component, with private entities accounting for 62% of total institutions, the concentration of students lies with Public Institutions of Higher Education (PIHE), who teach 78% of the nation’s students, according to the National Center for Education Statistics (NCES, 2019). Beyond reaching the majority of customers in the postsecondary education

marketplace, state governments annually contribute more than \$87 billion of public funds to support such providers (Pew, 2017). These large outlays rightfully draw scrutiny on how the funds are used. A greater demand for public reporting of the relationship of costs to tuition rates has emerged over the last two decades as the sticker price of postsecondary education grows at a greater pace than inflation or that of other industries (Ewell and Jones, 2006). These calls come in many forms, from performance funding schemes across a plurality of states to a focus on how PIHE receive state dollars and requirements that PIHE publish the cost of attendance (Dougherty, et. al, 2016). Related demands are only likely to grow as tuition payments increasingly financed by student debt cause the number of people whose personal finances are affected by university costs to multiply (Akers and Chingos, 2014).

Yet, for all of the scrutiny, the place of these tax dollars among the wide-ranging revenue sources of PIHE is rarely clear. Because no state has fully funded university activity, public principals focus on the total picture of activity managed by their university agents, meshing the contribution of state funds, tuition, internally generated fees, etc. as equal pieces in pursuit of desired outcomes like retention and graduation rates, enrollment figures, and diversity targets (Zumeta, et. al, 2012). The typical processes of defining costs for public universities play a role in compounding obscurity at the hour of assigning costs to activities. Institutions have built their data collection schemes for revenues and costs around the Federal government requirement to report said information in aggregate, institutional form in order to receive Title IV funds, e.g. so that its students are eligible for federal financial aid

programs (NCES, 2020). The reporting vehicle is the Integrated Post-Secondary Education Data System (IPEDS) managed by the NCES within the US Department of Education (ED). This survey is the benchmark for PIHE analyses because it provides a standardized, longitudinal panel data set that facilitates comparisons across institutions and over time. By rising to such a high level of aggregation, the comparisons it allows across institutions have greater validity, but require elaborate explanations to understand.

Additional detail is required because large PIHEs offer a vast array of services: undergraduate education, graduate education, research activity, public service, student housing and dining, athletic events, etc. (Archibald & Feldman, 2008). In addition, faculty members, employees, and students provide more than one of these services, without a standardized method of distributing the costs across the IPEDS classification rubrics of activities. In this vein, the software and accounting schemes tabulating the data is often limited to binary categories for expense categories, making the labeling of service provision more general than precise and restricting reporting possibilities wherein multiple points of view can be extracted (James, 1978). For example, among other things, university professors teach courses, lead research projects, guide graduate students, and participate in state task forces in their area of specialization as a public service. But, the majority of their effort falls into the account attributes assigned to their appointment. If university administrators designate the account as “Instruction,” then all that professor’s salary/fringe expenses would appear in IPEDS as instructional costs. Only work on restricted federal projects would be deemed “Research” because this type of work requires restriction

of fund types in specially designated accounts due to federal audit guidelines for proper expenditure of grant funds. Departmental workload assumptions are not consistently detailed on non-instructional tasks, however, overloading the reported cost of instruction.

Moreover, the data collection limitations under an aggregate array do not reflect the spending decisions of those charged with detailing exactly how certain processes, such as instruction, will unfold. How many course sections will be taught by a tenured professor, how many by adjuncts, how will graduate assistants provide instructional support in grading or advising to relieve the teaching burden on instructors? While there is central guidance on the number of students that must be served, all of these decisions typically fall to departmental officials. Hence, they are subject to the multiple concerns of academic chairs and administrators who must balance professorial desires against limited resources. The decisions made by English departments are often vastly different from the choice of the counterparts in Physics. So, to understand why the aggregate cost figure results in a given time period, one must be aware of how disaggregated components can influence the totals by moving subsets of expenses across use types (e.g. from Instruction to Research). These limitations have public policy and higher education finance implications when policy agendas begin to tie funding to specific university activities but have only data schemes with limited manipulability to provide guidance on how much it costs, for example, to provide instruction, as they seek to determine how much the state government should provide toward this end.

With the cost of delivering the many services of higher education to PIHE students in mind, this dissertation to explores the impacts of a technical approach to cost analysis (systematic expense disaggregation) on financial outcomes and fiscal decision making within the public university setting. Defining expenses in public higher education and the linkage of these dollars to institutional budgets and generally understood outcomes – such as annual cost of instruction and cost per undergraduate student – is an essential, but challenging prerequisite needed to inform the policy debate.

The literature inspires two hypotheses to test quantitatively as we seek to identify cases for a deeper dive into the institutional impacts of cost disaggregation efforts. First, the DCS literature suggests that participation should *alter the cost of instruction per credit hour* figures relative to non-DCS participators, but yield no reduction on *total institutional costs*. To place this hypothesis, it bears describing the activity involved in DCS participation and the costs and benefits associated with doing so. DCS’s central concern is detailing instructional costs within the larger framework of university spending (Wellman and O’Brien (eds.), 2000). To do so, its participants must undertake a mapping exercise of financial data that moves from the aggregated institutional level reported in the annual IPEDS survey of major spending categories down to the level of disciplines, which are defined by the National Center for Education Statistics’ “Classification of Instructional Programs” (CIP) taxonomy. For example, the CIP code for mathematics is 27.01 while that of English Language and Literature is 23.01 (NCES, 2020e). This foundation is then paired with additional data relevant to the activity, i.e. credit hours and the level of faculty providing

instruction, to generate detailed cost estimates at a highly disaggregated level. Doing so in all of the major areas of spending related to the university in question's Carnegie Classification level constitutes a completed DCS submission.

Such an undertaking is not insignificant and only makes sense given the promise of substantial benefits to the institutions willing to invest the resources required to do so. The costs a potential participant must consider involve the time of experienced and knowledgeable staff members. Leaders in the institutional research, finance, and academic affairs functions must be involved in the initial data alignment to ensure that the submission to DCS properly reflects their activity. Such individuals typically have higher-than-average salaries due to their expertise and will need to invest approximately a 1/8 of their time in the initial data gathering period to disaggregate their activity according to DCS parameters rather than the automated approaches that are generated by native accounting systems and historically calibrated routine IPEDS survey processes. Subjects interviewed in Section 3 estimated this cost to be around \$250,000 during the 2010s; yearly upkeep to ensure the data structures continue to reflect evolving organizational structures and the nominal DCS filing costs were in the \$100,000 per year range. Yet, the respondents noted that the opportunity cost of these individual's time and lack of availability for critical strategic activity management was more impactful as a counterweight to DCS reporting work than the portions of their salary attributable to it.

As for benefits, participants find that DCS affords them two sources of useful, and unique information. First, the act of reviewing their own data in a unique format that joins data in a novel way, and does so for all departments on campus, provides a

powerful data source for internal comparisons on the productivity of particular disciplines. It informs and highlights potentially heretofore unrecognized subsidies being provided by the universities resource allocation approach. Yet, likely even more powerful in the PIHE world, it provides peer comparison reports at a level of analysis unavailable anywhere else. By using a nationally recognized common methodology universities gain the ability to compare their own spending to peers and trends to those of other universities, they might use this information for either internal or external purposes.

The second hypothesis is that the mix of products/services provided by PIHE *should show changes in other major spending categories of institutional interest* in instances when the cost of instruction varies. If present, these results would show that, even in the event of cost savings, total expenditures would not fall: an outcome of interest for policy makers attempting to define a cost for all manner of education initiatives.

This framework leads to two research questions of interest:

- 1. What effect, on average, does the systematic disaggregation of expenses as a financial management tool in Research Public Institutions of Higher Education (RPIHE) have on the actual expenses at these universities?**
- 2. How does the presence (or absence) of this granular data influence financial decision-making processes and the resultant policy actions in these RPIHE?**

The following sub-section will describe the background and literature that the dissertation will build upon to situate the means of answering these questions and discuss how these answers will be a useful contribution to what previous researchers has already explored. The third sub-section details the methodological strategy that I employ, a mixed method approach, which will combine quantitative modeling to isolate the measurable impact stemming from the first question and qualitative interviews to explore the nuanced detail and prompted by the second question.

B. Literature Review

To situate the discussion properly, this dissertation draws on two literatures: *public financial management and higher education finance*. The broader context of costs on the public policy side of the issue focuses on expenditure growth and bureaucratic management approaches. This literature describes the means by which public managers working in postsecondary education deploy resources and account for their usage, as well as how these mechanisms differ from those found in for-profit enterprises due to the lack of direct accountability for outcomes, such as margin or stock price, and outputs defined – at least partially – as public goods. In turn, the higher education finance literature provides the framework for understanding the place of costs within entities that operate as providers of multiple, service-based outputs that deploy cross-subsidized resources as inputs to the various complex production processes undertaken by universities. Within the education world, research universities exemplify this multiple output complexity - and attract the

attention of this analysis - as these entities host more than 80% of all students attending 4-year institutions (NCES, 2019). The higher education finance literature also contains the foundational research on expense disaggregation approaches in which this work is situated. This dissertation adds analytical detail to this branch of higher education finance by utilizing new Delaware Cost Study (DCS) participation data and unique applications of this data to IPEDS financial survey data in the quantitative section, and by providing expanded depth of understanding to public policy options by way of subsequent qualitative interviews.

Budgeting and revenue theory principles from public financial management research guide the specifications of this analysis and help shape the questions employed in the qualitative portion of the dissertation. Much like other public agencies, such as state or federal departments, PIHE are “bureaus” in the context of public financial management research literature. The activity of bureaus and their leaders plays out within the relationship between the sponsoring level of government and the governmental entity entrusted with funding to carry out the sponsor’s desired activity. The following works set the base for the theory of action tested in this dissertation.

1. Public Budgeting

Our point of departure is Niskanen and his concept of the “Budget Maximizing Bureaucrat” (Niskanen, 1975). Niskanen describes how bureaucrats maximize the total budget of their bureau, subject to the constraint that the budget must be equal to or greater than the minimum total cost of supplying the output

expected by the sponsor. So, production behavior functions only work when output is budget constrained, otherwise there is high discretion about efficiency of output as defined by bureaucrats' preferences. In such an environment, bureau activity is defined primarily in response to the sponsor (the state or federal government) rather than to the public that it serves; one must internalize this relationship to understand the outputs emanating from the budget process. Hence, costs can escalate without a clear link to outputs, which external forces often define in total rather than on a per unit basis.

Bowen translates this focus on total spending versus the value of component services into the university setting (Bowen, 1980). Bowen traces the unit cost of instruction and offers several reasons as to why public universities rarely have incentives to reduce expenses. First, PIHE are non-profit entities, so economizing to meet a bottom line is not explicitly required. Second, competition in the public space by geography and mission differentiation reduces the need for cost cutting actions to maintain institutional viability. Finally, because PIHE are subsidized by both governmental appropriations and by the philanthropy of private donors, revenue totals are steady and rarely endangered due to this diversification. Such a position leads universities to have somewhat idiosyncratic spending patterns, but a unified approach to identifying the upper bounds of their annual expenditure, which Bowen labels the "Revenue Theory of Cost". In short, he posits that the amount of total expenditure at PIHE is set by the total amount of revenue available, such that as revenue increases, expenses will do so as well. For Bowen, this dynamic is particularly true for the cost

of instruction, given the linkage of enrollment to tuition, a key university revenue source.

With these ideas on public revenues shaping the contours of what it is possible for PIHE to spend, it is then necessary to look to the expense side. Baumol explores the “cost disease” of the rising costs in service industries (Baumol, 2012). He notes that in modern economies each industry’s productivity growth – defined as a labor-saving change in a production process so that the output supplied by an hour of labor increases – categorizes it as falling into either the “stagnant” or the “progressive” sector. Industries in the “progressive” group, such as light and heavy manufacturing, see significant growth in productivity and continually lower unit costs through technological improvements and organizational efficiencies. Higher education and health care providers fall into the “stagnant” sector, whose productivity growth is minimal in comparison to the “progressive” sector. Baumol explains the prime motivators of the “disease” that prevents cost savings of the “stagnant” sector are the dependence on unremunerated exploratory research to inform output activities, the need for a labor force with high technical knowledge, and a mandate to continually update expensive equipment in the production chain. He argues that society highly values the services provided by “stagnant” sectors, and hence these have been allowed to grow in relative cost indefinitely because output gains elsewhere raise the collective standard of living enough to render this cost growth feasible. Nevertheless, Baumol notes that this relative imbalance provokes political unease among average citizens - a prescient comment for the topic at hand.

Archibald and Feldman delve into this issue in detail, focusing on the budgeting and finance of the postsecondary education industry, and specifically on research universities (Archibald & Feldman, 2011). Their analysis confirms the presence of “costs disease” in higher education and finds it to be consistent with other personnel-heavy enterprises of similar constitution. Archibald and Feldman also delineate the specific higher education factors that push costs higher at a faster rate than that of the producers of tangible goods. First, higher education relies on a highly educated, relatively expensive labor force. Second, because of the high incidence and specialization of capital equipment usage (in the form of the new technologies), not only are productivity gains held back by the sector's reliance on highly educated labor, but it perpetually increases in lockstep with technological advances. Third, and on a related note, with the increased use of capital equipment, and the resulting rise in the proportion of employees who are highly skilled, *quality enhancements* in higher education service delivery do not lower costs.

The relationship of funding from other levels of government besides traditional state appropriations - and its impact on the demand side of university education - also influences the public policy ramifications related to understanding expense side of higher education. Then US Secretary of Education William J. Bennett's 1987 article in the New York Times entitled “Our Greedy Colleges” argued that colleges had used federally funded student aid increases to raise their tuition and “capture” this governmental aid (along with funds from other state and private donors) without offering an improved experience (Bennett, 1987). In a vein reminiscent of Niskanen's revenue maximization theory, Bennett asserted that,

because students had more funding to pay for the college experience due to their receipt of federal financial aid, universities had increased tuition prices without regard for cost or market limitations. This logic, powerful in its simplicity, depends on the assumption that prices in the higher education sector rose without a link to activity. The above discussion details why this theory does not hold up and decades later, a meta-study by Robinson of 24 scholarly articles showed that Bennett's conclusion of a positive correlation between federal subsidies and tuition increases was not accurate in 16 out of 24 analyses. And, in those where a positive correlation was present, the availability of federally supported student loans rather than need-based financial aid was a main driver in the relationship, especially in the for-profit post-secondary market (Robinson, 2017). Yet, the potential ramifications of Bennett's platform, which supported severe reductions of public funding that would have deeply reduced the services on offer, again points to how a lack of understanding of postsecondary costs can prompt policy that works against its desired aim.

Meyers catalogues the strategic budgeting methods undertaken by public agencies to obscure cost from year-to-year or between activity types in pursuit of budgetary solidity (Meyers, 1994). PIHE researchers must be aware of their presence to understand linkages of costs reported to public officials. Meyers defines four key strategies utilized in public budgeting that apply to PIHE. To each of Meyers' strategies, which are listed below, a parenthetical example to illustrate their usage in the higher education setting is provided: trickery involving accounting methods (accruing non-state expenses across years to enhance the perceived need of state funding); manipulating decision procedures by which spending authority is received

(differential tuition atop base tuition); crafting the design of how agencies acquire and spend funds so that they are outside of scoring rules (unrestricted non-state fund being cross-subsidized with state-related activity); and publicizing the effects of spending to draw in external forces that politically support out-sized increases or protection for a particular program (public campaigns detailing how lower state support damages equitable student access to higher education).

These rules further the reach of revenue maximization upon which this dissertation is partially premised. Meyers goes on to couple the example-rich descriptions of these tactics with an analysis of how most quantitative analyses of aggregate public budget activity confirm one conclusion (in his case the principle of budgeting incrementalism of federal agencies) that is overturned when one disaggregates the results. The flaws he points to inform the theory of this dissertation: by looking at the aggregate level of higher education costs, such analyses set arbitrary thresholds to characterize results that allow for generalized themes and, by doing so, miss the true nature of the finances of the public entity under review. So, inclusion of robust qualitative follow-up to flush out the details of the quantitative portion of this dissertation is imperative.

2. Higher Education Finance

The literature of higher education finance provides the framework for exploring the details of expenditure activity within the public setting. Toutkoushian & Paulsen document how, from the economic perspective, higher education research follows either demand side concerns - returns to education for students or society,

student opportunity costs, etc. - or supply side elements - revenues/expenditures, market competition, and labor aspects (Toutkoushian & Paulsen, 2016). This dissertation resides on the supply side, with a focus on institutional revenues and expenditures. Higher education finance is a subset of higher education economics that principally deals with the resources involved in university cost and production functions. This dissertation builds out of Brinkman's typology of higher education finance studies to situate the approach. Brinkman details four sets of concerns examined by cost studies: students as consumers, institutions as suppliers, higher education as a market, and higher education as an investment (Brinkman, 1990). Once the concern is set, one may either approach expenditures as a study of either opportunity costs vs. accounting costs, direct vs. indirect expenditure allocations, or average vs. marginal cost analysis. Finally, the means of determining the expenses involved may be undertaken by one of three complementary procedures: cost accounting, statistical estimation of cost functions, and cost modeling. Inside Brinkman's tiered rubric, the three research aspects this dissertation examines are *institutions as suppliers, comparative average costs, and explanatory nuances of cost analysis*.

With this framework in place, one must begin to address the central concern of defining cost. Hopkins notes that costs are hard to detail on a broad level because of the many difficulties of defining how a higher education institution transforms inputs (labor/capital/technology) into outputs (Hopkins, 1990). The main trouble in higher education is that institutions offer a broad mix of outputs and outcomes, such as imparting knowledge, mentoring personal growth, conferring degrees, enhancing

human capital, serving the community, and generating new knowledge through research (among others) that are fundamentally intertwined. Yet to describe a production function, one must precisely specify the nature and quantity of all relevant inputs/outputs and describe their relationships in mathematical terms. The inseparability and interactive nature of these functions requires that decisions are made on how to split apart the spending done in total by a university into their specific contribution to each individual output.

Problems related to assigning costs regularly have answers that are open to interpretation, are hard to compare across institutions, and vary from year to year by virtue of their being dependent on imprecise measures, labor intensive, and involving subjective judgment¹. For example, determining how much time professors spend in a given year on instruction versus research versus public service, or how to apportion the expenses for a conference room used for meetings, student gatherings, and equipment storage can bring huge variation in results when differing levels of care and clarity of assumptions are employed. Doing so for a single entity is possible through a rigorous recourse to cost accounting and cost allocation, but these decisions will always be vulnerable to uncertainty. Also, the intangible nature of the quality of postsecondary outputs is hard to define and measure over time, so defining the costs to produce a degree conferred in one year may have the same outputs as the

¹ See, for example, Amir, A. M., Auzair, S. M., Maelah, R., & Ahmad, A. (2012). Determination of Educational Cost in Public University—A Modified Activity Based Approach. *World journal of social sciences*, 2(2), 34-48; Massy, W. F. (2016). Course-level activity-based costing as an academic and financial tool. TIAA Institute and NACUBO; Cropper, P., & Cook, R. (2000). Developments: activity-based costing in universities—five years on. *Public Money and Management*, 20(2), 61-68; and Goddard, A., & Ooi, K. (1998). Activity-based costing and central overhead cost allocation in universities: a case study. *Public Money and Management*, 18(3), 31-38.

subsequent year, but feature a different factor input mix, and hence represent a different caliber of product. The interaction of outputs like research and instruction is likewise difficult to express, as it takes different forms across universities offering different mixes of degree programs. All of this is to say that there is a plurality of input/output mixes that endanger the reliability of comparisons across entities. The difficulties compound when one moves from the institutional levels and attempts to cost out different academic disciplines that have similar inputs utilized in different proportions to yield similar outputs.

Finally, Laband/Lentz provide useful insights as they explore the differences between expense patterns of private and public universities as well as those between for-profit and non-profit institutions (Laband and Lentz, 2004). Their analysis finds no cost differences between for-profit and non-profit groups from a production function perspective, with all differences noted residing between private non-profit and public university activity. The findings reinforce the notion that PIHE have particular production functions that correspond not solely to the lack of profit motive (which is important) but because of the public good component. This principle provides a nexus to the costing of university activity streams and public calls for accountability of PIHE.

3. Higher Education expense disaggregation literature

Within the costing literature, there is analytical work calling for more exploration of expense disaggregation to better understand PIHE reporting and outcomes, as well as contextual descriptions of cost disaggregation reporting via

consortia to examine costs, but few studies that explicitly describe causal relationships. The main work that does exist leaves much room for further research, which this dissertation seeks to partially fill.

James is the proto-disaggregator, as she explains a series of inaccurate policy conclusions that were drawn from a misunderstanding of aggregate figures on university costs, signaling the need to better understanding the data for public policy decisions (James, 1978). As mentioned, all public research universities have instructional and research requirements related to faculty, among other duties. Using estimates on faculty workload from the mid-1950s to the late 1960s, she identified a significant portion (approximately 25%) of expenses that had traditionally been assigned to instruction were actually used on departmental research, and to a lesser degree on graduate course instruction. More importantly, James showed that universities produce some services at a loss – primarily research and graduate instruction – though these pursuits increase overall utility. At the same time, these entities overproduce other services, in terms of utility, because they generate additional institutional revenue by expanding the size of the undergraduate endeavor. She attributes over-allocated costs to instruction at research universities to the over-assignment of faculty cost to instructional activity because of accounting limitations; the characteristics of the accounts that paid faculty salaries carried only one designation (e.g. instruction) in the University of California’s financial system of record. Yet, when the California legislature began comparing average costs per enrolled student at the various institutions of its extensive public higher education system, it concluded that research universities were over-funded because they had the

highest enrollments, the highest funding totals, and the highest average cost of instruction. Through this lens, overfunding equaled a clear exhibition of inefficiency. The policy implication was to reroute funds away from these “inefficient” (and more exclusive) institutions to other more accessible tiers of the system with the goal of evening out perceived funding differentials and extracting the most instructional effort out of each tax dollar. Ultimately, when James adjusted the costs to reflect her more precise estimates of the time dedicated to instruction, the exact opposite result emerged: community colleges proved to be more expensive on average for student instruction because their faculty dedicated all of its time to teaching, unlike their counterparts in research schools. This understanding is essential in the multi-product university setting and the value of cost disaggregation as a university endeavor.

While James does not presuppose joint efficiency of operation, but rather suggests economics of choice to carry large undergraduate classes that support upper-level activity, she identifies how each institution willfully designs a different product mix, factor mix, and technological level. Such idiosyncratic approaches blur comparisons across universities and point toward how a standardized approach to disaggregating such totals adds huge value for understanding costs in a complex, research university setting.

More recently, Toutkoushian’s work on cost functions in PIHE highlights key issues with IPEDS and comparisons using its data across institutions (Toutkoushian, 1999). He stresses the distinct nature of PIHE vis-à-vis other universities and the analytical need to group universities under review according to key characteristics (Carnegie classification, among others) to ensure the conclusions arrived at through

comparisons are accurate. This point is important for isolating variation in the results and influences the study design of this proposal. This dissertation follows the Carnegie Classification system developed by the Indiana University School of Education's Center for Postsecondary Research and limit the universe of PIHE under review to those categorized as Doctoral Institutions of Highest Research (R1) and Very High Research Activity Doctoral Institutions (R2), (IUSECPR, 2021). Such a narrowing of focus helps to reduce noise in the quantitative study arising from service offering differences and highlights those related to financially based actions of interest. This dissertation dubs this group RPIHE. Toutkoushian also notes two caveats of using IPEDS data. First, because the data contains no capital costs/expenses, it deals with variable cost only, thus revealing a focus on the short- to mid-term. Second, of greater interest for this research, instructional expenditures are almost certainly higher than reported due to inclusion of departmental research in these figures in the IPEDS schema. Hence, further study in this area on understanding departmental decision-making is required to truly understand cost patterns.

From this foundational need, Middaugh, et. al describe the advent of the DCS, the main expense disaggregation consortia in higher education. DCS emerged from series of Congressionally mandated reports on the cost of higher education in the 1990s (Middaugh, et. al, 2003). A key consideration of the Delaware collection of data is that it only focuses on direct costs and drills down to the discipline level. As intimated, this approach overcomes the likely misleading comparison of institutional aggregates of two Carnegie cohort research universities – where one has a focus on social sciences (with larger, lecture-based courses) and one with a focus on hard

sciences (with smaller course sizes with high lab and equipment requirements) – allowing such disparities to be differentiated properly. The groundbreaking undertaking showed that there was little link between cost and tuition price, especially in public universities where price was a function of state subsidy and cross-subsidization. This conclusion lends support to our public policy analysis of a revenue maximizing entity whose prices and costs rise in unison, and where economization in one area is redirected to another.

Using a Hierarchical Linear Modeling of DCS data, Middaugh, et al. add depth to the discussion by examining the drivers of cost variation in the university setting. The authors conclude that most cost variation in terms of instruction – here, direct per credit hour expense – is associated with the disciplinary mix offered, and the more disciplines that are offered by the institution, the higher the overall cost will be. Their analysis also indicates that the type of mission (Carnegie classifications of research, comprehensive, etc.) ranks as the second most important factor to directly impact costs. This relationship manifests itself in the fact that the grouping of DCS universities by Carnegie classes removes much of the variation from comparisons between institutional types. With access to both IPEDS and departmental data, this wide-ranging study also confirms several previously defined relationships: one, as the volume of students/credit hours grow, costs per unit decline; two, unit cost decreases are greater for lower-level undergraduate courses than upper level undergraduate or graduate offerings; and three, more faculty headcount equals higher cost, as do the counts of tenured faculty, but tenure does so to a lesser degree than total headcounts.

Before delving deeper into the DCS, it bears mentioning the other main consortia available: the Delta Cost Project (DCP, 2019). The DCP takes up cost analysis from the consumer perspective, focusing on how institutions use their resources, but from a somewhat more limited perspective given that the data is only collected every five years and has fewer participants. Conger, Bell, and Stanley build an analysis of DCP data and report on broad trends at PIHE in terms of changes over time in credit hour and instructional cost within a single state's higher education system, and between states in aggregate (Conger, Bell, & Stanley, 2010).

Unfortunately, compared to DCS, the DCP suffers from significant methodological flaws. For example, DCP allows the disaggregation of classes into upper- and lower-levels and into Undergraduate and Graduate groupings that may vary among respondents. Moreover, cost allocations are not consistent, with some including indirect expenses in the totals and some not, all but eliminating comparability.

Perhaps worst of all, the authors draw on DCP to compare baccalaureate instruction at 2-year and 4-year institutions without any acknowledgment of multiple products at the more complex institutions. While within-state information may be useful, it is difficult to tell what the DCP figures indicate is changing (or not) in terms of cost.

This deficiency only highlights the value of the broadly accepted DCS schema.

As the participation data file utilized in this dissertation shows, DCS's standardized expense disaggregation has been completed consistently by contributing universities for more than 20 years. Still, only a handful of academically inclined research projects put the data broadly to the test, likely because of the tight restrictions on data sharing in its terms of use (University of Delaware, 2020).

Outside of Middaugh, the two primary sources are Carrigan and Holbeck. Carrigan takes a case study approach to detail how the State of North Carolina used funding formulas to set revenues for the sixteen campuses of the University of North Carolina System (UNCS), based on various pieces of DCS data (Carrigan, 2008). UNCS uses academic program benchmarks to “provide a rational view of differentiated direct costs and credit hour production on which various decision-making tools can be built” as well as DCS-determined direct instructional expenditures per student credit hour benchmarks (Carrigan, 2008, p. 67). This utilization is only feasible when all UNC campuses also become members of the DCS and disaggregate their expenses in a uniform format to ensure comparability, which the State of North Carolina mandated in 1999. She reports that both system-wide benefits (rational, performance-based decision making for budget requests and allocations), and campus-level gains (revealing potential sources of efficiency within units and improved future planning for departmental effectiveness) have consistently resulted. Such in depth detail is an example to follow for this dissertation’s qualitative portion.

Holbeck, on the other hand, strives to analyze the variation of state funding between states as a driving influence of certain policy decisions (Holbeck, 2017). He employs DCS data to define the costs of instruction of the PIHE under review, chiefly to uncover the determinants in the policy adoption of undergraduate differential tuition schemes. The clearest policy result stated is that declines in state funding of PIHE were the main motivator behind differential tuition charging schemes. Moreover, he uses the comparative peer group data supplied to DCS participants to couch the results in a wider context. By employing both the data and the comparative

information of DCS, Holbeck informs researchers of likely behavioral uses of the cost disaggregating institutions. This dissertation explores the use of comparative data for policy in another direction, i.e. the strategic redirection of savings from undergraduate instruction efficiencies to other, preferred uses.

Most recently, Hemelt, et al. tap into the complete DCS database to provide disaggregated expense data at the departmental/discipline level, thus pointing to the vast possibilities of this branch of research (Hemelt, et. al, 2018). Yet, the many problematic policy conclusions of this analysis highlight the need to document strategic operational concerns beyond the cost study world when translating its detail to public policy. Partially inspiring this dissertation, the driving theory behind Hemelt's analysis is that having access to departmental/discipline level (where most spending actions are taken) can allow decision makers to gain productive efficiencies and know how to reduce costs in instructional areas. Hemelt, et. al note that DCS focuses on direct instructional costs only, and consequently their model focuses on cost drivers in this area, which impact costs that the university can control (e.g., costs that are not strictly beholden to market forces): average class size, faculty teaching load, faculty per student (and tenure/tenure track faculty counts within that); and non-personnel spending. While the analysis tests both the entire time series (2000-2015) and a pooled three-year window (2013-15) to gauge consistency of the effects, the broader conclusion is that over the entire 15-year period, expense per credit hour at the institutional level is nearly flat across the board. The authors identify that DCS departmental data offers clearer insight into how instructional cost drivers are manifest at the decision-maker level. Using English as a reference point for all

disciplines, the authors find that most variation of costs may be explained by class size, with faculty salaries being the second largest influence.

This key insight makes sense in the public policy framework this dissertation utilizes but leads to faulty premises in the author's policy applications.

Unconvincingly, Hemelt, et al. state that their approach minimizes activity preference, suggesting that there is consistency in expense activity within an institution because PIHEs have a lone academic leader, normally a Provost. So, Hemelt et. al.'s translation of analytical results to public policy action assumes that funding (and the resulting expenses) move without friction between departments. However, this dissertation tests this assumption because resource allocation decisions in public agencies that involve choices of taking funding from one unit and to provide it to another are rarely easy or quick.² Moreover, this dissertation proposes specific further testing under the idea that the institution spends its maximum dollars available, and departments move funds between major activity areas to maximize available revenue and prestige. If this dissertation's reasoning is accurate, conclusions to award or punish any department or institution made on Hemelt et al.'s assertions via changes in public funding are likely impractical and damaging because what has been represented are choices under an existing model and not inefficiencies or poor productive efforts.

² See Patashnik, "The Contractual Nature of Budgeting: A Transaction Cost Perspective on the Design of Budgeting Institutions," *Policy Science*, (1996) pp. 189-212 and Meyers, Roy T. (1994). *Strategic Budgeting*. Michigan Publishing, University of Michigan Press.

C. Methodological approach and data sets

To answer the stated research questions, this dissertation utilizes a sequential mixed methods study of the *mini-Qualitative -> Quantitative -> Qualitative* type, as detailed by Morse, Small, and others (Morse, 1994 and Small, 2011). Because of the limited DCS-specific cost disaggregation literature, and in conjunction with the gathering and cleaning of the quantitative data sets into the form necessary for analysis, a mini-Qualitative pair of informal interviews were conducted with contacts familiar with operating under a DCS-informed financial management structure. This preliminary outreach served several purposes. First, it allowed DCS participants to provide feedback and critique of the theory of action and subsequent cost outcomes to that the quantitative model was designed to test. Such feedback allowed for refinements to the approach before the quantitative models were ultimately run. Second, the discussions included a vetting of the variables and controls included in the model and the expected outcomes to ensure that the key influences on the process were contained in the estimating equation. Finally, inquiry on the origins and results of DCS participation at their home institutions helped solidify the questionnaire content and the target audience of qualitative interviews.

1. Mini-Qualitative Outreach

Representatives from a technical, institutional research (IR) function within universities is preferred for this initial discussion given the level of detail intended for review. This is the case because the institutional research arms of Research Public Institutions of Higher Education (RPIHE) are typically assigned the duties of

handling IPEDS reporting to the federal government and converting internal accounting data into the format required by DCS. Based on feasibility of access and a longstanding and regular participation in the DCS, the mini-qualitative baselining interviews included representatives from the State University of New York (SUNY) Buffalo and the University of North Carolina System (UNCS). A member of the finance staff at same institutions was also consulted to test how well this dissertation's methodology aligned with the DCS and financial decision-making processes in place for target population of this study.

Both IR leads confirmed that the control variables and structure of the estimating equation made sense in terms of identifying changes in institutional behavior related to the DCS and RCM dummy variables. While both found value in knowing the average outcomes that would be produced, they shared the belief that the quantitative results would best serve to point to areas of investigation for the qualitative study rather than confirming a single causal mover to patterns across all RPIHE because of their variety and unique patterns of internal cross-subsidization of IPEDS major activity areas like instruction and research. For the SUNY-Buffalo representative, this conclusion led to a recommendation that the qualitative studies be contrasting in terms of DCS experience in addition to the quantitative. This result helped shape the data set, as each university's grouping into "Always", "Sometimes" and helped define the triads of universities selected for the qualitative portion as detailed toward the end of Section 2. The UNCS experts, especially from the financial side, cited the need to deeply explore the relationship of RPIHE to their system in explaining spending patterns, as state controls tend to be broad in terms of

application. These two recommendations were included in the qualitative follow-up and led to fruitful paths of investigation that are described in the results found in Section 3.

2. Data Set overviews

The main data sets used in the estimating equations are: 1) the IPEDS national database of institutional, financial and student data maintained by the US Department of Education and 2) a newly available DCS participation file from the Institutional Research Office of the University of Delaware. A list published by Huron Consulting on the timing of when PHIEs have adopted an RCM model (when applicable) is also employed (Huron, 2017).

a. IPEDS

Each year, IPEDS collects standardized data from every institution that receives federal financial aid (Title IV) via a series of standardized surveys across a broad array of topics (NCES, 2020b). These surveys focus on critical functional areas like Institutional Characteristics, 12-Month Enrollment, Admissions, Graduation Rates, Fall Enrollment, Finance, Human Resources, and Student Financial Aid. NCES collects each survey at a different point of the calendar year and must be joined to the other surveys with care to ensure that the time periods of, for example, enrollment and finance data, are in sync. Moreover, while most of the data fields persist with little change over the past 20 years, there are occasional alterations and deviations that must be overcome to properly construct the panel. The most critical to this dissertation occurs in the Finance survey. Changes in industry accounting

standards in the early 2000s led universities to utilize a mixture of approaches to report their financial data prior to 2004. However, IPEDS phased in a unified standard and finally required all PIHE to use the Governmental Accounting Standards Board (GASB) method of reporting financial activity in 2004 (NCES, 2020c). Because obtaining consistent financials prior to fiscal year 2004 is a daunting and unreliable proposition, this year marks the beginning of this dissertation's period of study, while fiscal year 2018 marks the close of the period.

Therefore, the quantitative analysis constructs a panel from fifteen years of financial, institutional, and student data for RPIHE from IPEDS (Fiscal Years 2004-2018). From this data set, for each RPIHE (69) and in each fiscal year (15) the following types of data *Institutional* data – e.g. Carnegie Classification, Research Intensity, Student to Faculty Ratio; *Financial* data – e.g. Instructional Expense total per credit hour, Total Expense, and State Appropriations; and *Student* Data – e.g. Enrollment totals, Incoming SAT score averages, and Graduation Rates. **Appendix 1** lists the full set of IPEDS values used in the estimating equations. Part of the motivation for this dissertation revisits the main drawback of the IPEDS data: it is collected at the highest level of aggregation (the institution) so comparisons at lower organizational levels where resources decisions are made become unclear.

In terms of data cleaning, efforts to adapt the raw IPEDS data were undertaken to move the analysis forward and balance the panel. Chief among these was to synchronize the data to align the years in question between those years reported in IPEDS, and the year of activity for DCS. IPEDS financial data is already lagged due to the nature of its collection and had to be aligned to the control variables

(student, size, etc.) for consistency. Beyond that, all expenditure dollars were normalized using July 2006 as the indexing base, as defined in the Bureau of Labor Statistics Table 24 Historical Consumer Price Index for All Urban Consumers (CPI-U): U. S. city average, all items (BLS, 2020). A July starting point is used because Academic and Fiscal Years in IPEDS run from July through June. Most expenditures were converted into per capita figures by dividing them by the Full-time Equivalent Undergraduate Enrollment totals (NCES, 2020d). The control elements selected are among those commonly utilized in the higher education cost literature (Harter, et. al, 2005 and de Groot, et. al, 1991). Variables, such as Mean SAT scores (a measure of the academic preparation of incoming students) and Student-to-Faculty Ratio (a class size measure that often stands in as a proxy for quality of course offerings), serve to refine estimates by controlling for variation of demographic and academic characteristics of students that influence resources required for Instruction. Following Webber and Ehrenberg, the proposal derives combined Mean SAT scores by summing the averages of the 25th and 75th percentile scores on the Reading and Math tests to create a composite number (Webber and Ehrenberg, 2009). While percentages, the analysis reports retention rate and graduation rates as numbers between 0 and 100 to allow for ease of interpretation. Finally, the act of limiting the institutions under review to RPIHE has already harmonized much of the potential unwanted variance related to such student factors.

b. DCS Participation data

The estimation equation uses DCS participation data as dummy variable run against financial and institutional IPEDS data, which is the best means of estimating the dollar value impact of the most widely used expense disaggregation approach in the country on major cost areas (like Instruction) at RPHIE. As discussed in the discussion on limitations, the lone superior alternative – access to the DCS database itself – was sought but could not be obtained. Yet, even with access to the full DCS dataset, this dissertation’s approach would likely be a required, complementary piece to the DCS departmental data due to this study’s inclusion of non-participant comparators.

The data on–DCS participation is from a newly available file provided directly by the Institutional Research Office of the University of Delaware, who manages the data intake and collation of the 690 four-year, non-profit colleges & universities that have contributed data to the cost tracking consortia. The file itself contains the following data points for each DCS-participating institution: its Carnegie Classification, a Public/Private indicator, and a Yes/No indicator of participation for each year of the DCS’s existence (1996-present). Several descriptive statistics of note from this file indicate the direction this dissertation will take:

- There are 380 PIHE and 307 Private institutions that have participated in DCS since its inception.
- Of these, 73 PIHE have ten or more years of DCS participation since 2006 (38 of which are RPIHE) and 127 have six or more years (78 of which are RPIHE).

- The average time of participation is 8.3 years among all PIHE and 17.5 years among RPIHE.

The longer average use by RPIHE suggests both a higher value of cost disaggregation to complex universities, and the availability of more financial resources to dedicate within these institutions to the additional effort required to parse expense records according to the DCS rule set. Yet, this insight points toward a limitation of DCS as a financial mechanism to study: institutions self-select participation in DCS. Given that non-participant RPIHE represents 58% of total, a comparable figure to total non-contributors among all PIHE, this fact is not trivial. This bias likely over-estimate the effect on other universities not opting for DCS because of a likely pre-disposition among the adopting schools to understand their costs in a broader context. Any conclusion that an effect found in the quantitative analysis would recur to the same degree in non-DCS universities of similar magnitude is tenuous. So, the effect that occurs, is likely lesser in influence than the analysis suggests due to several potential factors, such as the absence of leadership initiatives focused on understanding expense, a lack of managerial control on spending, or a culture poorly disposed to data analysis, among other possibilities.

c. RCM budget model

With financial decision making at the heart of the theory of action, a distinct and popular higher education financial management technique – Responsibility Center Management (RCM) – was data to the data analysis. RCM treats each

academic division of the university as its own financial entity, responsible for revenue generation and expense control.³ The centralized campus units that serve the entire institution, such as facilities maintenance, utilities, human resources, information technology, etc., apply charges to the divisions for these activities rather than having a standalone budget allocation. Under RCM, central authorities mandate little to campus units within this decentralized scheme, and each division or “responsibility center” is permitted to enact the policies and procedures it desires to maximize its margins. Therefore, the utilization of a cost disaggregation system by university leadership to enact campus-wide policies that drive specific cost outcomes hypothesized by this proposal may be subsumed by the existence of the splintered authority chains associated with RCM. Yet, the focus on cost sensitivity at the heart of the RCM philosophy suggests that deploying such a system is a very clear directive to control costs. In fact, of the PHIE group, 38 universities have adopted an RCM model during the time-period being studied and all but three of them were also DCS participants. As such, a dummy variable indicating the implementation of an RCM system by the university has been included to account for this approach (Huron, 2017). The influence of the dummy on costs sheds light on the comparative role of DCS and RCM in movement of funds between expenditure types.

³ See, for example, Hanover Research Council. (2008). Responsibility Center Management at Major Public Universities. Washington, DC for a broad overview on the topic; or Curry, J. R., Laws, A. L., & Strauss, J. C. (2013). Responsibility center management: A guide to balancing academic entrepreneurship with fiscal responsibility. Second edition. Washington, DC: National Association of College and University Business Officers for financial decision making related to RCM; and Hearn, J. C., Lewis, D. R., Kallsen, L., Holdsworth, J. M., & Jones, L. M. (2006). Incentives for managed growth: A case study of incentives-based planning and budgeting in a large public research university. *The Journal of Higher Education*, 77(2), 286-316 for a case study on the University of Minnesota ; etc.

Finally, it bears noting once again that because the panel estimation would detail the impact of DCS participation on costs, but not provide a reason why such outcomes occurred, my strategy is to use the individual institutional results from the panel to indicate cases for qualitative interview. The cases could be chosen, based on the actual results, in several ways: by the individual effect of the DCS dummy on cost based on their results across the distribution; through the inclusion a difference-in-differences analysis to compare changes in costs for schools before and after DCS participation begins and/or the effect on PIHE that never joined; through the use synthetic controls in the absence of access to a suitable comparison group in the actual data; or by gauging the differences in the sample (full PIHE sample versus R1/R2s).

Chapter 2: Quantitative analysis

As noted in Section 1, the cost of obtaining post-secondary degrees is of concern to a wide variety of audiences such as students, parents, industry leaders, and public officials. Yet, when policy governing the actions of public universities is developed by state sponsors to address this concern, a fundamental lack of clarity of what one means by “cost” in the world of higher education pervades the potential solutions. Much of the confusion stems from the data available to support policy approaches. Aggregate spending data for all Research Public Institutions of Higher Education (RPIHE) is assembled by the federal government through annual data surveys within the US Dept. of Education known as the Integrated Post-Secondary Education Data System (IPEDS). The key drawback to undertaking analyses solely with IPEDS data is that the expense data points are developed at the aggregate level of the institution, rather than at a lower, departmental one, when the most significant and interesting budget decisions normally are those at this more decentralized department level.

To address this concern, in 1996 over 130 universities formed a consortium – the Delaware Cost Study (DCS) – that established a standardized reporting schema to disaggregate institutional expenditures of the IPEDS-ilk into discipline-level data. This reporting approach also created peer groups for its members based on key institutional characters (Carnegie Classifications that group universities by the type of degrees offered and the volume of research undertaken, as collated by the Indiana University Center for Postsecondary Research). The comparability of the discipline-level expenditure data and the availability of peer benchmarks has led more than 350

universities to participate in DCS since its creation, with the prime outcome of interest being a more accurate way of quantifying and managing resource usage (Middaugh, 2003). So, after more than 25 years of DCS activity in some universities and its absence in other, similar schools, examining whether and how this cost management tool influences the cost of higher education delivery warrants exploration.

This dissertation explores how DCS influences the expenditure outcomes of its user group compared to non-participants, specifically in the public sector. The framework prompts my two research questions of interest, the first of which is addressed by the quantitative portion of this dissertation:

- 1. What effect, on average, does the systematic disaggregation of expenses as a financial management tool in RPIHE have on the actual expenses at these universities?**
2. How does the presence of this granular data influence financial decision-making processes and the resultant internal management policy actions in these RPIHE? (*The qualitative focus to be addressed later via case study interviews*).

The public budgeting and higher education finance literature inspires two hypotheses to test quantitatively as we seek to identify cases for a deeper dive into the institutional impacts of cost disaggregation efforts. First, as Niskanen suggests, participation should *lower the cost of several areas of expenditure per FTE* figures relative to non-DCS participators but yield no reduction on *total institutional costs*

per FTE because public agencies strive to utilize all available revenues to maximize total sponsor appropriations (Niskanen, 1975). The second part of the hypothesis is that systematic expense disaggregation changes the mix of products/services provided by RPIHE. For example, following Meyers the introduction of these tools could generate *an decrease in one area expenditure per FTE and to enhance the cost of another to promote strategic growth by leadership in another area* (Meyers, 1994). It's worth noting that higher education literature indicates that different executive leadership preferences may lead such a redirection down another path. Labeled the prestige factor by Archibald and Feldman, among others (Archibald & Feldman, 2008), executive leadership may direct funds toward instructional expenditure because the rankings - such as those published by *U.S. News and World Report* - utilize metrics that place a high value on the reputation of teaching cohorts and small class sizes, which correspond to higher instructional spending. If present in combination, these results would show that even in the event of cost savings total expenditures would not fall: an outcome of interest for policy makers attempting to define a cost for all manner of education initiatives.

A. Panel Data Set

For the quantitative analysis, a panel from 15 years of financial, institutional, and student data for PIHE from IPEDS (Fiscal Years 2004-2018) was constructed. From this data set, for each RPIHE⁴ (96) and in each fiscal year (15) the following types of

⁴ The University of New Hampshire has been removed because it shows \$0 in spending on Scholarship expenditure across the entire 15-year period, which disrupts the calculation of both total expense and Scholarship spending per FTE totals.

data: *Institutional* data – e.g. Carnegie Classification, Research Intensity, Student to Faculty Ratio; *Financial* data – e.g. Instructional Expense total per credit hour, Total Expense, and State Appropriations; and *Student Data* – e.g. Enrollment totals, Incoming SAT score averages, and Graduation Rates. The panel as shown is balanced and results in 1,440 total observations. **Table 1** contains the summary statistics of the data points in the analysis:

Table 1
Summary statistics

<u>Variable</u>	<u>Obs.</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Min</u>	<u>Max</u>
Delaware Cost Study participation by year	1,440	0.57	0.50	0.0	1.0
Delaware Cost Study event study dummy	1,440	0.65	2.18	0.0	14.0
Responsibility Center Management usage by year	1,440	0.12	0.33	0.0	1.0
Full Time Equivalent Students - Undergraduate	1,440	21,048.5	7,743.5	7,892.0	55,016.0
Full Time Equivalent Students - Graduate	1,440	5,125.1	3,015.3	747.0	20,423.0
Graduation Rate (%)	1,440	65	14.0	26.0	95.0
Retention Rate, Full time (%)	1,440	65	7.4	60.0	98.0
Faculty FTE	1,440	2,307.8	1,139.5	633.0	7,371.0
Student-Faculty Ratio	1,440	18.5	3.1	11.0	35.0
Instructional Cost per UG FTE	1,440	\$13,205	\$6,523	\$3,407	\$57,191
Total Expense per FTE	1,440	\$40,730	\$19,497	\$10,414	\$132,414
Research Cost per UG FTE	1,440	\$8,809	\$6,599	\$198	\$46,021
Public Service Cost per UG FTE	1,440	\$3,169	\$3,481	\$22	\$29,519
Academic Support Cost per UG FTE	1,440	\$3,917	\$3,014	\$1,106	\$39,921
Student Service Cost per UG FTE	1,440	\$1,697	\$860	\$441	\$6,250
Institutional Support Cost per UG FTE	1,440	\$2,988	\$1,570	\$524	\$13,792
Scholarships and Fellowships per UG FTE	1,440	\$1,482	\$867	\$1	\$5,374
Auxiliary Cost per UG FTE	1,440	\$5,463	\$3,800	\$587	\$37,894

The key variables in **Table 1** are: the dummy variables showing DCS participation in each year, a dummy to measure to what extent Responsibility Center Management (RCM) is used by year used to test the influence of this budgeting approach on expenses, the series of outcome variables that provide a per-

undergraduate Full-Time Equivalent (FTE) headcount cost for each major area of university expenditures, the various non-financial outcome controls (e.g. graduation rates, student-faculty ration, etc.) discussed below that were included to reflect common practice in the literature to remove differences across universities related to the quality or manner of service provision available to students. The *DCS dummy* has a mean value of 0.57, indicating that just above half of the schools are acting within DCS-informed systems in the time period. Conversely, the mean of the *RCM dummy* is only 0.12, showing it to be employed by a much smaller group of RPHIE. The schools in question are intentionally large, having an average of 21,000 *undergraduate student FTEs*, and have high relative *graduation and retention rates* (65% and 85% respectively), compared to smaller, less research-intensive schools that are, according to the source IPEDS data, typically 20% lower in these metrics. The higher these measures, the greater the implied efficiency of resource utilization; so, as one examines RPHIE with high student success rates, the motivation to utilize advanced financial management techniques like DCS and RCM increases as marginal gains are more difficult to obtain. The *cost per FTE* figures show the average university expense on each major cost area of the RPHIE, with Instruction outlays of \$13,205 per FTE, per year and Research expenditures of \$8,809 per FTE, per year representing the largest two areas.

The following data cleaning efforts were undertaken to adapt the raw IPEDS data to enable the dissertation's analytical design. Perhaps most importantly, we start by synchronizing the data to align the years in question between those years reported in IPEDS, and the year of activity for DCS. IPEDS financial data is already lagged due

to the nature of its collection and were aligned to the control variables (student, size, etc.) for consistency. All expenditure dollars were normalized using July 2006 as the indexing base, as defined in the Bureau of Labor Statistics Table 24 Historical Consumer Price Index for All Urban Consumers (CPI-U): U. S. city average, all items. A July starting point is used because Academic and Fiscal Years in IPEDS run from July through June. Expenditures were converted into per capita figures by dividing them by the FTE Undergraduate Enrollment total, rather than total headcounts that include graduate students and non-credit bearing student cohorts. The control elements selected are among those commonly utilized in the higher education cost literature - particularly Harter, Wade, and Watkins (-2005) - and then honed via the mini-qualitative interviews. Variables, such as State Appropriation (an indicator of non-tuition revenues and general like) and Student-to-Faculty Ratio (a class size measure that often stands in as a proxy for quality of course offerings), serve to refine estimates by controlling for variation of demographic and academic characteristics of students that influence resources required for Instruction, similar in a form suggested by Webber and Ehrenberg (2009), among others.⁵

We also factor in one popular higher education financial management technique – Responsibility Center Management (RCM) – to the analysis given the theory of action that drives the hypotheses. RCM treats each academic division of the university as its own financial entity, responsible for revenue generation and expense

⁵ Also following Webber and Ehrenberg, combined Mean SAT scores were derived by summing the averages of the 25th and 75th percentile scores on the Reading and Math tests to create a composite number. Unfortunately, the inconsistency of SAT and ACT scores across universities and years limited their ultimate usefulness in the analyses.

control. The centralized campus units that serve the entire institution, such as facilities maintenance, utilities, human resources, information technology, etc., apply charges to the divisions for these activities rather than having a particular budget allocation. As the Hanover Research Council describes (Hanover Research Council, 2008), central authorities mandate little to campus units within this decentralized scheme, and each division or “responsibility center” is permitted to enact the policies and procedures it desires to maximize its margins. Therefore, the utilization of a cost disaggregation system by university leadership to enact campus-wide policies that drive particular cost outcomes hypothesized by this proposal may be subsumed by the existence of the splintered authority chains associated with RCM. Yet, the focus on cost sensitivity at the heart of the RCM philosophy suggests that deploying such a system is a very clear directive to manage costs. In fact, of the PHIE group, 38 universities employed an RCM model during the time-period being studied and all but three of them were also DCS participants. The influence of the dummy variable on costs has the potential shed light on the comparative role of DCS and RCM while interactions of DCS and RCM participation and the timing of implementation will also be of interest in the quantitative analysis and the qualitative follow up.

B. Policy Treatment Definition

The following coding and grouping have been developed from the DCS participation file provided by the University of Delaware to enable the full difference-in-difference (DinD) design. As **Figure 1** shows, aggregate DCS participation among RPHIE over the 15-year period examined in this analysis is fairly stable, with a

maximum participation percentage of 49% and a minimum of 39%. So, the *Ever DCS* variable has been coded in each fiscal year as ‘1’ when the RPIHE participated in the *Ever DCS* and ‘0’ when it did not. While many universities consistently report their data to DCS (26 of the 40 RPHIE who submitted data to DCS more than 10 times during the 15-year period under review did so without interruption), fourteen RPHIE did not continuously submit the annual data to DCS to provoke an uninterrupted series of ‘1’ indicators. Yet, the theory of action propelling this analysis is that participation in DCS acts a treatment when initiated, via the act of disaggregating departmental data into information that is comparable internally across disciplines and may be compared externally to the unique peer data reports provided exclusively to universities to prompt financial management actions. So, *Active DCS* was developed to reflect treatment and continuation of impact in subsequent fiscal years. All the analyses have been run with both dummy variables – *Ever DCS* and *Active DCS* – but *Active DCS* provides the primary result discussed in this analysis (shown fully in **Table 4**⁶). The results generated when *DCS* participation is input in its indicating the act of having reported the data is included in **Table 5**.

⁶ **Tables 4 and 5** appear on page 55-56 after the discussion of the primary results.

Figure 1
DCS Participation: FY04-FY18

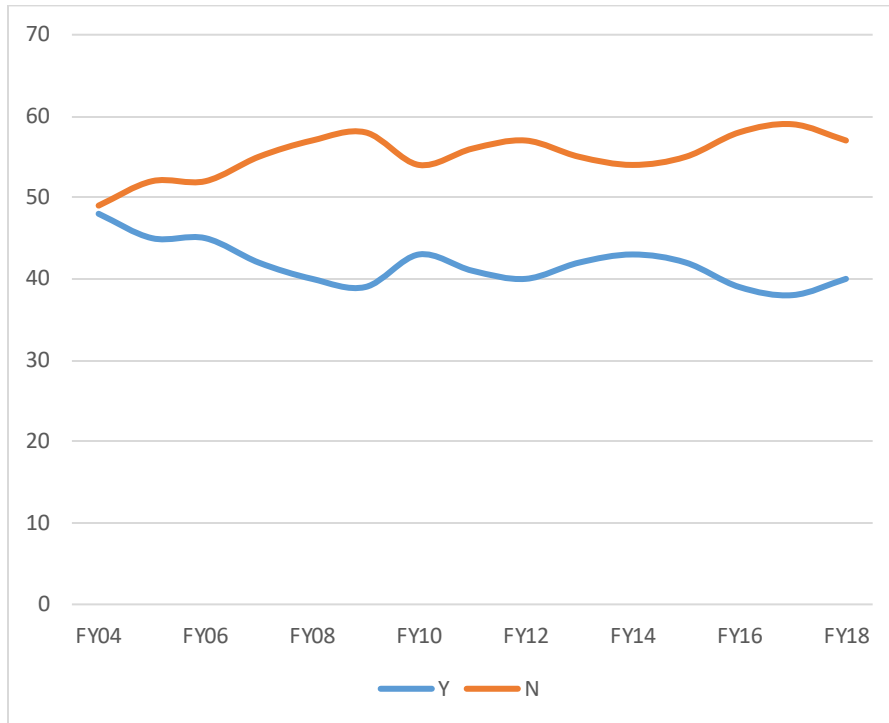


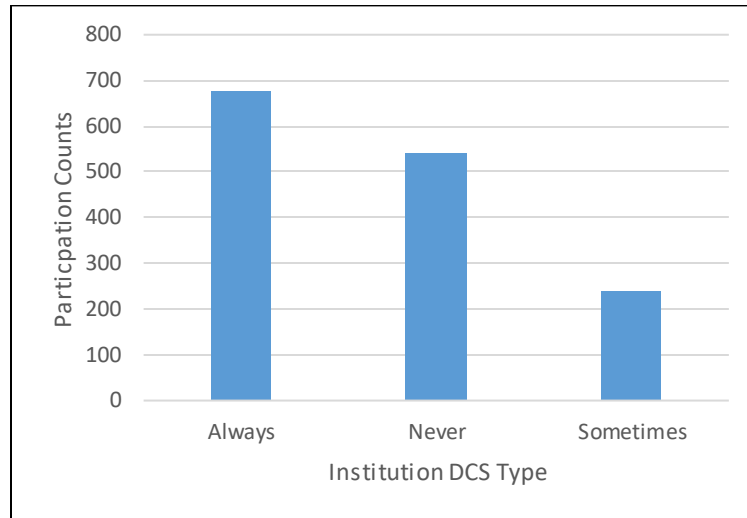
Table 2 below quantifies the incidence of participation of *Active DCS*. As seen in Table 2, 43.1% of observations have DCS participation ("1") and 56.9% do not ("0"). Meanwhile, 62.5% of universities participated at least one year in DCS and 54.2% have at least one year without participation in at least one year. Finally, for RPIHE with at least one DCS participation, 91% of the total observations show participation, while those schools with at least one DCS non-participating year, see 79.6% of their observations indicate non-participation.

Table 2
DCS Participation Frequencies and Probabilities

Value	Overall		Between		Within
	Frequency	Percent	Frequency	Percent	Percent
0	621.0	43.1	52.0	54.2	79.6
1	<u>819.0</u>	<u>56.9</u>	<u>60.0</u>	<u>62.5</u>	<u>91.0</u>
<i>Total</i>	<i>1440.0</i>	<i>100.0</i>	<i>112.0</i>	<i>116.7</i>	<i>85.7</i>

Moreover, DCS participation was created to assign each university into one of three groups: ‘Always’, ‘Never’, and ‘Sometimes’. ‘Always’ signifies that the RPIHE participated in DCS throughout the 15-year panel period; ‘Never’ signifies no participation during the period under review; and ‘Sometimes’ signifies that the institution changed its participation status in DCS sometime during the fiscal year 2004 and 2018 interval. It is the ‘Sometimes’ group (comprised of 16 RPIHE) that allows comparisons beyond the averages as the switch in DCS participation acts a treatment event. **Figure 2** shows the incidence of DCS participation resulting from this grouping across the three types of RPIHE.

Figure 2
DCS Participation Counts



C. Estimating equation.

The hypothesis guiding the dissertation is that the quantitative analysis will generally show that DCS participation lowers instructional expense per credit hour figures relative to non-DCS participators but yields no reduction on total institutional expenses. This hypothesis follows from prior findings from the public policy literature that indicate that a drop in departmental expense in one activity required by sponsors will prompt internal movement of the funds toward discretionary pursuits. To test this hypothesis, I use a generalized DiD model in Equation (1). This model uses DCS data as an overlay on IPEDS data, which is the best means of estimating the average dollar value impact of the most widely used expense disaggregation approach in the country on Instruction costs at RPHIE.

$$Y_{it} = \alpha + \varphi DCS_{it} + \beta x_{it} + \mu_i + \lambda_t + \gamma_r + \varepsilon_{it} \quad (1)$$

The terms of the equation are defined as follows: Y_{it} = Financial Outcome by FTE; α = Constant; φ = Parameter of interest; DCS_{it} = DCS Participation; βx_{it} = Control variables; μ_i = Institutional Fixed effects; λ_t = Time Fixed Effects; γ_r = Region/State Fixed Effects; and ε_i = Error term. I use fixed effects to control for unobserved characteristics correlated with DCS participation, while the including year fixed effects allows for staggered adoption of the treatment of DCS participation.

Alternate specifications of the two-way fixed effects (TWFE) estimation test the influence of DCS participation on other major areas of expenditure reported to the source database by all RPHIE: Research, Public Service, Academic Support, Student Services, Institutional Support, Scholarships and Fellowships, and Auxiliary Activity (which mainly represents Athletics, Housing, and Dining services). Because the dissertation hypothesizes that, even in the event of cost changes to instruction, total expenditures should not fall, policy makers attempting to define funding requirements at the institutional levels may need to design different rules sets to match desired outcomes to all manner of approaches.

Moreover, the outputs from the DiD estimation can be interpreted as the average between all possible comparisons between groups: (i) Sometimes/Always (ii) Sometimes/Never, (iii) Always/Never, following Goodman-Bacon (Goodman-Bacon, 2021). In selecting the potential sub-set comparisons, we do not include the Always/Never dyad because the two fixed effects absorb all variation on DCS

coefficient. The “Sometimes” to “Always” comparison was run as Version 8 of the model but does not appear in the primary result table because it lacks comparisons to an untreated group. However, the “Sometimes” to “Never” group comparison should be the most faithful indicator of the relative influence of adding the cost disaggregation tool into the university management arsenal. When done, this specification has the same sign and pattern of statistically significant results as the other decomposed fixed effect model variations for Instruction, Institutional Support, Student Services and Public Service while the outcomes are inconsistent for Scholarship spend per FTE.

The results from the main specifications of the model are shown in **Table 3**. From the nine specifications of the model, Version 9 (‘No Always’) is the most representative of the full vision of the analysis. Version 7 (‘Full TWFE’) of the model shows the coefficient of the dummy *Active DCS* dummy on aggregate institutional per FTE expenses, the full set of controls, TWFE and composition by year with state time trends for all RPIHE regardless of their DCS participation status. Each version yields insights into the likely impact of DCS participation, but version 9 is the most convincing measure given the form that the estimating models derive the various outcome as it removes the ‘Always’ cohort from the analysis since these universities received treatment prior to the period of study.

D. Empirical Results

Based on the public finance and higher education cost literature, I hypothesized that university-wide spending would change instructional activity levels

with expenditures elsewhere being altered based on DCS participation prompted by access to more granular information that allows decision makers to identify areas of slack and/or align costs to the levels of peers in a given area via the comparison data but would ultimately not impact the overall total. The bands in yellow in **Table 3** highlight the types of expenditure per FTE that showed a statistical significance related to the dummy *Active DCS* participation coefficient in the full TWFE model and/or the version that removed the ‘Always’ cohort to account for these RPIHE having already received treatment: *Instruction, Public Service, Student Services, Institutional Support and Scholarships*.

The results run partially contrary to the hypothesized specific internal reallocation of funds within the total, even as they indicate an approach consistent with the overall theory that DCS participation will not definitively impact total costs. Meanwhile, they suggest a redirection of funds by DCS universities toward Instruction and Public Service and away from Student Services and Institutional Support. Such redirection is more in line with aspects of the higher education finance literature focused on outputs such as degree attainment explored by Ryan (2009) and retention rates as detailed by Dahlvig that indicate a tendency to increase instructional expense to achieve these goals at the expense of technical support services rather than the incentives outline by cost management and public budgeting views of overall spending preferences for discretion (Ryan, 2009; and Dahlvig, Dahlvig & Chatriand, 2020). Unfortunately, none of these studies reference DCS participation.

Table 3
DCS Participation by Program Expense

<u>Program Expense</u>	<u>(7 - Full TWFE)</u>	<u>(9 - No Always)</u>
Total Cost	-669.9 (580.2)	440.3 (336.3)
Instruction Cost	199.9* (111.4)	468.1*** (120.6)
Research Cost	68.40 (133.2)	83.66 (152.9)
Public Service Cost	88.53 (67.01)	283.1*** (46.38)
Academic Service Cost	5.070 (150.4)	-111.0 (85.20)
Student Service Cost	-48.54** (21.66)	-55.38** (22.48)
Institutional Support Cost	- 199.9*** (50.79)	-159.8*** (50.58)
Scholarship Cost	24.45* (14.05)	24.47 (20.88)
Auxiliary Cost	52.54 (116.9)	-10.88 (58.25)
Institutional Fixed Effects	√	√
Year Fixed Effects	√	√
Controls	√	√
With state time trends	√	√
Decomposed by Year with State time trends	√	√
Subset Comparisons	X	w/o Always
Standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

In the full version of the TWFE model, DCS participation aligns with total expenditure per FTE decreasing, but the results are not statistically significant. On the other hand, the cost of Instruction per FTE (in **bold** in **Table 3**) - *the prime area of expenditure interest for the dissertation given its centrality to the mission of Research Public Institutions of Higher Education (RPIHE)* - shows higher relative spending by DCS members of \$468 per FTE as compared to non-DCS users; the result is statistically significant at the 1% level. Yet, as **Table 4** shows, this relationship was much larger in the parsimonious model specification; by demeaning the outcomes by year and state the significance of the result dissipates, suggesting that DCS is correlated with unobserved characteristics that also affect instructional costs rather than being directly influenced by DCS. This result is reasonable given that the institutions under review are all public and the cost, reach, and quality of instruction is subject to varied financial constraints depending on the particular relationship between the universities and their state patrons, as explored by Kane and Orszag (Kane and Orszag, 2003).

This central outcome generates rich veins of exploration for the qualitative questioning and selection process. The main hypothesis was that some areas of expenditure would fall as financial managers understood their institutions' relative position among their peer group and would adjust outlays down to the mean or prompt greater revenue pursuit to allow higher spending on discretionary (but prestige offering) activities. The cost-side outcomes did occur and signal key questions to explore as to how the availability of comparative DCS data spurred an effort to enhance spending in Instructional areas vis-à-vis peers/competitors and,

when it did, how the funding was redirected to accomplish the outcome; the data suggests that the redirection was facilitated by lowering spending on central, institutional support activities and student services. However, as will be discussed in greater detail in the various classes of expenditure results, comparing only those schools that did not participate in DCS before FY2004 but became members during the period of study (the “Sometimes” group) to universities that have not participated (the “Never” group) shows the strongest linkages of treatment to outcome.

For Instructional expense per FTE there is a highly statistically significant result showing higher relative instructional spending per FTE as compared to non-users than in the TWFE model. So, coupling a university that began DCS participation during the review period with one that has never done so will provide a strong basis for comparison during interviews. The questions surfacing will be detailed in the case study selection process description below. In addition to increased spending on Instruction, Public Service outlays also grew despite not registering a significant no relationship in the TWFE estimation. In terms of Scholarship spending on students, DCS participants provided \$25 more per FTE of scholarship aid on average than non-participants, statistically significant at the 10% level in the TWFE version, but this impact is not present in the main result. The literature suggests a non-DCS driver for such variable redirection: moving toward large tuition discounting approaches, e.g. the use of merit aid scholarship awards to attract out-of-state students who pay much higher tuition rates than in-state students in RPIHE, as detailed by Martin (Martin, 2002). Such students have the same cost to educate (beyond these scholarship awards) and help to backfill funds lost through

reduced state appropriations. Something other than DCS participation may have prompted the RPIHE to enact this strategy of revenue diversification and protection. This area will be explored in the qualitative interviews.

Public service work focuses on such items as agricultural extension services, clinical services, or continuing education. Spending in the Public Service area also shows a significant relationship to DCS participation in Version 9 of the model. Here, the Public Service expenditure of DCS participants is \$283 higher per FTE on average than non-DCS schools, a result significant at the 99% confidence level. Lowery suggests that the prime mover of Public Service spending by RPHIE is not enrollment or tuition funding, but rather the presence of an important farming sector in the state that increases the demand and popularity of agricultural and extension services provided by land-grant universities (Lowry, 2001). A potential path of exploration is whether land grant institutions compare themselves to one another via DCS and increase their outlays in this pursuit as a result. However, such an avenue is too specialized for this dissertation, and will be left as an area for future researchers to explore.

With the areas of DCS-influenced expenditure increase in mind, it bares noting that the main results did not indicate that discretionary Research was an ultimate recipient of diverted spending, despite its high role in boosting university prestige. While per FTE spending on Research was positive, the result was not statistically significant. Similarly, expenditure related to Academic Support and Auxiliary activity showed no clear statistical correlation to DCS participation. These three zones of little impact are intriguing as their absence from common financial

management suggests pragmatic internal allocation of funds, rather than a desire to enhance discretionary funding. Still, with controls for revenue increases embedded in the modeling equation, understanding where relative reductions of expenditure have been taken by RPIHE that sought to increase Instructional and Public Service spending is essential.

The influence of DCS participation in reducing expenditure on Institutional Support and Student Services activity is statistically significant across most of the model specifications. Institutional Support spending, which generally relates to centralized functions like Human Resources, Finance, Facilities Maintenance, and Information Technology, was consistently negative when DCS forms a part of the RPIHE financial management playbook. Version 9 shows that when institutions that began DCS participation during the 15-year period of study were compared only to non-DCS participants a drop of \$166 per FTE resulted in the Institutional Support category; around \$200 per FTE less was spent by DCS participants than by those not utilizing the cost disaggregation approach in the TWFE model and both results were significant at the 99% confidence level. Institutional support expenses have the characteristic of being much easier to adjust because they are not dispersed across a large variety of decision makers in the academic units, but rather are controlled by the central finance and administration office. So, items that can adjust total institutional support downward with a significant enough magnitude, such as deferring maintenance of infrastructure and limiting hires in areas serving the entire campus, can be made with little need to build consensus or worry about immediately apparent drops in customer service. Thus, focusing on this area of expense that has minimal

oversight, makes sense when new peer data becomes available to leadership that prompts a desire to increase investment in Instruction and/or Scholarships.

Turning to Student Services, these functions encompass expenses for admissions, registrar activities, and other activities whose primary purpose is to contribute to students emotional and physical wellbeing, such as student organizations, cultural events, intramural athletics, etc. In the primary version of the model (Version 9), the coefficient of the DCS dummy showed a \$51 decrease in Student Services spending per FTE, which is significant at the 95% level; the outcome in the full TWFE version. follows a similar vein, showing a \$48 reduction. Higher education finance researchers like Chaney and Massas, primarily link spending on student support services to issues related to socioeconomic equity (Chaney, 2010; and Massas, 2019). In general, student support services are employed to boost remedial services to students from lower socioeconomic backgrounds that offer university-level preparatory instruction at a higher rate than students coming to higher education from relatively more affluent backgrounds. These expenses also boost student advising and counseling to assist students who may need to work high numbers of hours, commute, or care for family members while studying. As such, most of the scholarly research focuses on community colleges/two-year institutions, rather than large four-year universities. Because this dissertation focuses on RPIHE, which have not been documented in detail on this topic, there is no evidence to base transference of these results on the R1 institutions examined herein. Still, a question to this topic will be well placed in the qualitative follow up to explore if the lower

relative expenditure on student support links to DCS planning or to the general preparation levels of their students or some other factor.

Table 4 – Primary Model Results with Alternative Specifications

<u>Program Expense</u>	<u>(1)</u>	<u>(2)</u>	<u>(3)</u>	<u>(4)</u>	<u>(5)</u>	<u>(6)</u>	<u>(7)</u>	<u>(8)</u>	<u>(9)</u>
Total Cost	7,289*** (951.8)	2,077*** (383.8)	2,080*** (401.3)	1,769*** (400.9)	1,525*** (545.9)	253.1 (618.8)	-669.9 (580.2)	-298.9 (422.0)	440.3 (336.3)
Instruction Cost	3,050*** (312.6)	983.3*** (118.4)	1,043*** (124.3)	933.9*** (124.9)	523.1*** (114.1)	352.5*** (116.6)	199.9* (111.4)	-33.71 (109.8)	468.1*** (120.6)
Research Cost	200.1 (251.7)	-51.90 (115.6)	-97.96 (119.3)	22.36 (121.2)	150.4 (132.9)	10.81 (123.8)	68.40 (133.2)	-8.512 (117.0)	83.66 (152.9)
Public Service Cost	810.7*** (167.1)	306.3*** (55.60)	267.6*** (57.77)	243.4*** (59.31)	102.4 (66.30)	234.6*** (61.09)	88.53 (67.01)	107.0 (70.90)	283.1*** (46.38)
Academic Service Cost	932.8*** (218.4)	248.8** (110.7)	238.6* (127.2)	299.6** (129.3)	86.32 (149.7)	190.5 (132.0)	5.070 (150.4)	-119.7 (119.8)	-111.0 (85.20)
Student Service Cost	343.1*** (56.95)	108.1*** (21.18)	129.0*** (23.03)	100.1*** (23.23)	-32.30 (21.81)	28.65 (22.15)	-48.54** (21.66)	-50.60** (20.75)	-55.38** (22.48)
Institutional Support Cost	435.5*** (113.9)	31.18 (43.48)	-19.37 (46.91)	-65.65 (47.07)	- (50.79)	- (46.32)	- (50.79)	- (52.93)	-159.8*** (50.58)
Scholarship Cost		39.55*** (14.19)	41.29*** (14.67)	39.44*** (14.57)	23.34 (14.25)	30.17** (14.15)	24.45* (14.05)	36.67*** (13.37)	24.47 (20.88)
Auxiliary Cost	1,072*** (240.6)	239.8*** (87.39)	191.4* (102.9)	224.9** (104.6)	104.6 (116.1)	185.3* (107.7)	52.54 (116.9)	-77.43 (123.7)	-10.88 (58.25)
Institutional Fixed Effects	X	X	√	√	√	√	√	√	√
Year Fixed Effects	X	X	X	X	√	X	√	√	√
Controls	X	Min	Min	√	√	√	√	√	√
With state time trends	X	X	X	X	X	√	√	√	√
Decomposed by Year with State time trends	X	X	X	X	X	X	√	√	√
Subset Comparisons	X	X	X	X	X	X	X	w/o Never DCS	w/o Always DCS
Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1									

Table 5

Result with DCS (years indicating data submission)

<u>Program Expense</u>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Total Cost	-137.1 (629.1)	338.3 (253.6)	310 (254.3)	323.2 (249.1)	-424.1 (332.4)	-183.8 (350.6)	-207.4 (326.1)	-99.81 (224.1)	-190.7 (174.4)
Instruction Cost	187.6 (209.1)	182.6** (79.0)	173.1** (79.4)	193.8* (78.0)	76.06 (69.5)	-85.31 (66.0)	-86.6 (62.4)	-48.17 (58.2)	-58.38 (62.0)
Research Cost	-230.3 (162.8)	-18.98 (75.2)	-34.91 (75.7)	-43.46 (74.8)	-29.14 (75.0)	-26.87 (74.3)	-26.52 (74.6)	-18.67 (61.7)	-29.71 (74.9)
Public Service Cost	103.7 (110.3)	42.89 (37.1)	24.14 (37.1)	25.4 (37.1)	-22.36 (37.7)	24.13 (37.5)	-22 (37.8)	-25.98 (37.7)	-2.459 (27.7)
Academic Service Cost	-127.5 (147.8)	110.2 (77.2)	93.24 (80.8)	91.27 (80.4)	-10.1 (84.9)	70.64 (80.5)	-7.591 (84.6)	110.5* (63.5)	-60.57 (40.4)
Student Service Cost	-25.91 (38.2)	25.82* (14.4)	31.17** (14.6)	36.54** (14.4)	-13.78 (12.4)	14.04 (13.4)	-14.35 (12.2)	-6.785 (11.1)	-9.591 (13.0)
Institutional Support Cost	-38.21 (77.1)	-33.09 (29.4)	-49.37* (29.8)	-45.14 (29.2)	58.46** (28.9)	74.53** (28.2)	58.40** (28.7)	-51.15** (28.4)	-54.81** (25.9)
Scholarship Cost	4.816 (38.7)	43.20*** (14.2)	46.59*** (14.7)	44.58*** (14.6)	27.83* (14.25)	33.42** (14.2)	28.60** (14.0)	41.01*** (13.5)	24.47* (14.8)
Auxiliary Cost	-18.75 (160.3)	89.47 (62.0)	42.69 (65.3)	28.13 (65.0)	-51.68 (65.8)	24.53 (65.3)	-49.7 (65.7)	-24.47 (65.7)	-39.15 (30.3)
Institutional Fixed Effects	X	X	√	√	√	√	√	√	√
Year Fixed Effects	X	X	X	X	√	X	√	√	√
Controls	X	Min	Min	√	√	√	√	√	√
With state time trends	X	X	X	X	X	√	√	√	√
Decomposed by Year with State time trends	X	X	X	X	X	X	√	√	√
Subset Comparisons	X	X	X	X	X	X	X	w/o Never DCS	w/o Always DCS
Standard errors in parentheses									
*** p<0.01, ** p<0.05, * p<0.1									

A final, related result is the impact of employing an RCM budget model on the costs that were distinct to the DCS effect. Total costs under the full model for RCM schools (over 91% of which also employed DCS) increased over the time period by \$2,212 per FTE in the full version of the model (Version 7), as shown in Table 6. The same trend for increased scholarship spending was present in the RCM schools, but to a much stronger degree than that attributable to DCS, as it added \$64 per FTE for RCM schools. However, many of the relationships to specific areas of cost found when only examining the impact of DCS are more pronounced in RCM schools. The drop in Institutional Support spending related to DCS was more than offset by the higher expenditure per FTE experienced by the RCM schools, while Student Service costs also increased. In sum, RCM indicates a consistent reallocation of dollars across spending categories but does so with a larger overall available resource pool, as higher cost follow higher revenues.

Table 6
RCM as dummy variable in estimating equation

<u>Program Expense</u>	(7)	(9)
Total Cost	2,185*** (540.2)	8.951 (402.0)
Instruction Cost	-21.06 (103.7)	-325.6** (144.8)
Research Cost	-83.82 (124.2)	83.66 (152.9)
Public Service Cost	-70.77 (63.94)	283.1*** (46.38)
Academic Service Cost	-177.5 (140.8)	-111.0 (85.20)
Student Service Cost	29.31 (20.11)	14.51 (26.77)
Institutional Support Cost	62.65 (47.33)	-25.00 (60.48)
Scholarship Cost	63.91*** (23.41)	28.33 (33.42)
Auxiliary Cost	32.32 (108.8)	-24.38 (70.27)
Institutional Fixed Effects	√	√
Year Fixed Effects	√	√
Controls	√	√
With state time trends	√	√
Decomposed by Year with State time trends	√	√
Subset Comparisons	X	w/o Always DCS
Standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

E. Parallel Trends Assumption and Bacon Decomposition robustness check

The TWFE approach requires a demonstration that, absent the treatment (DCS participation), the outcomes for treated and comparison groups would have followed a similar trajectory (Roth, et. al, 2023). As discussed earlier, the IPEDS financial survey data has significant compositional differences in consistency during the 5 years prior to FY2004 due to the gradual phase-in of GASB financial reporting requirements that had to be completed by the end of FY2003. As such, a covariate-based comparison based on the years immediately prior to FY2004 is impractical and may provide inconsistent and/or confusing results. Moreover, when there is heterogeneous timing of the treatment effects, as is the case here, another approach for charting the assumptions of parallel trends can better offer this validity check of the model. This dissertation utilizes the approach developed by Clarke and Schythe to document the parallel trends of the outcomes under review before the DCS treatment occurs in multiple time periods (Clarke and Schythe, 2020).

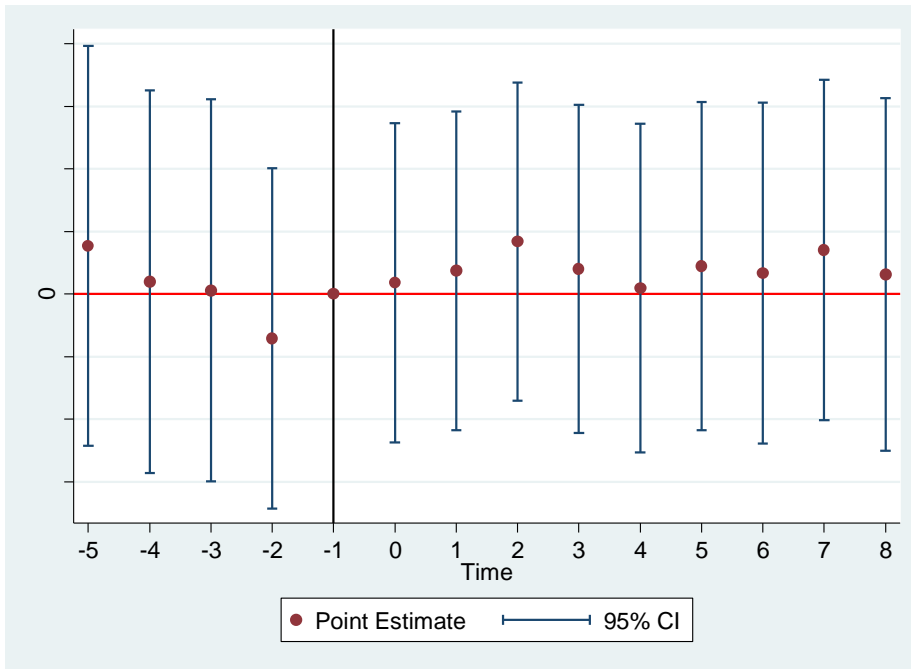
Figure 3 shows the parallel trend results for the four outcomes with statistically significant results, while **Appendix 5** does so for the remaining outcomes. DCS treatment occurs at different times during the period of study for the sixteen RPIHE in the “Sometimes” group. This approach re-centers the time of treatment so that time period -1 represents the demarcation line between pre-and post-treatment, regardless of the actual fiscal year in which it occurred, with treatment first manifesting in time period 0. The ideal result to demonstrate that the parallel trends assumption holds is that the pre-treatment time periods are not statistically different

from zero. The figures, which show point estimates and confidence intervals for each spending outcome under review, document this to be the case. The confidence intervals all contain zero. Still, in select instances, such as in the first year prior to treatment of Institutional Support expenditure, the point estimate nears significance, but never do so.

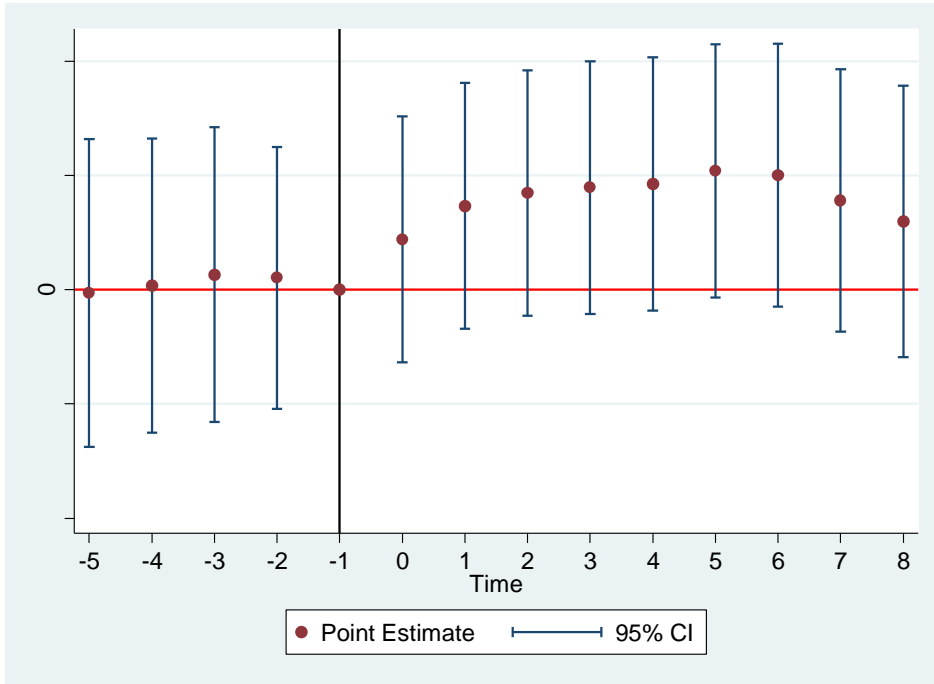
Figure 3

Parallel trends test plots for main results

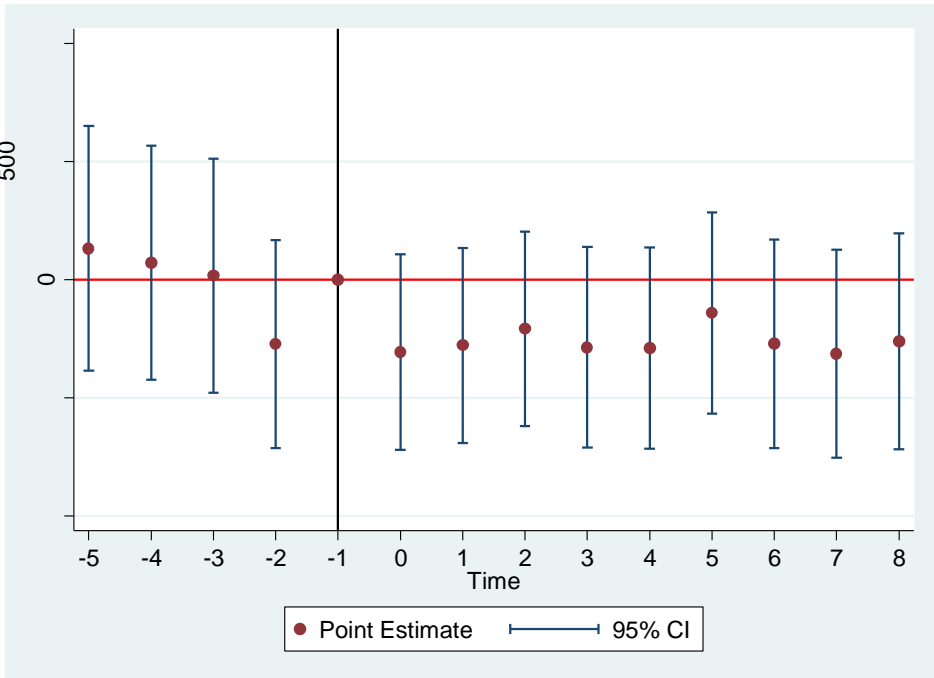
Instruction



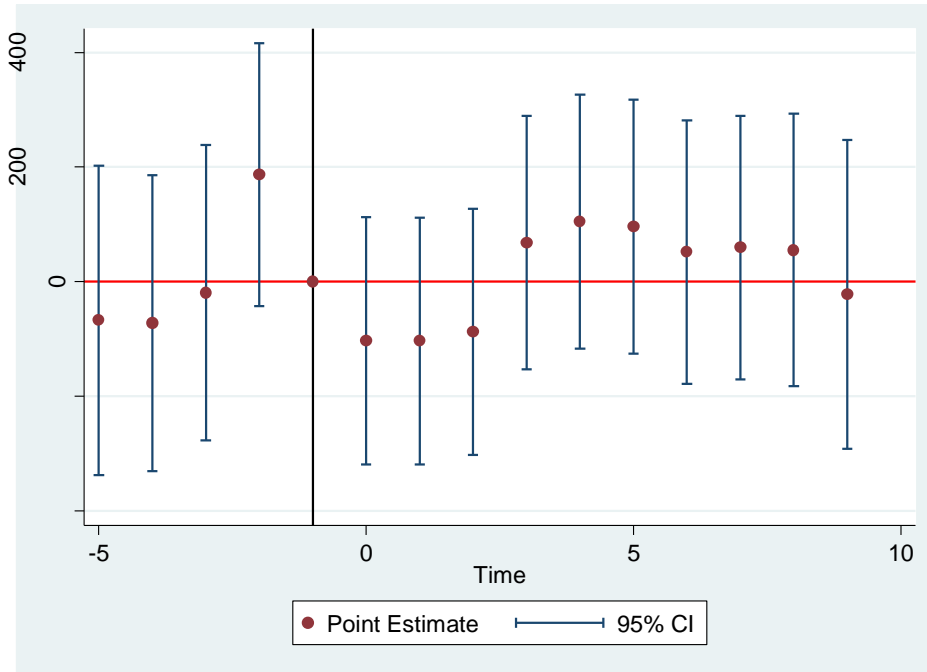
Public Service



Student Services



Institutional Support



The post-treatment results show trends that follow the signs and values of the TWFE point estimates, supporting the model's estimated impact of the treatment.

Yet, all but the Public Service outcome, from the same type of analysis that confirmed the parallel trend assumption. This is likely due to the low power of the event study approach which only draws from 16 'Sometimes' universities to derive the estimators (Roth, et. al, 2023). Still, these results enhance the validity of the model's output. So, a robustness check on the TWFE estimators is helpful to understand how the variation in treatment timing impacts the outcomes, potentially introducing bias. The decomposition approach developed by Andrew Goodman-Bacon has been utilized here (Goodman-Bacon, 2021). Other methods, such as the Sant'Anna/Callaway estimator, and the alternative approach proposed by Chaisemartin and D'Haulfoeuille, have similar uses. Sant'Anna/Callaway help

address outliers that have an outsized impact on the estimator results while Chaisemartin and D’Haulfoeuille propose a non-parametric approach to correct weights of treated units that have significant negative effects that obscure the average reflected by the DiD estimator (Sant’Anna and Callaway, 2021; and Chaisemartin and D’Haulfoeuille, 2020).

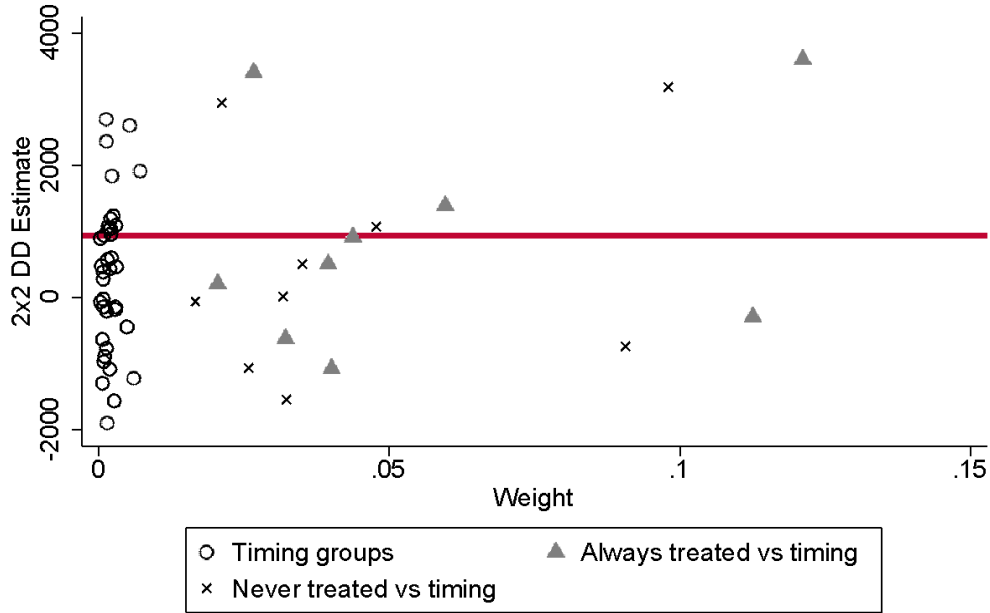
The Goodman-Bacon methods have been applied here to understand the timing effects, especially as it also instructed the application of my approach toward grouping RPIHE into the treatment categories of Always, Never, and Sometimes categories. **Table 7** shows the summarized results and **Figure 4** has the graphs for each area of expenditure. Importantly, the timing groups represent only 7.3% of the weight that make up the DiD results, while the controls (represented by the Within group) only represent 3.2% of the overall DCS coefficient, suggesting that 90% of the total impact is related to the process under review in this dissertation.

Table 7
Bacon Decomposition summary weighting outcomes results

<u>Grouping</u>	<u>Beta</u>	<u>Weight</u>
Timing Groups	503.1	7.3%
Always v. Timing	1,165.8	49.6%
Never v. Timing	744.9	39.9%
Always v. Never	29,669.0	0.0%
Within	516.3	3.2%

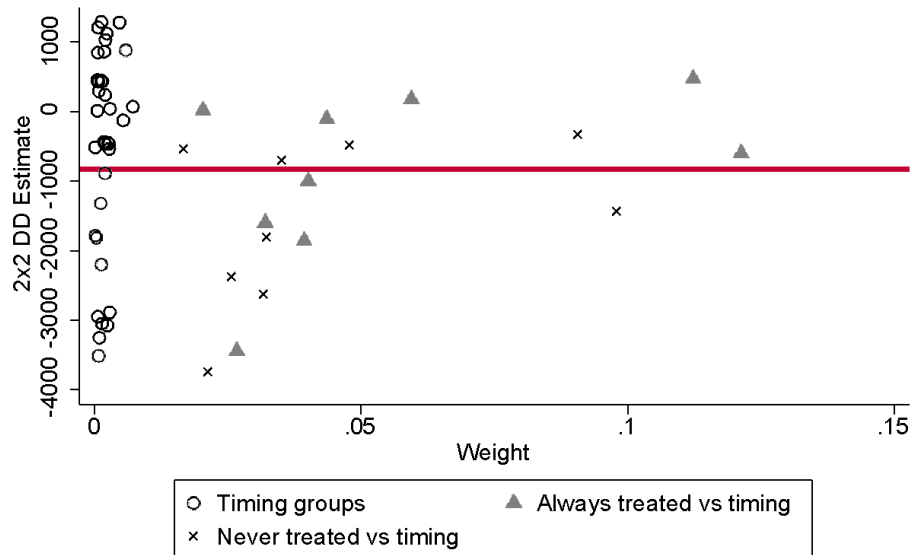
Figure 4
Bacon Decompositions by expenditure type

Instructional Expense



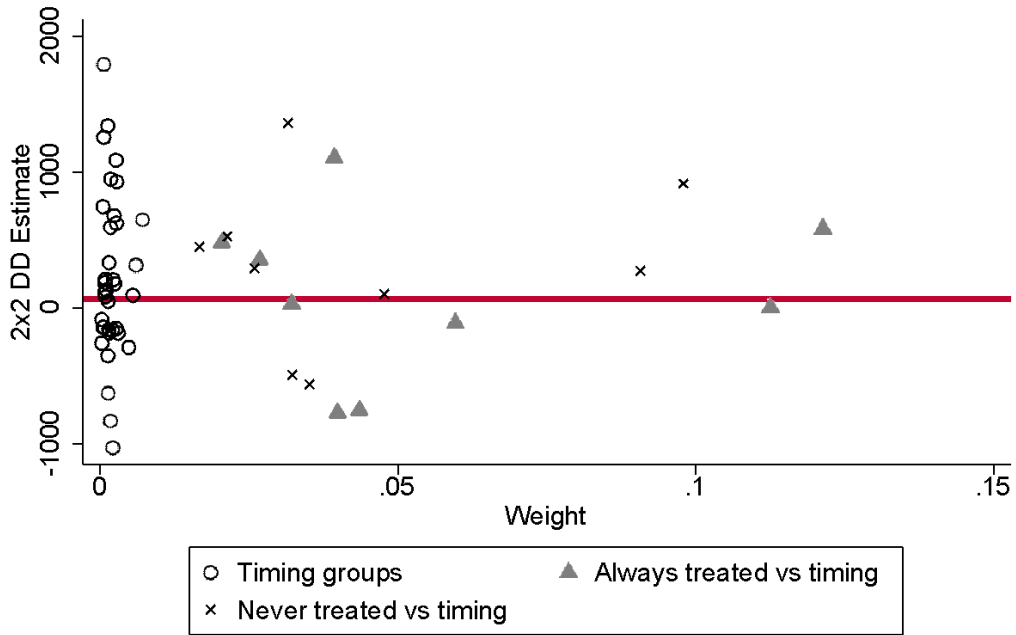
Overall DD Estimate = 937.38303
 Always vs never treated = 29669.025 (weight = .00030209)
 Within component = 516.34113 (weight = .03196578)

Research Expense



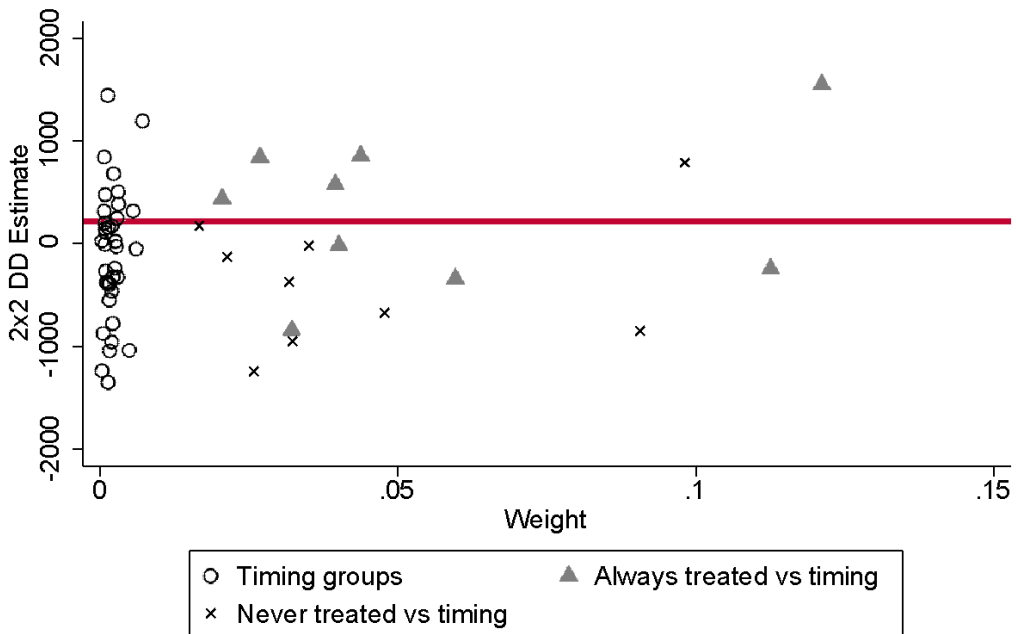
Overall DD Estimate = -818.69681
 Always vs never treated = 23393.756 (weight = .00030209)
 Within component = -685.36816 (weight = .03196578)

Public Service Expense



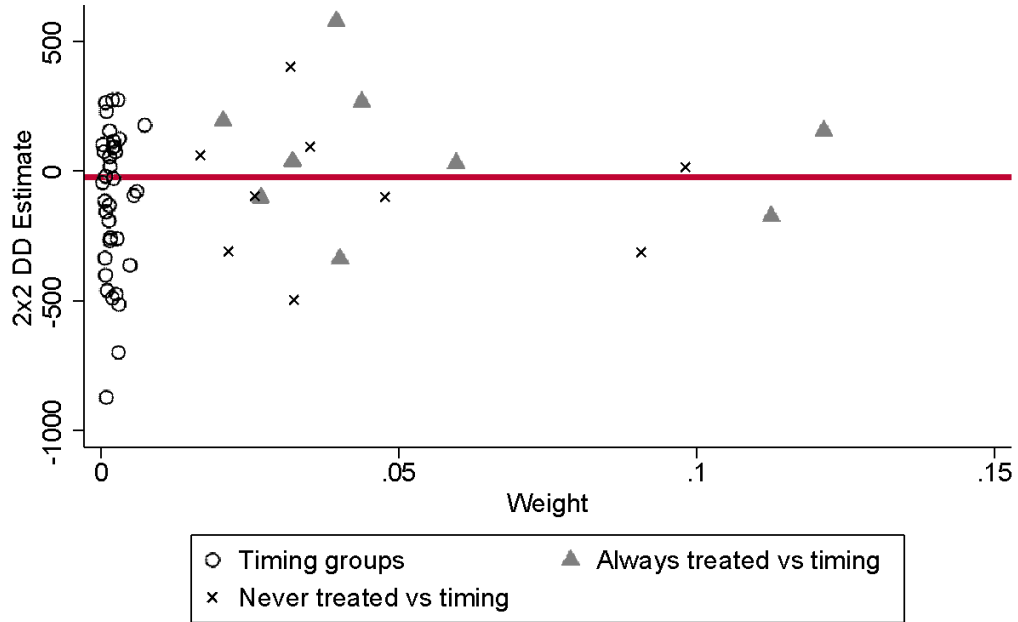
Overall DD Estimate = 71.065699
 Always vs never treated = -10126.423 (weight = .00030209)
 Within component = -5040.2075 (weight = .03196578)

Academic Support



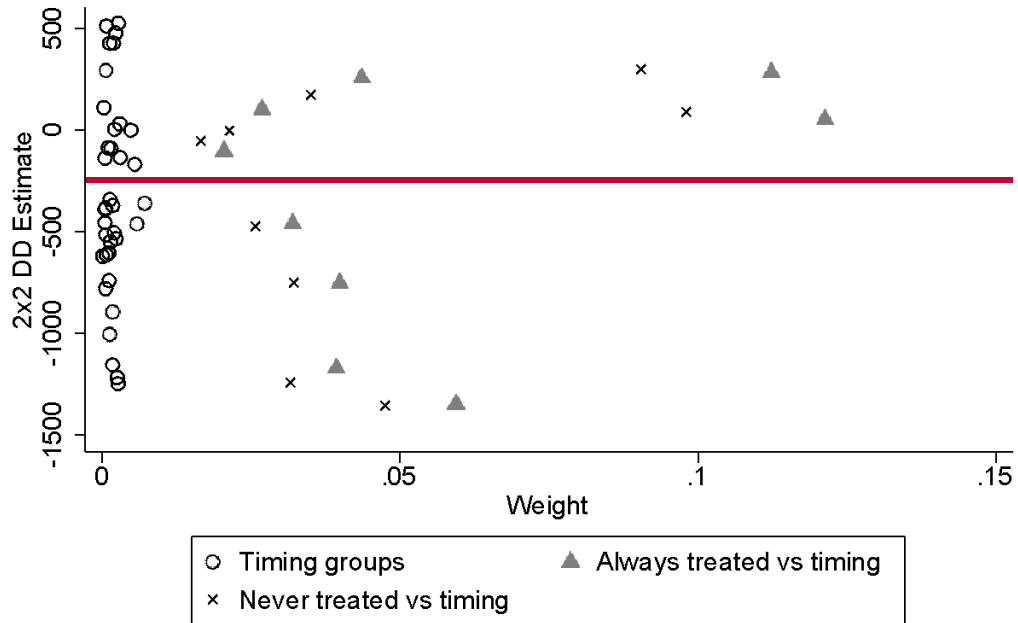
Overall DD Estimate = 224.21522
 Always vs never treated = 50798.031 (weight = .00030209)
 Within component = 3457.78 (weight = .03196578)

Student Support



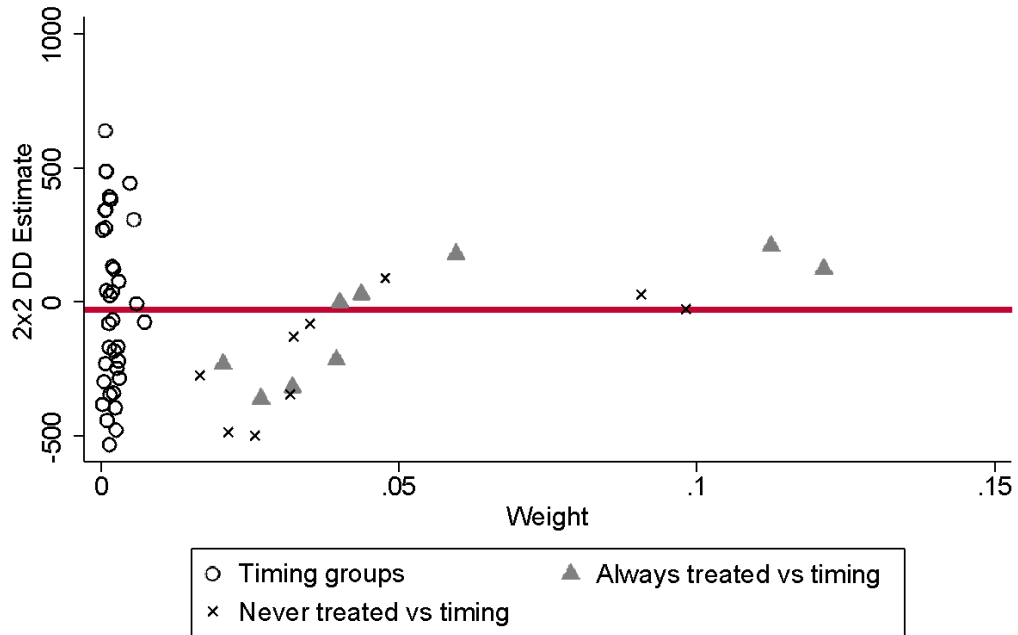
Overall DD Estimate = -21.663776
Always vs never treated = 11565.19 (weight = .00030209)
Within component = -114.47771 (weight = .03196578)

Institutional Support



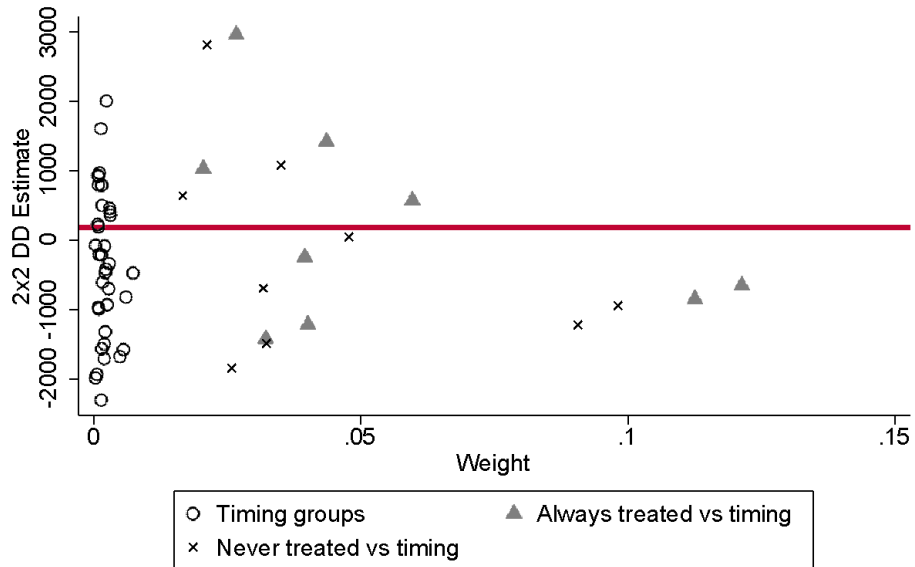
Overall DD Estimate = -240.88605
Always vs never treated = 9072.1064 (weight = .00030209)
Within component = 20.256031 (weight = .03196578)

Scholarships



Overall DD Estimate = -26.231404
 Always vs never treated = 7315.3486 (weight = .00030209)
 Within component = -127.99024 (weight = .03196578)

Auxiliary



Overall DD Estimate = 185.29874
 Always vs never treated = 25827.738 (weight = .00030209)
 Within component = 15751.385 (weight = .03196578)

F. Qualitative case study implications

In summary, the quantitative results identify a clear increase in spending on instruction and scholarship expenditures from universities that participated in DCS during the 15-year period of study vis-à-vis those that did not. Moreover, this activity corresponded with a lower relative per FTE-based outlay than non-DCS Research Public Institutions of Higher Education (RPIHE) on institutional support and student support activities. Yet, the IPEDS data cannot provide insight into several fascinating public policy and financial management questions around the implementation and strategic decision-making process that led to the outcomes documented in this dissertation. Moreover, the controls in the analytical model rule out simple economic motivators - like recessions, changes in demographics, etc. - or solutions related to enrollment or state-sponsored revenue changes as the prompt for such redirection of internal resources. So, questions arise that only qualitative follow-up can shine light upon, such as:

- Were the spending outcomes indicated by this dissertation those intended by the RPIHE, and were they a direct result of DCS participation alone or part of a larger effort?
 - If so, how does each year's successive DCS input influence managerial responses?
 - If not, what other factors led to the outcomes at these RPIHE?
- What level of leadership (e.g. President, Provost, Deans, Chairs, Chief Financial Officer, or combination of leaders etc.) within universities promoted a change in activity related to DCS?

- Which levels of the organization were charged with enacting the changes?
- What trade-offs did decision-makers weigh when shifting resources between uses (e.g. from institutional support to instruction)?
 - Was there slack, ease of control, presumed efficiencies to be gained, etc. that indicated institutional support or student service spending would be part of the resource reallocation solutions?
- How long did it take the university to move from effort to desired result?
- How, if at all, were state funding sponsors involved in the process?
- Why did the university decide to participate (or not) in DCS?

Answers to such questions will offer context to the quantitative results in terms of paths taken in implementation but will also importantly indicate points of engagement crucial for the understanding of public policy efforts made to fund RPIHE. Questions for state sponsors thus could equally offer valuable understanding of the policy context in which improvement efforts like DCS are successful or not, and what value funding agencies see in improving outcomes when their input may not be the primary motivator behind a change. Some crucial questions along these lines are:

- What are the prime outcomes that your state government looks for RPIHE to offer the community?
 - Do the results this dissertation's quantitative analysis show in terms of DCS's impacts on spending category results reflect the State's areas of interest?

- Does the state in which the university is located have a pattern of involvement/guidance on universities enacting financial strategies like DCS participation?
- If efficiencies at RPIHE yield cost savings, does that money remain at the university, revert to the state, or do something else?
 - How do such efficiency programs influence the willingness (or not) of the state to provide additional funding to RPIHE?

With these questions in mind, the DinD design and results indicate that a comparative case study of a “Sometimes” RPIHE (that is, that had sometimes been a DCS school) part vs. a “Never” (never participated in DCS) school would prove the most fruitful means of deepening our understanding of the business processes behind the quantitatively documented outcomes across this financial decision divide - to participate in DCS or not. Since very little research on the topic exists, all insights unearthed through qualitative means are additive to the literature and may provide a basis for future researchers. Including one “Always” (consistently participating in DCS) university would add nuance around the longer-term implications of cost disaggregation as a standard operating procedure rather than a new policy being implemented and altering results. Nevertheless, this is ultimately a convenience sample (Brady and Collier, 2010) methodology guided by the those within in broad 96 RPIHE group with whom interviews can be secured. Convenience sampling, a nonprobability sampling technique, suffers from clear issues in terms of returning irrefutable evidence in support of the conclusions the study. Most important among

these are selection bias and non-generalizability through a lack of sample representation (Taherdoost, 2016)

Yet, as described by Skowronek & Duerr, researchers may reduce the impact of selection bias by approaches such as matching that improve the baseline representativeness of contrasting cases (Skowronek & Duerr, 2009). To that end, I matched triads of desirable institutions within which to seek interview subjects by the following means. First, each RPIHE was set into one of the three DCS groupings used in the quantitative section. From there, the matching approach utilized the IPEDS characteristics employed as controls in Equation (1) - undergraduate student counts, total revenue, total expenses, and faculty to student ratio being chief among them – to find the three RPIHE most similar in scope while representing each of the different DCS utilization histories (“Sometimes”, “Never”, and “Always”). Still, as Dunning reminds (Brady and Collier, 2010), such attempts cannot account for unobserved variables that either belie similarities or contrasts. So, caution with the exactitude of the groupings and their ability to truly represent the RPIHE is high and not implied by this analysis. Finally, priority was given to groupings among which I had strong pre-existing connections that would promote more extensive access to detailed information. From this effort, I identified the two sets of schools with the highest matching scores:

- 1) “Always”: Mississippi State University; “Sometimes”: SUNY Albany;
and “Never”: University of Nevada: Reno; or

- 2) “Always”: University of North Carolina at Chapel Hill (UNC-CH);
“Sometimes”: University of Illinois at Chicago (UIC); and “Never”:
Virginia Commonwealth University (VCU).

The second triad proved most fruitful in term of two key factors needed for successful interviews: first, there was much greater access to university professionals familiar with DCS and other financial management activities among this group for interviews; and second, this grouping reflects the full breadth of mission-based activity described in the “theory of action” where financial managers on campus have the ability to make decisions that significantly impact the type of spending undertaken by RPIHE.

Chapter 3: Qualitative analysis

A. Case study framework

The second research question motivating this dissertation is **How does the presence of this granular data influence financial decision-making processes and the resultant internal management policy actions in these Research Public Institutions of Higher Education (RPIHE)?** This entails inquiries among financial decision-makers at varying levels of influence within RPIHE as well as their public funding sponsors. To provide answers to this concern, this dissertation employs an interview method of those cases indicated by the results of the quantitative analysis. As noted at the end of the quantitative section, a contrasting cases approach is utilized: RPIHE that took different managerial decisions on DCS utilization (“Sometimes” or “Never”) and thus provoked different impacts to expenditures outcomes. This case selection is mindful of Ragin’s discussion (Ragin, 2004) of the careful consideration required to identify the type of conclusions the researcher can draw from such a combination quantitative and qualitative research. By setting the qualitative work in an explanatory framework that has identified particular outcomes from the quantitative work, this dissertation will be probing *sufficient* conditions for the cost outcomes under review but will not be capable of portraying them as *necessary* conditions for the same.

Yin (2008) details how a two- or three-case study design for the interviews overcomes the vulnerability of single case design, whose results may relate only to

the particular circumstances of single case rather than represent wider patterns. The aim of the interviews is therefore to provide in-depth answers on why RPIHE make certain financial decisions in the presence of DCS-informed data. This dissertation patterns the main form of the qualitative approach after Yin's framework. The *propositions* are to understand:

- 1) how and why institutions use DCS comparative data to inform departmental resource reallocations to achieve particular outcomes;
- 2) how departments implement leadership guidance to meet cost directives; and
- 3) the manner in which cost reductions in one area led to higher expenditure elsewhere.

The *unit of analysis* for the study is the institution. This dissertation examines how institutional-level decision makers at RPIHE determine resource allocations with the cost information available to them, with special attention on the DCS comparative info they receive. It also details the financial guidance developed by institutional leadership and explores how the guidance shapes decisions at the departmental level. Finally, it probes how state budget sponsors request expense information and utilize it within the public policy framework described above.

The *logic linking data to propositions* is that of pattern matching and cross case synthesis, wherein we follow our theory of action - that DCS cost disaggregation leads to cost displacement in one area to in favor of those that produce a desired outcome - and compares the actual activity to that model. The synthesis of cases involves comparing the outcomes of paired cases and determining how the

divergences functionally emerge. Finally, the *criteria for interpreting findings* is to identify rival explanations and address them, following the identification strategy of the quantitative work.

B. Case study validity

For *construct validity*, this research requires one to speak with multiple decision makers within each institution to represent the full case. Furthermore, the focus on cost requires respondents to have direct influence on overall policy and/or activity-level spending decisions, such that their responses reflect the end results that manifest in cost data. To this end, the dissertation the following interviewee list:

- Institutional leaders directly involved with Finance at a Vice President (VP) or Assistant/Associate VP for Finance level (with one representing the Provost's Office and another the Chief Financial Officer/VP Finance);
- Departmental financial officers and Institutional Research (IR) officials that manage or influence DCS data; and
- State-level budgeting officers and system office managers to chart the interaction of campus activity with the state policy environment.

In terms of *internal validity*, the opening literature review describes how this dissertation builds the most plausible explanation of results for those interviewed from extant research. The research also addresses rival explanations with pattern matching and comparison of contrary cases. As for *external validity*, the approach is to test the logic beyond a single case to probe its plausibility. Finally, as to

reliability, the research utilizes a standard questionnaire and adheres to protocol for follow-up questions and response recordation.

The second research question probes how systematically disaggregating expenses influences financial decision-making at RIPHE. To answer it, this dissertation proposes to pursue an interview method of those cases indicated by the results of the quantitative analysis. In selecting pairs of cases, the dissertation follows Gerring's guidance (Seawright and Gerring, 2008). Several approaches matching Gerring's criteria are of interest: contrasting cases of DCS users with very different effects on instructional cost; similar cases where a DCS member and a non-participant university saw a similar effect on instructional cost; or, before and after contrasting cases with two universities that began DCS participation at same time that had very different results. This case selection is mindful of Ragin's discussion of the careful consideration required to identify the type of conclusions the researcher can draw from such a combination quantitative and qualitative research (Ragin, 2004). By setting the qualitative work in an explanatory framework that has identified particular outcomes from the quantitative work, this dissertation will be probing *sufficient* conditions for the cost outcomes under review but will not be capable of portraying them as *necessary* conditions for the same.

Yin (2008) details how a two-case study design for the interviews overcomes the vulnerability of single case design, whose results may relate only to the particular circumstances of single case rather than represent wider patterns. This proposal patterns the main form of the qualitative approach after Yin's framework. The *propositions* are to understand: 1) how institutions use DCS comparative data to

inform departmental resource allocations; 2) how departments adjust instructional delivery/spending to meet cost directives; and 3) whether some cost reductions lead to higher expenditure elsewhere – as suggested by public budget theory. The unit of analysis for the study is the institution. This section examines how institutional-level decision makers at RPIHE determine resource allocations with the cost information available to them, with special attention on the DCS comparative info they receive. It also details the financial guidance developed by institutional leadership and explores how the guidance shapes decisions at the departmental level. Finally, it probes how state budget sponsors request expense information and utilize it within the public policy framework described above. The *logic linking data to propositions* is that of pattern matching and cross case synthesis, wherein we follow our theory of action - that DCS cost disaggregation leads to cost displacement in instruction to discretionary pursuits like research - and compare the actual activity to that model. The synthesis of cases involves comparing the outcomes of the contrasting cases and determining how the divergences emerged. Finally, the *criteria for interpreting findings* are to identify rival explanations and address them, following the identification strategy of the quantitative work.

Upfront, the plan to address key points of case study design validity is as follows. For *construct validity*, this research requires one to speak with multiple decision makers within each institution to represent the full case. Furthermore, the focus on cost requires respondents to have direct influence on overall policy and/or activity-level spending decisions, such that their responses reflect the end results that manifest in cost data. To this end, the dissertation proposes the following interviewee list:

- Institutional leaders directly involved with Finance at a Vice President (VP) or Assistant/Associate VP for Finance level (with one representing the Provost’s Office and another the Chief Financial Officer/VP Finance);
- Departmental financial officers and Institutional Research (IR) officials that manage or influence DCS data; and
- State-level budgeting officers and system office managers to chart the interaction of campus activity with the state policy environment.

C. Case Study Results

The interviews were undertaken in the Winter of 2022 and Spring of 2023. They involved Zoom and in person discussions with business managers, financial leadership, and academic administrators on the university side as well as university system governing representatives and state budgeting figures.

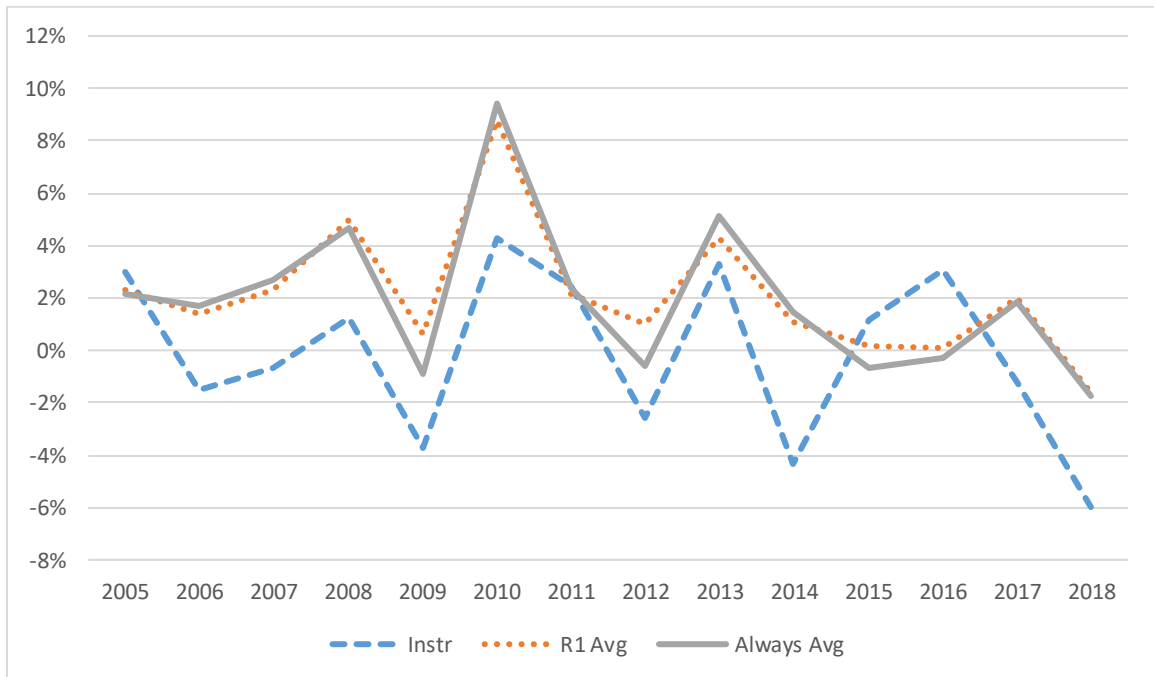
Interview Group One - the “Always” case: University of North Carolina at Chapel Hill (UNC-CH): System imposed rules that influenced funding totals with uneven results

Interview Subjects: 1) Assistant Dean for Finance and Operations (ADFO) 2) former State Budget Analyst (SBA); and 3) Assistant Provost for Institutional Research and Assessment (APIRA)

North Carolina, as described in the literature review, developed a state mandate in 1999 that all schools under the oversight of the University of North

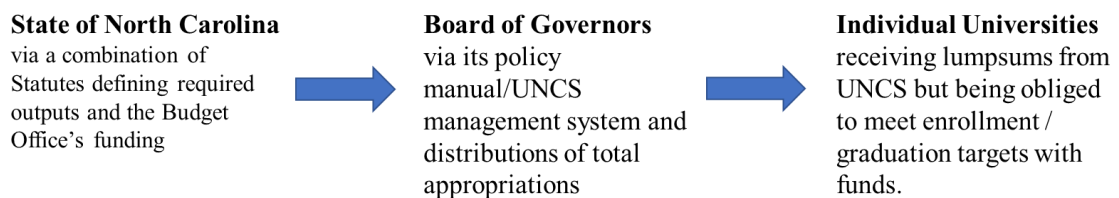
Carolina System (UNCS) and its Board of Governors (BOG) participate in DCS. As such, UNC-CH represents the ‘Always’ category of RPIHE for this dissertation’s period of study and is seemingly well placed to be an exemplar of the typical impacts of DCS on university spending behavior. Yet, the results of the quantitative data report a result that goes counter to the average overall patterns discovered. **Figure 5** shows that UNC-CH was both below the average among all R1s in terms of the annual percentage increase in per student FTE expenditure on Instruction and even further beneath that of their “Always” DCS cohort. Yet, this result did not repeat in Scholarship spending, which were in line with or above the cohort averages. Exploring these differences was thus a key component of the qualitative interview process with UNC-CH.

Figure 5
University of North Carolina at Chapel Hill
Change in Instruction per FTE vs. R1 and DCS Group Averages



The result finds a meaningful context within the public policy interplay that respondents described between how the different agencies throughout the hierarchical governmental structures overseeing UNC-CH’s finances received and translated DCS-data into practice. A simplified chain of command is shown in **Figure 6**.

Figure 6
North Carolina State Sponsor Chain of Command



The requirements of the North Carolina State Constitution and its General Statutes set the hierarchy of control that provides a broad and comprehensive framework for the activity of PIHE in the state. The State Budget Office, housed within the executive branch, provides the funding for all PIHE in North Carolina through a single appropriation to UNCS, as determined by the Governor and adjusted by the Legislature. The SBA described that the UNCS appropriation is primarily determined by the overall availability of state general funds that defines the initial lump-sum total budgeted for public post-secondary education rather than temporal circumstances or agency appeals. The Executive’s interactions with UNCS and the government relations teams of each university have only limited effect on this exercise, primarily because much of the incremental budget change process is delegated to UNCS officials. Nevertheless, throughout the fiscal year the Budget Office ensures spending activity at UNCS institutions comply with state regulations

and that use of funding not supplied by the state sponsor conforms with spending authority provided to the universities.

The main statutory provision of interest to this dissertation (and one that falls under this Budget Office compliance function) is the flexibility provided to UNCS institutions to move funds around their internal budgets in all areas of expenditure, except capital projects and financial aid. This rule helps explain the DCS result for UNC-CH in terms of scholarship awards, which is discussed later in this section. On the operational side, state sponsor oversight for UNC-CH is primarily channeled through the BOG, its chief decision makers. BOG creates and maintains the high-level code of operations for all UNCS institutions and provides specific direction and policies on nearly all university matters via the UNCS Policy Manual, which contains more detailed guidance (UNCS, 2022). Such highly coordinated oversight of public universities by a state agency stems from the elevated place of state appropriations as a percentage of total unrestricted revenues for institutions in the UNCS, where these funds represent as high as 70% of revenues for multiple universities (although not UNC-CH, which typically receives around 25% of its total revenues from the state). As The Pew Charitable Trusts two-decade review of the role of state funding as part of total PIHE funding sources found, the typical state contribution to such universities represents approximately 21% of total revenue (Pew Institute, 2019), so UNCS's outsized support aligns with a greater emphasis on state input into decision making of its post-secondary institutions.

Along each step-- from State to BOG and from UNCS to individual campuses-- DCS played a positive role in adding transparency to the process by

which state funding amounts were determined and how the populace's tax dollars were being used for its students. However, the implementation occasionally prompted inconsistent understanding and application of financial management once the dollars reached individual campuses. Detailing the roles in play is useful in understanding how the funding dynamics unfolded. Fortunately, UNC-CH's financial management interviews include a source with unique compilation of viewpoints into the university's operational hierarchies: an Associate Dean for Finance and Operations (ADFO) within a UNC-CH college who also had significant finance experience at UNCS and at a smaller university within the system. Her description of the policy tracks this financial data takes through the sponsor hierarchy helps clarify how DCS-based figures directly led to funding changes and the managerial decisions to spend more or less of available revenue in support of particular functions of the mission.

The ADFO described how state policy oversight follows three threads: tuition setting, enrollment, and state appropriations. UNCS has a delegated coordinator to guide each of these pillars, and enrollment is the policy area most closely aligned to DCS and its disaggregated, discipline-level data, even as it ultimately helps determine changes to state appropriations as well. The ADFO described how the DCS cost disaggregation approach was put into practice by way of a 'cell matrix' system. The 'cell matrix' assigns areas of instruction to one of four categories based on the DCS determination of the average cost of delivery in the relevant discipline (e.g. Engineering, Nursing, Business, etc.). **Table 8** shows the 2018 version of this matrix while **Appendix 3** illustrates how these values flowed through the broader rule set so

that, when interacted with faculty position counts and existing state funding, UNCS may calculate needed changes to state appropriations at UNCS schools.

Table 8
UNCS Matrix - Value of Credit Hour by Category/Level of Instruction

<u>Category</u>	<u>Undergrad</u>	<u>Masters</u>	<u>Doctoral</u>
I	\$ 708.64	\$ 169.52	\$ 115.56
II	\$ 535.74	\$ 303.93	\$ 110.16
III	\$ 406.24	\$ 186.23	\$ 109.86
IV	\$ 232.25	\$ 90.17	\$ 80.91

Source: UNCS Enrollment Funding, 2018.

Starting from a base of credit hour outputs to be achieved by UNCS institutions that was reset in fiscal year 2006, each year’s actual cost and student activity outcomes were run through a set of formulas to gauge whether the credit hour targets were being met by UNCS schools (UNCS, 2018). These targets then calibrate appropriations up or down *ex post* as state and system leadership review detailed (but lagged) information on UNCS institutional conversion of funding into performance results, which focus on the state’s higher education goals of graduation and job creation. But, during the 2005-2016 interval, several environmental/market changes called for alterations in the strict application of program rules. Perhaps most serious was the impact of the Great Recession, which saw enrollments (and their related tuition dollars) plummet due to a nationwide contraction of post-secondary education attendance. Under the UNCS approach, several universities produced lower than required credit hours in 2011-2013, which should have resulted in reduced state

support. But the damage to operations of lower state support while tuition revenue was also falling would have greatly undermined achievement of the performance results they were meant to incentivize. So, as the ADFO explained, a hold harmless period in DCS-based funding level reductions was enacted in fiscal year 2012 to allow schools to regain their hold on the student market. This policy action relates to the brief rebounding of Instructional spending seen in **Table 7**. Nevertheless, adjustments to admissions protocol were required by the state to ensure that enough students would be able to enroll at UNCS schools to meet the graduation expectations of state leaders. While UNC-CH was not among those universities struggling for student admits during this time, these state policy updates impacted its spending patterns.

The insights of an Assistant Provost for Institutional Research and Assessment (APIRA) added nuance to how this approach contributed to both positive and negative outcomes for UNC-CH that were signaled by the quantitative analysis. At the institutional level, the basic needs for all the colleges within the university were met by the tiered state funding structure, a feat not to be undervalued given the size of the state's annual investment. Yet, two issues related to the mechanics of the application of DCS credit hour data by different stakeholders across the hierarchy yielded undesirable funding outcomes for this RPHIE, whose operations were on a different scale than most of the UNCS schools. First, UNCS utilized the average cost of each discipline across the entire system - regardless of the type of institution delivering the instruction - as the means for calculating appropriations adjustments. Because all UNCS member institutions were obliged to participate in DCS, the state

and system had access to the full gamut of DCS peer data. While this breadth of information allowed for a comprehensive average, the decision to build a calculation methodology using a universal mean institutionalized an approach unfavorable to the larger, complex research institutions. This is the case because faculty at these RPIHE spend a smaller percentage of their time on instruction due to research and public service commitments vis-à-vis faculty at regional and comprehensive master's institutions, thus driving down the costs captured for instructional reporting at R1 schools relative to other post-secondary providers (an echo of the issues described by James in her analysis of the 1960s University of California System). This choice by the state and UNCS offered the benefit of a single rate and a clear and transparent calculation method, but it eliminated some of the benefits an individual university might obtain from participating in DCS (through analysis and policy formulation to its bespoke peer group results) because the outcomes specific to UNC-CH were subsumed by the system wide figure applied to credit hours taught at institutions.

Second, the category system also engendered challenges for particular disciplines across time. Each category housed a group of disciplines from most expensive (I) to offer to the least expensive (IV). So, the decision of where to place each discipline among the four cost categories shown in **Table 8** eventually caused misalignments of expense and state appropriation for specific colleges within universities that proved difficult to change as fields evolve. Because the combination of category and level of course instruction (bachelors, masters, or doctoral) align to disciplines, the average funding outcomes related to each discipline varied within universities. This variation between UNC-CH's cost structures of schools, for

example between the Schools of Education and Information/Library Science, raised the perceived cost of UNC-CH spending political capital to appeal for a change in categorization of a single college as it was rare that more than one college would share similar funding concerns at any given point in time. Moreover, because a change to the category portion of the DCS-based funding approach is discipline specific, a coalition that could seek a corrective action would need to be formed across UNCS institutions, and not within a single campus. All the while, the other, smaller UNCS institutions that offered courses of study in the same discipline were likely to not be underfunded in the same way as RPIHE because of the aforementioned averaging of instructional cost estimates in favor of institutions with narrower demands on faculty time.

So, with discipline placement decisions not updated regularly, particular colleges began the cell matrix funding approach with dollar values for their instructional expense levels below “break even” that became embedded in the structure and negatively compounded across time, even as the cost of delivery skyrocketed relative to other disciplines. Exemplifying this situation was the discipline of Nursing, which the APIRA noted to be the lone discipline to have a category change request granted by UNCS during the period of study. In this instance, representatives from all the North Carolina public institutions with Schools of Nursing (UNC-CH included) commissioned an independent discipline-specific cost study (beyond DCS) to demonstrate that the original assignment of nursing to a lower value category was inaccurate and that it belonged in the highest value category. The extraordinary effort required to inject dynamism into the structural

design of the data driven UNCS study is a key policy take away, which will be explored in the final section of this dissertation.

Finally, even such a high-profile enhancement as that afforded to Nursing schools could not serve as a guarantee that increased state funding would arrive at its intended local destination. All UNC-CH respondents confirmed that the total appropriations allotted to UNCS was clear and mechanistic, but the movement of funds from State to UNCS and then to UNC-CH and select Schools/Colleges was in no way formulaic. The interview subjects knew the totals received by the system, but viewed the amounts kept centrally by UNCS and/or UNCH-CH as going into a “black-box.” All respondents also agreed that the state funds were likely to be distributed at levels below expected totals that would be due to individual units if a one-for-one relation of credit hour production and state funding were the rule. So, incentives to increase credit hour delivery by a particular College at its expense were poorly defined or missing altogether. As such, a unit offering a new major or program that would increase system and university appropriations through the DCS-base credit hour metric was by no means assured of receiving the incremental funding growth their activity (and expense) had generated. This (missed) opportunity to promote revenue growth that benefited both the unit and the campus is another policy takeaway that will be explored later in this dissertation.

While the freedom to move funding between spending areas granted by state policy was helpful from a management perspective, the state funding model also created a *de facto* upper bound of total revenue that manifested itself in several undesirable ways. The APIRA indicated that the main negative DCS-related

operational outcome was that the campus felt obliged to provide lower faculty salaries in most of its disciplines than those paid by comparable RPIHE due to revenue constraints. Because faculty compensation is the single largest direct cost component in the DCS approach, this knock-on effect of UNC-CH having received average credit cost support (and not amounts aligned to its actual multi-faceted, mission-based service delivery) meant that compensation of faculty was consistently below that of its peers, in large part explaining the lower-than-average Instructional FTE expense totals shown in the quantitative model. It also pushed UNC-CH to focus heavily on nonresident student recruitment, particularly in graduate programs. Hence, wealthier out-of-state students were wooed to UNC-CH to provide a complementary revenue source to the capped state funding. While this is a common theme among all large universities, termed tuition discounting, the lower relative salaries made it difficult for UNC-CH to retain the high caliber faculty required to successfully run the programs that high-performing students sought in their graduate studies (Blumenstyk, 2014). A high level of funding risk on tuition collection was therefore introduced into UNC-CH's financial structure as an indirect negative outcome of the UNCS approach to state funding. This constriction of diverse revenue paths is the final UNC-CH inspired consideration of note to consider in the policy discussion to follow.

Nevertheless, on the positive side, the system's policy prohibiting unauthorized adjustments to financial aid spending created the space for UNC-CH to address one of the state's key desired outcomes: affordability for students. The APIRA and SBA pointed to the Carolina Covenant (CC) program as a point of pride on both an individual campus and state level. The CC is a financial aid program that

provides eligible residents with a financial aid package that allows them to graduate from UNC-CH debt free (UNC-CH, 2023). The cost of offering this program that awards annual institutional financial aid support worth between \$15,000 to \$25,000 to thousands of undergraduates annually drove UNC-CH to return Scholarship expense per FTE above the R1 and DCS “Always” cohort averages noted in the quantitative analysis while the campus’s Instructional spend per FTE was below average.

By looking backward from the onset to the mid-2010s, UNCS leadership determined that its approach was more prone to be punitive of underperformance than to incent efficient growth. Yet, DCS data was not discontinued. Rather, UNCS updated the fundamental ‘cell matrix’ system in the mid-2010s to offer forward-looking incentives to its institutions based on enrollment targets in particular disciplines. Perhaps unsurprisingly, the difficulties cited above lead UNCS to move away from the cell matrix to a ‘zip code’ costing approach after the period of study of this dissertation. The COVID-19 pandemic pushed a new cost nexus to a zip code methodology, which has more gradations of cost and focuses on the CPI by the location of course delivery, but the general structure for translating credit hours to dollars remains. UNC-CH will likely face a new set of imbalances from the latest change in methodology, one that would undoubtedly benefit in efficacy if the issues experienced under the DCS cell matrix approach can be incorporated in its execution.

Interview Group Two - the “Sometimes” case: University of Illinois Chicago (UIC): DCS came and went with little impact due to powerful external shocks.

Interview Subjects: 1) Associate Vice Chancellor UIC(AVC); 2) Director, Institutional Research UIC (DIR), 3) Assistant Vice President, Planning & Budget UI SYSTEM (AVPBP), 4) Associate Director, Planning & Budget UI SYSTEM (ADPB)

Like the other two universities being researched, UIC is part of a state superstructure called for by executive and legislative sponsors that sets detailed policy to govern post-secondary activity. First, UIC is a member of the University of Illinois System (UI SYSTEM), which is composed of three main UI campuses, several affiliated regional campuses, the UI Health hospital and clinics, extension offices, and an interdisciplinary private-public research institute (UI SYSTEM, 2023). Furthermore, the State of Illinois established the Illinois Board of Higher Education (IBHE) to administer the policy and funding activity of not only UI SYSTEM, but the other Public Institutions of Higher Education (PIHE) and Community Colleges⁷. IBHE is therefore the conduit for the state rules and financial guidance to UIC via the strategic oversight of UI SYSTEM.

Most pertinent to this dissertation, IBHE established a quantitative costing approach in the 1970s that required all constituent PIHE in the state to submit annual cost information in a standardized format (IBHE, 2016). In the early 1990s, the mandated format was updated to focus on comparisons at the discipline level, quite similar to the DCS approach. This IBHE Discipline Cost Study, an illustrative UIC departmental example of which is available in **Appendix 4**, unified expense

⁷ Along with the three UI SYSTEM campus, the eight other PIHE under the IHBE's purview are: Chicago State University, Eastern Illinois University, Governors State University, Illinois State University, Northeastern Illinois University, Northern Illinois University, Southern Illinois University, and Western Illinois University.

structures across all IBHE universities to provide state decision makers with comparative financial data. It also incorporates non-financial data, such as key inputs (faculty positions and classroom space) and outputs (student credit hours and degrees awarded) directly related to the many missions of university activity. This base data generates four comparative metrics for each department, college, and campus in Illinois: Direct Instructional Cost (DIC), DIC with departmental overhead, DIC with college overhead, and the full-loaded DIC with university overhead. These four points of comparison (and to a lesser extent the broader data set) help drive resource state appropriation allocation discussions between state, system, and campus representatives during each budget cycle.

The System Office's AVBP shared that from the early 1990s through the late 2000s, the IBHE cost study was used in a mechanical manner to add and subtract appropriations from the constituent universities based on each institution's annual delivery of the student-related outputs mentioned above. The average of overall PIHE costs in the state served as a key reference for IBHE to guide the funding distributions after the cost study results for all universities were tallied. Yet, as seen in North Carolina, no compensating measures to distinguish how the vastly different missions of instruction-heavy regional state universities and those of the high research UI SYSTEM schools titled average cost figures in favor of the smaller (and less expensive) regionals due to the metrics principally focusing on instructional outputs. Even so, the level of detail required from reporting PIHE was high, and the demand of upkeep at the campus level began to outstrip the potential benefits to UIC given the pride of place instructional results held in the formulas. A UI SYSTEM

Associate Director for Planning & Budget (ADPB) related that, as the 2000s advanced the workload involved and the low likelihood of a positive appropriation return – no matter how encouraging the student success results – compromised the detail and accuracy of UI SYSTEM institutional submissions, although the reported information always served as an accurate barometer of expenditure trends.

This campus level shift was corroborated by an Associate Vice Chancellor (AVC) overseeing Budgets and Financial Analysis at UIC. He noted that, for these same reasons, the DIC figures were much less influential in internal campus decisions prior to 2010. However, as the Great Recession stretched on, political exigencies became much more influential in driving tuition increases permitted by the state than market conditions. After 2010, state leaders cited the lingering impact of the national economic climate on the ability of Illinois families to afford state-sponsored institutions as the rationale for declaring a moratorium on all tuition hikes. Two years of no tuition growth were followed by repeated instructions to IBHE universities to limit tuition increases to no more 1%-2% annually. This policy significantly constrained short- and long-term prospects for this key revenue across the IBHE's ranks.

Thus, like its system partners, UIC was obliged to intensely re-examine its cost structure in the shadow of the state sponsor's restrictions on tuition revenue. However, UIC could not reliably draw on the IBHE approach to chart a path forward for managing its complex expense structure in the new low-appropriation, low-tuition landscape it navigated in the 2010s. The AVC noted that IBHE does not share the detailed institutional metrics between the Illinois PIHE, but rather provides only

summary reports. So, the understanding of each university regarding its relative cost structure remains limited to surface level appraisals of aggregate data. Because of UIC's unique position in the state as the operator of an R1 university with both a medical school and a hospital, this approach offered little financial management value to UIC; its operations were much larger and more complex than its IBHE cohort. And while UIC had experience disaggregating cost data through the DIC exercise, the data it received and generated was not readily comparable to its peers. Moreover, the summary comparative information it had access to was mismatched to its own complex structure (which most public Illinois institutions did not share) and was not granular enough to generate insights into differences that could help identify and direct financial interventions. This combination of factors was likely influential in its decision to begin participation in DCS, as it sought out peer data. It also highlights the public policy value of sharing detailed data across entities when employing a broad financial costing methodology to tie performance to desired outcomes.

So, guided by the hopes that access to true R1 peer data would sway state sponsors to increase its appropriations to UIC, it participated in DCS from 2010 to 2013. During this period, its leaders had access to peer comparisons data at the discipline level that overcame the issues described above from the IBHE Discipline Cost Study exercise. It received details on the cost structure of similarly structured RPIHE with hospitals and complex instructional and research missions. And it had a clear need to focus on the expenditure involved in its service delivery. Yet, all UIC subjects confirm that DCS did not take root, is no longer part of its financial management strategies, and has not been utilized since its participation ended. In

fact, scant information remains about its uses and impact during the four years it participated. A Director of Institutional Research (DIR) at UIC reported that the paucity of information relates to the fact that UIC began digitizing most of its financial reports and processes around 2015. So, the end of the formal DCS relationship after 2013 resigned most of its detailed work to paper records and older email systems not currently part of UIC's record retention portfolio. This brief stint with DCS leads UIC to be the "Sometimes" representative of this dissertation's interview subject triad. It also begs the question why did DCS not realize its full potential at UIC?

The information conveyed by the interviewees suggests that several external shocks of differing genesis hampered UIC's ability to employ DCS as part of any strategic financial effort. Four structural changes were identified by the subjects as having made the DCS approach less useful than it would have been at the onset of UIC's transition. First, a transition to a hybrid RCM model began in the late 2000s that gradually outsourced cost control measures to the individual colleges, outside of the central campus directives. Because RCM focuses institutional guidance on the application of an overhead charge that each unit must pay, it incentivizes each academic unit/discipline to pursue enrollment decisions and financial tactics that maximize net revenue but may sacrifice stability. At the aggregated level of campus, RCM typically increases expense volatility because it exposes individual units less accustomed to financial management of tuition revenue risk related to student enrollment changes to a much greater degree than incremental budget models. Incremental approaches employ a broader team of central enrollment experts than a

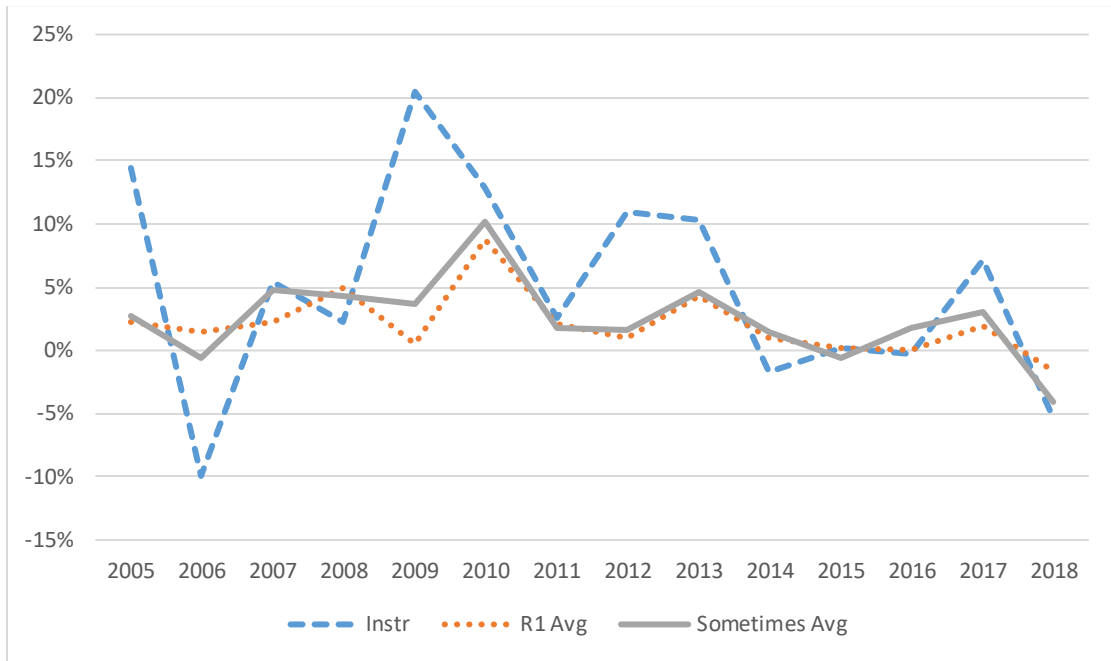
lone college can support and practice targeted resource allocations of pooled revenue that enable an interventionist ability to subsidize essential pieces of academic offerings that may not generate enrollment-based revenue each year (Curry & Straus, 2013).

Second, in the four years beginning with fiscal 2012, UIC's state appropriations started growing steadily as the Great Recession's negative impact on tax revenues waned. This influx was crucial at the central level because it partially counteracted the downturn in institutional support funding/spending UIC faced due to scarce resources; state support for non-academic administrative services had the knock-on effect of providing relief on the RCM tax charged to its colleges, thus freeing up funding for spending on instructional needs. On the downside for long-term management expertise, it also helped stave off the need to scrutinize permanent cost structures more intensely. Third, as part of this same state tendency, IBHE provided guidance that all Illinois system schools should increase their undergraduate enrollments to serve more students. This enhancement of the student population prompted a stabilization in per FTE results of spending in UIC, which will be discussed below. The freedom to grow enrollment signals another major policy consideration for financial management of RPIHE, as autonomy over the size and constitution of the student population can either help or hinder the achievement of specific financial outcomes when combined with state funding amounts and other related policy directives. Finally, a unionization movement of faculty and graduate assistants at UIC put upward pressure on its direct instructional costs, undermining

one of the major outlets for adjusting costs available to its academic administrators, and likely constraining further investment in instructional resources.

UIC's quantitative results reflect how these shocks contributed to it being able to spend at a much greater clip than most RPIHE, both within its "Sometimes" cohort and across all R1s, during the majority of the 15-year period of study. **Figure 7** illustrates UIC's instructional expenditure per student FTE rising at larger-than-average rates from fiscal 2008-2010 during its transition to a hybrid-RCM budgeting approach, and again in fiscal 2012-3 as state support picked up. This makes sense considering the incentivizing of unit-specific revenue efforts of RCM in the earlier period and the broader revenue availability rebounding state appropriations offered in the latter phase. Once overall enrollment growth permitted by state sponsors beginning in fiscal 2013 increasing the student FTEs the instructional spend evened out and UIC's experience reverted to the mean of its RPIHE cohort.

Figure 7
University of Illinois-Chicago
Change in Instruction per FTE vs. R1 and DCS Group Averages



Importantly, the AVPBP stressed that the specific budgeting model used by each campus reporting up through UI SYSTEM and/or IBHE does not have a notable impact on the state funding the university itself receives. Rather, the Discipline Cost study is a prime driver, as are the output metrics related to enrollment and the broader political pressure to keep resident tuition low. Moreover, she noted that after the appropriations are provided by the state of Illinois, there is little directive on how each institution should utilize the funding, which is provided in a lump sum format to each campus with minimal restrictions. State leaders work with UI SYSTEM/IBHE to identify areas of strategic importance (such as high-tech research or financial aid) but assign only approximately 5% of the total general fund appropriation to explicitly support these broad initiatives; the majority of state dollars may be spent without

specific instructions. Again, the funds are given to the system as aggregates rather than being assigned by the state to a particular campus and are provided to each institution according to the IBHE's determination of maximum impact in realizing the desired result. Looking forward, the UI SYSTEM ADBP believes this hands-off approach to funding use may need to be reviewed going forward because of the national demographic trends that indicate all but the largest universities will be forced to seek out enhanced enrollments through the exploration of new markets, such as life-long learners and increased post-secondary attendance by a wider range of socio-economic groups (Prescott, 2019; Grawe, 2021). If this proves to be the case, comparing the cost to instruct students at PIHE in Illinois across different university types will only become more complicated.

Interview Group Three – the “Never” case: Virginia Commonwealth University (VCU): High interest in DCS derailed by internal strategic management changes

Interview Subjects: 1) Assistant Vice President (AVP), 2) Director of Higher Education Innovation (DHEI) at SCHEV, 3) State Budget Liaison (SBL)

An Assistant Vice President (AVP) within the CFO's office at VCU detailed that this RPHIE was interested in adopting DCS in the early 2010s. As plans geared up to prepare the institution's involvement in the data disaggregating consortia, another parallel change in financial approach was being engineered: an overhaul of VCU's tuition charging strategy. With this large campuswide financial change moving forward, the institutional bandwidth to tackle the reporting requirements required by DCS was unavailable. So, campus leadership – following the lead of the

provost at the time – decided to make a partial entrance into DCS in FY11 through the participation of just one of its 15 academic units, the College of Humanities and Sciences (CHS).

CHS found itself highly challenged by the data requirements involved with converting its internal expense structure to the shared DCS format. With the effort centered in a lone college, CHS did not benefit from the institutional familiarity with data conversion offered by the campus Institutional Research (IR) office. DCS's design, which disaggregates IPEDS data in the key spending areas to align the costs to departmental/discipline-level outputs like credit hours and student throughput in courses, is much different than the financial statement views most operational staff utilize on a day-to-day basis. So, the skill sets of CHS' finance team faced a complicated and unfamiliar path to make the transition to DCS standards. Similarly, the difficulties in submission translated into issues with interpretation of the peer data received in the initial year.

Meanwhile, the change in tuition strategies, a move from a "block rate" that charged each student a flat, per-semester total to a more common "per-credit hour" system, was a significant administrative lift and involved a time-consuming IT system change. Nevertheless, the switch provided an influx of ongoing tuition dollars that was deeply needed by VCU units. The Great Recession had depleted state support, and to increase tuition revenues by millions of dollars without the need to run afoul of state directives to keep tuition low was a major success. The additional funds were focused on faculty hires that had been postponed during the recession and historically

underfunded departments, as defined by internal comparisons rather than through a peer comparison approach.

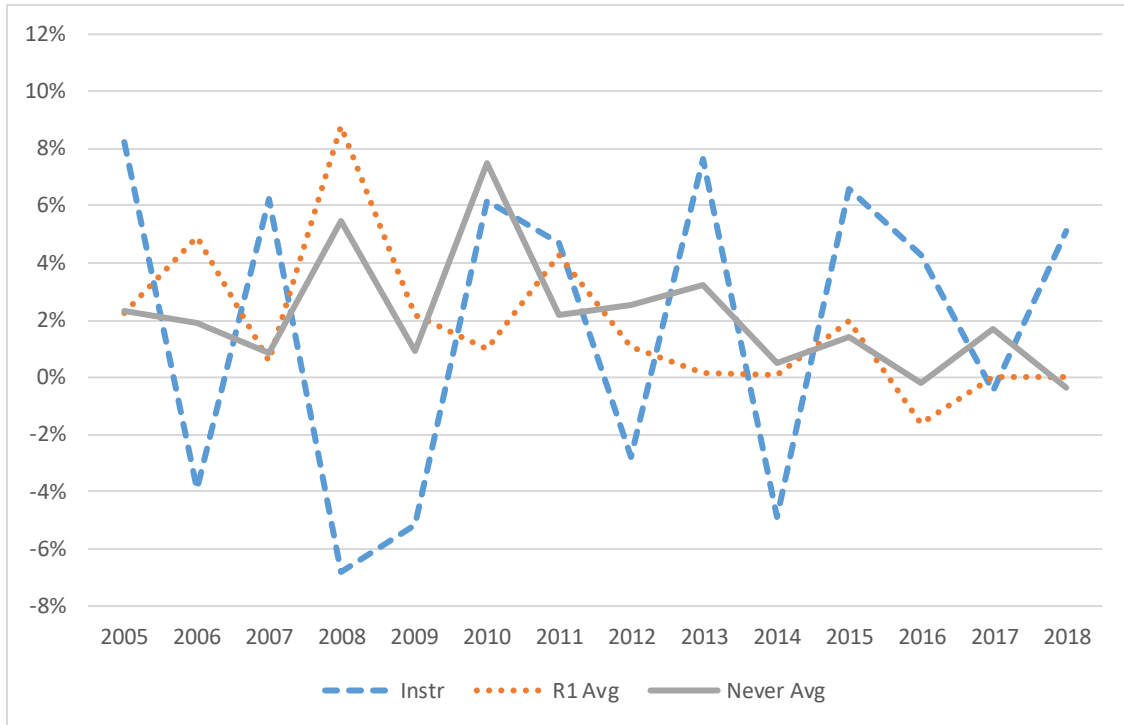
This internal flexibility to redirect dollars solely along campus-based initiatives reflects VCU's status as a Level 3 school with the State Council of Higher Education for Virginia (SCHEV). This ranking system assigns "operational authority in the areas of capital outlay, information technology, procurement, human resources, and finance" to the highest performing institutions via management agreements between each institution's Board of Visitors, the Governor, and the General Assembly (SCHEV, 2016). The AVP attributed this status to VCU's unique place as one of only two comprehensive Research Public Institutions of Higher Education (RPIHE) in the state that also operate a medical school and a hospital. So, limited external sponsor constraints were put on the utilization of these additional tuition dollars. Colleges were highly supportive given the tight resource restrictions in place prior to the change but, as is discussed below, taking this tack came with negative implications for future state funding support.

By virtue of the high demand for additional ongoing funds following the Great Recession, the tuition windfall stemming from the switch in charging approaches had been exhausted after approximately four years. The revenue slowly became part of the base rather than being considered additive, as ongoing costs in personnel were committed against the dollars. Moreover, the financial management team felt that it had achieved many of its goals (chief among them building faculty ranks and equitably funding departments) in the allocation process; in fact, leadership concluded that it had tackled a great deal of need in the initial year of the new

charging methodology alone. Therefore, when CHS had struggled through the college-level process to send disaggregated financial data files to DCS at the same time that executive decision makers felt the tuition overhaul had addressed many of the likely outcomes that adjustments to behavior expected to be prompted by DCS, the value proposition of joining DCS on an institutional, ongoing basis was extremely weak. Hence, VCU became a member the RPIHE “Never” group of DCS participation at the institutional level.

Figure 8 illustrates that VCU’s Instructional expense per FTE were more volatile than the result for the DCS “Never” participant cohort. And while its activity tracked the averages of the entire population of RPIHE in direction, it followed a more extreme form. This outcome is worth noting because the “Never” DCS-subgroup did not post an average negative year-over-year Instructional expenditure per-FTE result of the RPIHE universe until the final year of the period of study, while the other DCS subgroups did so on multiple occasions. While VCU’s large swings reflect the AVP’s description of leadership motivation toward acquiring DCS-type guidance, the details provided by the DHEI from SHEV on the state funding climate during the same period help explain this RPHIE’s volatility of spending for Instructional activity.

Figure 8
Virginia Commonwealth University
Change in Instruction per FTE vs. R1 and DCS Group Averages



From the early 2000s through the end of the period of study, VCU’s state sponsor utilized a funding model termed “base adequacy,” which was facilitated by SCHEV. The DHEI explained that under this model the state of Virginia’s explicit goal was to ensure that its state appropriations covered two-thirds of each institution’s core operating cost, with the remaining third seen as the student share of the cost. This goal became law through 2011’s Higher Education Opportunity Act of 2011 (Virginia Law, LIS 2012). To determine the budgetary requests that would provide appropriate funding totals to fulfill this goal, core instructional costs were calculated annually for each PIHE as a share of total education and general costs and then

compared to available campus-level funding resources, i.e., prior year state funding, tuition/fees, etc. (SCHEV, 2021). Like North Carolina’s “cell matrix,” Virginia’s calculations used different levels of instruction and disciplines across all institutions to inform the direct cost components of this approach (faculty salaries and academic program support). Yet, noticeably different was the base adequacy method’s use of indirect cost adjustments to recognize the variation in mission across different institution types (Research, Doctoral, Comprehensive, etc.) that influenced the results. The larger and more complex the PIHE, the larger the adjustments provided to the indirect cost portion of the formulas, thus helping to reflect that the direct costs used for all institutions for comparability’s sake underrepresented RPHIE faculty time commitments to research and public service, an issue seen in Illinois and North Carolina. This countermeasure represents a policy example of how to maintain program integrity (i.e., a single approach), while recognizing how this uniformity can produce imbalanced outcomes that may be actively addressing.

Even so, the DHEI recognized that base adequacy was helpful for continuity of core university services. However, it did not provide a method to address program or campus growth and evolution over time, especially for the larger, more complex universities. This is the case because of the unique higher education tuition oversight hierarchy in Virginia. Unlike the two other cases reviewed, neither SCHEV nor another state agency is charged with setting tuition at Virginia’s public universities. Rather, each campus has its own Board of Visitors (BOV), which reviews and approves the annual tuition rates proposed by the PIHE’s CFO. The voting members making up each campus’s BOV are appointed by the Governor, subject to

confirmation by the General Assembly, for terms of four years; several universities also have non-voting student or faculty members join the tuition setting discussion (VCU BOV, 2023). So, with decisions on tuition localized rather than imposed from outside (although with a built-in check with the decision makers being political appointees), each SCHEV institution faced a difficult decision under base adequacy as how it alone would respond to changes in student behavior in terms of desirable new courses of study and the cost/benefit proposition of non-instructional activity that could help maintain the PIHE's relevance and attractiveness to faculty, students and staff alike.

In any given year, the state appropriation would provide the resources needed to sustain 2/3 of instructional operations while the remaining 1/3 was to be supplied via tuition/fees charged to students. But, the difficulty lay in the fact that the state's obligation to provide funding stopped there. More importantly, in the identification of whether a particular university had sufficient budget for maintenance of service, other (tuition-based) resources would be the first dollar counted before additional state funding was deemed needed via the funding formulas. So, any PIHE attempting to enhance non-instructional operations or to offer new instructional majors without decommissioning existing offerings would either:

- a) take the slow road that depended on small, incremental state funding increases based on adequacy over many years while keeping tuition revenue at a near constant share of its resource pool; or

b) move quickly to expand total resources via tuition/enrollment increases that rapidly brought discretionary funds to campus at the cost of broadening the proportion of available funding to the PIHE that was reliant on market-based student behavior and eroded the link between the ongoing cost base and state support.

Both the DHEI and SBL described how VCU opted for the faster route, increasing non-general fund income during the 2010s through a series of tuition hikes and enrollment growth as state officials relaxed Great Recession constraints. The revenue increased by this new financial measure facilitated the creation of several new majors/courses of study, a sizeable investment in a growing research enterprise, and the ability to meet the expense obligations commensurate with an expansion of enrollment, which was especially acute because, as seen in the quantitative results, the immediate 2008-2010 impacts of Great Recession had previously undermined VCU's overall resource pool and the ability of state support to reliably serve as its principal funding source. Consequently, by the final year of our period of study, Virginia's funding assurance level under as calculated under the base adequacy system for VCU in 2018 was \$303 million, but VCU received a good deal less, \$198 million in state general fund appropriations, because its tuition-based funding more than covered the instructionally minded formulas, thus ensuring "adequacy" of funding was being met.

The high variation of VCU's annual Instructional spend in **Figure 8** can therefore be partially explained by the resultant push-and-pull of resources. Tuition

enhancements yielded a larger total resource pool while the campus's ability to place it consistently in the desired areas was increasingly constrained by higher risk exposure stemming from burgeoning tuition dependency and a new uncertainty related to just how much annual state appropriation funding the campus would receive. As tuition intake and rates grew, VCU became more susceptible to year-to-year revenue peaks and valleys. The greater the percentage of total revenue subject to fluctuations that come from the difficult to forecast the level of enrollment "melt" – the name given to prospective students that commit to attend a university but never enroll – the larger the amount of spending that cannot be safely assumed to recur in the following year (Castleman and Page, 2014). Melt was particularly damaging to VCU for non-resident students whose enrollment shifts can provoke large revenue swings because their tuition contributions are roughly three times larger than that of resident students. When nonresident student tuition slips, the impact on available funds is magnified and requires greater enrollment replacement from state residents, the more plentiful and reliable (but less lucrative) waitlisted students.

Moreover, the well-intentioned indirect cost offsets of the base adequacy approach ended up capturing only a small portion of this contribution in the state calculation once instructional adequacy had been achieved the larger a component tuition piece became as a total portion of revenue. So, for all PIHE under base adequacy, larger than foreseeable proportions of tuition increases were *de facto* assigned to instructional costs than intended because this funding counted against potential increases in state support, further locking the RPIHE into greater dependency on student payments. Fortunately for VCU, as the SBL related, state

mandated salary increases are provided via separate personnel funding vehicles that did not impact base adequacy figures. In fact, the larger state-supported salary infusions are timed with the peaks of the instructional costs seen in **Figure 8**.

By electing a self-funded route to growth, VCU ended up losing a certain amount of discretionary power under base adequacy that spurred higher variation in its expenditure activity, by type. Moreover, although generous in its extension of autonomy in financial decision making to the Tier 3 schools, the state channeled its non-salary incremental support away from general purpose dollars toward allocations with specific goals in mind. Funds tied to initiatives that could not be used for another purpose arose. For example, Tech-Talent provided state schools with developing enhanced pathways and courses of study that would expand access to technology careers in Virginia (VCU, 2020). While highly beneficial to students and communities, such programs lock in the funds for a single purpose and prevent leadership from altering their financial outcomes with full latitude, as these pockets of activity must be held outside of strategic expenditure changes.

Interestingly, the AVP noted that more recent financial difficulties at the tail end of the period of study led VCU to switch to an RCM model, 2018-9. RCM requires an intense focus on costs, but one directed inward, as its formulas measure usage of central services to allocate a tax to Colleges like CHS, who in turn keep revenue (net of this tax) directly attributable to the student population each unit attracts. This approach was promoted by VCU's Board of Visitors who were concerned with high turnover at the CFO position in the mid-2010s, following the normalization of the added revenue from the tuition model change (VCU Board of

Visitors, 2022). VCU's goals of understanding its own cost structure in greater detail were achieved, as visibility of cross-subsidization of colleges became clear when student-based revenue became the focus of both institutional- and college-level decision making. The AVP notes that RCM's student major-centric approach highlighted how much cost-intensive colleges like Nursing were benefitting from the prior model of centrally shared undergraduate tuition revenue by receiving dollars generated by lower per student cost but higher volume colleges like CHS. Such a redistribution is not necessarily a problem, but the fact that it previously had not been readily apparent and was, therefore, not been an explicit choice by VCU leadership was a major concern. The centralized approach had propagated a culture of "the loudest voice" amongst colleges capturing limited resources rather than an intentional, strategic process guiding the direction of funds. RCM rerouted that culture to a more entrepreneurial approach but moved VCU further away from identifying its place among key peers.

The financial contraction prompted by the COVID pandemic in 2020-21 has proven to be the latest financial sea change to hit VCU and force financial and budgetary adjustments. In the past, without DCS or RCM, VCU had utilized aggregated IPEDS data to compare its fiscal posture to those RPIHE it identified as its chief competitors/peers to justify funding requests to its state sponsors. RCM's emphasis on inward cost analysis now makes outward comparison and placement among peer groups more difficult than historical incremental budgeting approaches because it fosters idiosyncratic approaches to administrative structures and indirect costing methodologies that render a data mapping across institutions nigh impossible.

Still, the hope remains at VCU of tapping into comparative data, as its finance teams is exploring Heliocampus⁸ offerings in this vein.

D. Conclusions from qualitative findings

The results of the quantitative analysis indicated that, on average, DCS participation increased Research Public Institutions of Higher Education (RPIHE) expenditure on Instruction and Public Service per student FTE while decreasing spending on Institutional Support and Student Services in the period of study. Yet, several key questions that remained unanswered (page 68-70) prompted the qualitative follow-up with varying public R1 universities. This section will detail how the interviews and related research filled in some of the gaps in our understanding from the quantitative findings. The case study results will first answer the primary concern of how the presence of disaggregated data influences financial decision-making processes and the resultant policy actions. An additional section is included as **Appendix 6** to document the other lessons learned from respondents that are relevant to informing cost-related policy for RPIHE.

Primary Result #1: *Cost-disaggregation provides stability in spending across program areas and supports a framework for moving resources between expenditure types without introducing imbalances between units.*

⁸ Heliocampus is a commercial endeavor that sells data measurement and comparison services similar to those offered for free to DCS consortia participants, but tailored to unique institutional objectives: <https://www.heliocampus.com/>

By virtue of an intentionally derived structure that contains an “Always”, a “Sometimes” and a “Never” institution among the triad of universities probed, two RPIHE were guaranteed to have participated in DCS during the period under review while one did not. So, the interviews explored how the two DCS participant groups perceived it driving results, while the third’s familiarity with DCS and choice not to pursue it as a financial management tool was discussed. As one may suspect, the more consistently the RPIHE participated in DCS, the stronger its influence.

The respondents from UNC-CH (the “Always school) indicated that DCS had a high level of influence over the expenditure results by type on their campus, which is expected given the statutory role of DCS in determining the state appropriations provided to UNCS institutions. Importantly, additional contextual information was provided by the interviewees about the role of UNCS systemwide reporting requirements and the role of DCS in setting the expected cost of North Carolina’s public university ecosystem that reinforced the significance of the cost disaggregation system in the state. DCS’s role in North Carolina was geared toward normalizing an understanding of expenses across all state PIHE rather than generating a deep blueprint of each university’s cost drivers. This method, which averaged costs across all institution types in the North Carolina’s public postsecondary portfolio, ended up reducing the power of the informational upgrade typically conveyed by DCS participation to UNC-CH through access to peer financial data at the discipline level. This policy decision statewide, therefore helped push DCS’s influence on instructional costs at UNC-CH to levels beneath those of its “Always” cohort.

Yet, UNC-CH's respondents were quick to note the value of DCS-based data in terms of stability in funding and as a means of identifying how the campus could alter its resource allocation approaches to maximize value from its state appropriation levels. Its leaders indicated that while the campus's spending on instruction was lower than the levels of its competitors due to slow growing salaries - a fact that they were able to identify and share with state sponsors thanks to their DCS participation - salaries still grew. The concern was that, because of the funding approach, salary funding occurred in an incremental fashion rather than one that kept pace with hiring and compensation trends in the nation market. The relatively lower compensation position was seen as damaging the campus's recruitment efforts of high performing faculty in key disciplines.

On the positive side, UNC-CH interviewees noted that the campus was able to avoid major reductions in core services due to the state model's commitment to maintaining funding levels when enrollment targets and graduation levels commensurate with these key outputs were met. Moreover, UNC-CH's scholarship spending was not negatively impacted in the way that its instructional outlay was because state policy prohibited UNC-CH (and all other state publics) from selecting this area of fund utilization as a source of redistribution of resources. Finally, the state of North Carolina and UNCS bolstered how the continuity of the disaggregated costing approach worked to meet core post-secondary student and institutional needs by adding flexibility to its application. Authorizing pauses in the usage of DCS-based reductions that could have been levied against various institutions whose enrollment suffered during the Great Recession were critical in avoiding extreme fluctuations in

spending. The break in application formula funding at a time when tuition revenue was down across the board provided relief to PIHE, curtailing the need to further retrench expenditures at North Carolina institutions. This measure was possible because the data-rich environment gave decision makers clear financial maps that indicated how state general funds were needed to maintain service levels that directly related their missions.

Subjects from UIC (the “Sometimes” representative) stated that the gains from DCS participation to the campus were limited because the university was dividing its cost focus between DCS and the pre-existing state-centric Discipline Cost Study. The internal benefits of clearly understanding university data were noted, but there were few opportunities to demonstrate that DCS added internal nuance because of its similarities to the Discipline Cost Study. UIC leaders hoped to utilize the peer data the Illinois Discipline Cost Study had always lacked to enhance its state funding support. But, when the state of Illinois preemptively responded to UIC’s revenue needs (and those of other state universities) just as DCS data was coming into use on campus, it could not identify a path to put the peer data it had sought into play. Moreover, RCM played a role in reducing the value proposition of DCS as a hybrid-version of this budget model helped bring attention to activity-specific costs as a driver of college-level sustainability rather than outward looking standing among peers.

As such, DCS’s influence waned over time at UIC, whose participation stretched across 4 of the 15 years in the period of study. The take up by reporting units was slow and other financial management activities – increased appropriations

after a dearth of state support and a new budget model – undermined the usefulness of external comparisons. According to the respondents, central financial leadership took advantage of higher than anticipated revenues when available to spend beyond their peers and pulled back (thanks to the widespread RCM-imposed discipline) when revenues declined. This resulted in centrally supported institutional support quickly expanding in step with appropriation growth, and plateauing in times of lower state funding, thus faithfully representing Bowen’s portrayal of the revenue maximizing bureau. Financial leaders used facilities maintenance projects as the pressure outlet that could be sacrificed (rather than core personnel) when state funding declined. Respondents noted that such activity was enabled by the focus on detailed cost analysis.

On the other hand, UIC’s academic units responded in a polarized fashion to these same circumstances. Some colleges, such as Pharmacy and the Hospital, undertook deep dives into the state’s Discipline Cost Study (even for a time pairing it with DCS’s external comparisons) to exert cost controls, even when revenues were robust. Others, like Liberal Arts & Sciences and Architecture & Design, took a strictly compliance-based approach to reporting its summary data to IBHE, and never took up a focus on reviewing peer cost results, focusing rather on revenues. This mélange of responsibility across time by the cost-minded units and spending out of tune with revenue cycles by others helped provoke the outsized investment in instruction posted by UIC in good times and the below average muddling through noted when resources became scarce. So, the more limited influence of DCS put

UIC's spending results in line with its peers in times of stability but on the extremes in times of uncertainty.

Both UIC and UNC-CH faced environments where state sponsors placed a higher value on developing a funding and cost reporting approach that was consistent internally between state PIHEs than on developing an understanding of cost that reflected the variation in market demands and multiproduct outputs between different post-secondary institution types. Yet, the superstructure provided stability that enabled financial leaders to redirect resources to areas of strategic need as desired. The "Never" case (VCU) helps demonstrate the value of such an approach through its absence.

VCU never adopted DCS institutionally, so its financial management path was not shaped by this tool. Its brief exposure at the departmental level to DCS did not inspire a deeper commitment. Yet, the contemporary changes in financial management – the change in student charging strategies and the later move toward RCM – both indicated an institutional preference for solutions on the revenue side of the equation rather than the expenditure focus of DCS. So, VCU shared UIC's high volatility in years of economic contraction, but that variability continued in times of growth, unlike the DCS-informed universities.

VCU's combination of revenue-centric financial choices, a mixed product of Virginia's "base adequacy" state funding approach and the gradual adoption of RCM, introduced high volatility to the spending decisions on all key IPEDS categories. Instructional costs increased due to enrollment-based growth that prompted the need for more and/or larger sections. Recruitment of a larger student populace, in turn,

required broader scholarship expense to more students. As tuition rose, the absolute dollar value of each student award increased as well to enable VCU's tuition discounting strategy. Nevertheless, its expenditure results became more volatile as its finances became increasingly linked to market-based student behavior. Respondents stated that decision makers lacked a campuswide cost-anchor to justify strategic changes in spending.

In periods of growth, VCU outpaced its peer groups in instruction and scholarship spending. However, spending in these areas fell below average when demand declined. VCU interviewees offered mixed reviews on these patterns. On the positive side, the need for flexibility in expenditure type and timing made this RPIHE more dynamic in response to changing needs, allowing it to maintain operations without clear central financial management direction. Nevertheless, this system undermined efforts at long-term planning and fostered an environment of "perpetual chaos" that unsettled faculty employees and faculty alike. In the final year of this dissertation's study, a permanent CFO arrived at VCU. His first act was to switch the budget model to RCM as a means of controlling this rudderless approach to financial decision making.

Within these three different circumstances, a common thread of financial management decisions emerged. The three universities all became generally more reactive to macroeconomic conditions rather than proactively deploying a strategic resourcing plan. This shared experience indicates the power of the bureaucratic model signaled by Niskanen and Bowen of public entities to maximize revenues and spend to that limit regardless of situation. Yet, those with deeper utilization of DCS had

more measures in place to prompt the accumulation of purpose-driven reserves and an inclination for budgeting with dynamic spending of slack during growth periods in mind that allowed for a quicker reallocation of funds without sacrificing to promote stability of expenditure. **The presence of DCS influenced results within spending categories but never significantly impacted overall spending patterns, confirming the quantitative findings. Participation in DCS did, however, provide more stability in outcomes from year to year, regardless of the macroeconomic conditions in the period of study.**

Primary Result #2: *While universities employed DCS to communicate messages on the link of RPIHE spending to desired outcomes, public funding sponsors did little to transmit their desired cost-related outcomes to universities leading to confusing directives and unclear incentives.*

UNC-CH's state sponsor was clearest among those interviewed with respect to communicating desired outcomes because its budget documents (following statute) include explicit language noting that each campus has management flexibility to put its funding into whatever area it deemed appropriate. So, the state's policy was to *not* dictate spending preference amongst activity types. Yet, the very process of utilizing DCS and the 'cell matrix' during the period of study represented the state's major entry into cost control at its universities and included structures that aligned to specific areas of expense, i.e. instruction. By recognizing a set amount of funding needed to operate its universities, North Carolina directly addressed the "revenue

maximizing” tendency of public bureaus. As such, legislative and executive leaders did not further message how costs should be controlled or intervene in funding beyond the results from the DCS-informed calculation methodology. The lone intervention in place ensured floors for expenditure totals that ensured key services valued by state decision makers - the two exceptions noted above of financial aid and capital projects - were funded as per their mandates.

UNC-CH respondents pointed to their negative perceptions of this state of affairs, especially the lack of concern by lawmakers over the stagnation in faculty salaries and the inflexibility for changing discipline assignments among the cost categories inherent in the funding approach. The two UNC-CH interviewees with direct experience representing academic units on the receiving end of university-level guidance on appropriation usage also identified an absence of clear communication or guidance from UNCS and campus leadership on how state funds were received and then distributed across the institution. The Assistant Dean for Finance and Operations (ADFO) had unique work experience that provided her deep insight into the UNCS approach to calculating the college-level funding. She stated that once the DCS-based formulas determined each campus’ state funding totals, there was no consistent means for college-level financial managers to anticipate what those results meant for academic funding. This sentiment was shared by the Assistant Provost for Institutional Research and Assessment (APIRA), the curator of the DCS data submission in the institutional research office. They reported that they could not consistently forecast IPEDS-level spend and revenue category outcomes with the reported state totals plugged into UNC-CH’s models. The frustration translated into

inaction in the face of opportunity because academic units that were contemplating the creation of a new course of study that might have grown enrollments and generated revenue had no guarantee that funding would make its way from the state formula to the college level due to these garbled communication channels.

Still, both respondents recognized that the pause in allocation reductions that would have been the appropriate application of the DCS-determined funding due to enrollment reductions during the Great Recession showed that state policy leaders were able to receive information through the hierarchies about temporal problems with its calculation methodology. The interview subjects attributed this injection of flexibility to the UNCS' strong standing with state leadership. The overarching communication disconnect found in North Carolina's hierarchy was present for the other two RPHIE interviewed.

Through Virginia's 'base adequacy' state funding approach, VCU faced a similar structure to that experienced by UNC-CH, but with little intermediary support from its system partner, SHEV. As described by the DHEI from SHEV, the Virginia system served more as a coordinating agency than as a policy leader. This arrangement left VCU and the other PIHE in the state without a united advocate during times of difficult economic conditions, such that the state solution to the Great Recession was to enhance autonomy to its universities in terms of enrollment targets rather than to alter the funding strategy. As with the North Carolina case, Virginia's 'base adequacy' scheme provided a much-needed baseline minimum to each university, yet the autonomy provided on tuition setting and then enrollment counts prioritized the role of revenue increases to address resource constraints rather than

dictating a focus on the cost side. However, over time there are demographic limits to enrollment and economic limits to tuition-based revenues that render such a path unsustainable (Jalal & Khaksari, 2019). The lack of guidance to PIHE in Virginia contributed to VCU's financial volatility as it consequently navigated into the scramble for market-based tuition dollars without a clear path as to how their choices would manifest themselves in future state appropriations. As discussed, boosting tuition significantly essentially capped VCU's state funding amounts, even as its core costs grew.

Finally, UIC's state sponsors evinced a long and involved process of cost control to PIHE in Illinois through the application of its Discipline Cost Study. The state's main objective behind this approach, as reported by interviewees, was to maintain a manageable funding equity between universities, the specifics of which were reported annually to institutional Boards of Trustees via a dashboard managed by Illinois Board of Higher Education (IBHE). Further, IBHE was entrusted to administer the lump sum state allocations it had requested for each constituent PIHE. Yet, the Associate Director, Planning & Budget (ADPB) related that only during the first 5 years of this dissertation's period of study did the state take a detailed look at specific cost activity at UIC and other IBHE schools. The state's cost reviews became less intensive, and hence less connected to funding concerns. By the end of the study period in 2018, the state had fully relinquished this method of oversight in favor of focusing on marginal changes related to strategic goals promoted by IBHE and UI SYSTEM. The data-intensive and resource consuming analytical load associated with cost management became undesirable, even by state sponsors in Illinois, whose

communication approach ended up focusing on a handful on new programs rather than the successful operation of the whole. **In sum, the lack of communication at the three RPIHE incentivized quicker, less accurate financial management that was better aligned with the cost/benefit calculations of key stakeholders. However, this structure proved to be detrimental to the alignment of state funding approaches to the operational expense activity of the universities converting these state dollars into desired instructional outputs.**

Chapter 4: Public Policy Conclusions, Limitations and Future Research

A. Policy implications

The combined results of the quantitative and qualitative analyses indicate key tenets that policy makers should have in mind when implementing programs designed to direct resource usage among public universities. The four main policy lessons that will be detailed in this section are:

- 1) *Policy can influence the type of spending being undertaken by RPIHE but will likely not impact overall activity expenditure.*
- 2) *Policy outcomes that contain both revenue flexibility and cost management provisions are better poised to avoid the high variability and reduced long-term planning associated with heavily aligning a RPIHE operating budget to tuition revenue.*
- 3) *Policies that lead to transparency of cost measurement and funding allocations throughout state hierarchies enable decision makers to respond to incentives and promote success.*
- 4) *Complicated or labor-intensive policy requirements often fail to meet the cost/benefit requirements of key stakeholders and undermine their successful application without built in flexibility to adjust to changing conditions.*

1) **Policy can influence the type of spending being undertaken by RPIHE but will likely not impact overall activity expenditure.**

The principal finding of the quantitative analysis was that participation in the two major financial management tools under review – the Delaware Cost Study (DCS) and Responsibility Center Management (RCM) – yielded no statistically significant impact on *total* costs at Research Public Institutions of Higher Education (RPIHE). Costs neither fell when these tools were employed, nor did they increase in a measurable way. Yet, as predicted, DCS participation did result in some areas of expenditure being reduced - Institutional Support and Student Services - as financial managers adjusted outlays in these areas to pursue greater spending on Instruction and Scholarships. The blend of Niskanen’s description of public bureaus as revenue maximizing entities that link output to sponsor perceptions rather than customer values and Bowen’s revenue cost theory in which RPHIE costs are incentivized to match revenues provides the theoretical framework for why this would be the case.

The qualitative section of this dissertation outlined the mechanics behind this result and builds on higher education literature. One of a state sponsors’ strongest mechanisms of control over public universities is the state appropriation. By limiting the funding amount, putting restrictions on the use of state dollars provided for specific purposes and/or making pieces of support contingent on particular outcomes (e.g. State Treasury revenue attainment), sponsors have the ability to alter composition of RPIHE revenue portfolios (Weerts and Ronca,

2012). But such resource constraints on one piece of the income equation – whether due to state fiscal concerns, oversight interest in financial outcomes among universities, or some other policy goal – often lead decision makers within universities to seek out the same amount of funding elsewhere (Tandberg & Griffith, 2013). Representatives from all three RPIHE noted this need to seek funding because of the role of state appropriations in their resource mix. Yet, the forms this search took were shaped by other facets of the policy environment, with the longer-lived policies reflecting an acknowledgement that state efforts would help steer a **shifting of the resource mix internally among RPIHE rather than outright cost control.**

2) Policy outcomes that contain both revenue flexibility and cost management provisions are better poised to avoid the high variability and reduced long-term planning associated with heavily aligning a RPIHE operating budget to tuition revenue.

In two of the three cases reviewed, the RPIHE (UNC-CH and VCU) faced a similar policy environment, one in which state lawmakers sought to harmonize the funding support provided to PIHE that received public funds via a simplified format that was essentially the same across all institution types, from small regional universities through R1 flagships. These approaches restricted state funding by forcing the RPIHE to conform to cost allocations built on the average output of PIHE in the state, rather than the varied production functions of their

individual settings and missions. Importantly, DCS was employed at UNC-CH and it was not at VCU. In the DCS-informed environment, UNC-CH respondents described a sense of greater overall cost control and lesser vulnerability to revenue swings related to the policy framework. This milieu resulted in UNC-CH responding to the state funding constraints by *lowering* expenditures on faculty salaries to offset some of the anticipated funding support. Revenue gains were sought as well, but were confined to the non-resident graduate enrollment sphere, rather than the undergraduate endeavor. Graduate tuition discounting is much less risky because its impact and deployment relates to a far smaller group of students, and policy makers are more likely to allow tuition increases that respond to what the market will bear in these smaller, primarily professional programs that often serve mid-career adults rather than younger students.

On the other hand, VCU's response to the restrictive state approach towards appropriations under "base adequacy" in Virginia did not have DCS cost data to rely upon. As Jaquette and Curs demonstrate, public research universities often respond to declines in state appropriations by growing nonresident freshman enrollment as they uncharacteristically follow the tactics of private universities in a quest for high-paying students (Jaquette and Curs, 2015). Yet, the qualitative interviews in this dissertation highlight a nuance of that activity not described in the literature: VCU respondents noted that in the absence of an externally validated costing system that linked activity to resources like DCS, revenue-based solutions were the sole focus of management options. VCU understood its course of action lying purely on tuition, which translated not only into wooing

nonresident graduate students, but into reshaping its undergraduate class because of financial rather than policy motivations. The results pointed to VCU becoming more financially dependent on non-Virginian tuition revenue, suggesting that a cost disaggregating presence may offer more stability in financial outcomes from year to year. Yet, more interesting is that this lack of focus on understanding costs, both at the state policy and the institutional management levels, contributed to shifting VCU away from in-state student ratios without a directive from the sponsors.

3) Policies that lead to transparency of cost measurement and funding allocations throughout state hierarchies enable decision makers to respond to incentives and promote success.

A sense that policies formulated in the realm of cost disaggregation (like DCS in the UNC-CH and UIC, or its closest proxy of “base adequacy” in VCU) lost a great deal in translation between state sponsor and the ultimate departmental financial decision makers in universities was shared among all respondents in the qualitative interviews, regardless of role or employer. Some of the issues generating the problems listed below could be considered by future policymakers to enhance outcomes.

Perhaps the largest concern was clarity on the state sponsor’s desired outcomes. For example, while state funding formulas (VCU and UNC-CH) may have been clear on how the figures were generated, little guidance on their use

was made available. Most fundamental was a dearth of instruction as to how the funding destined for the RPIHE was to be distributed among programs of interest. Both universities reported the focus of their intergovernmental relations effort was to ensure the largest share of the funding pot within the formulaic rule set. Yet, no methodological approach on how shares of new revenue to the campus were to be determined and disbursed were required by sponsors or put forward in detail by university or system representatives.

Meanwhile, UIC subjects detailed a fundamental disconnect between the practical implications of the Discipline Cost Study cost reporting required by the state through the Illinois Board of Higher Education (IBHE) and the Illinois state budget office's process for deriving state appropriations. IBHE's approach leveraged cost-based arguments on why enhancements to funding were needed, but the State's funding approach aligned nearly wholly to the amount of funding perceived to be available by Executive branch decision makers, and scarcely contemplated the voluminous data-informed cost reports PIHE were required to submit to the state, ostensibly for verification of their proper utilization of sponsor resources.

In all cases, such vague linkages led on-the-ground decision makers to conclude that there was neither clear direction on how to curb spending nor clear incentives to promote growth. The result, as indicated in the quantitative findings, was a tendency toward higher volatility in types of expenditures. This high variability of spending was internalized by respondents to represent a host of negative perceptions: unfair resource distribution due to the unclear

communication of the flow of funds, lack of confidence in leadership as the ever-changing financial approach breeding uncertainty, and lower morale as the evident outcomes were mostly negative (such as stagnant faculty salaries at UNC-CH) while a clear connections to positive outcomes (such as receiving more funding for having created and promoted an innovative new course of study that increased enrollment) were absent. Notably, the State of Virginia recently noted that its base adequacy funding formula (described in the VCU case study) had ceased to be viable as a resource allocation device and lost all value in incentivizing behavior once a PIHE reached the base adequacy totals because of its narrow operational focus (SCHEV, 2022).

What was missing - and was recommended by several interviewees - was a documented path of funding or cost alignment that stretched from state sponsor to university decision maker. Here the onus is on RPIHE leadership to be transparent in its communication of where state funding and tuition revenue is directed each year. It also requires forethought and a process for clearly identifying recipients of funding from an institutional perspective, which itself is a time-consuming exercise. Still, the qualitative interviews highlighted that state sponsors contributed to communication problems by having a heavy focus on the mechanisms at work in deriving the funding totals at the expense of documenting its implementation. Sponsors can enhance the efficacy of policy in practice by describing in greater detail the motivation behind, and intended future outcomes of cost management and related funding policies instead of being bogged down by the details of how the final figures are computed. Such a focus provides financial

decision makers at all levels of the state hierarchy clear signals and aligns incentives much better than lump sum figures are capable of doing.

- 4) **Complicated or labor-intensive policy requirements often fail to meet the cost/benefit requirements of key stakeholders and undermine their successful application without built in flexibility to adjust to changing conditions.**

All three RPIHE representatives described the complexity of the cost management tools and policies as a hindrance to implementation and goal achievement. VCU noted that part of its rationale in not ultimately adopting DCS related to the resource requirements involved in the process of translating its internal finances into the detailed breakouts required by the consortia. UIC ended its DCS participation during the period of study because of the heavy burden required by it and Illinois's internal, state-mandated discipline cost study; notably, the differences in the state approach and the DCS methodology made UIC's local data incompatible with the nationwide DCS data gathering effort. As for UNC-CH, the complicated formulas built on DCS-informed cost data to determine its state funding amounts led to individual universities lobbying state officials on scoring components and the categorization of courses of study heavily, crowding out discussion on how the funding would be invested and communicated.

Moreover, the immediacy of revenue need figured among the respondents as the chief difficulty in maintaining complicated cost control and funding strategies

over time. As experienced during the Great Recession by all 3 RPIHE (and then again by UIC in the later part of the 2010s due to a significant state appropriation reduction related to Illinois' pension funding woes⁹) a large macroeconomic shock led these three institutions to move away from their chosen financial management tool. How much each RPIHE changed suggests policy details to consider.

VCU went furthest from its original path. VCU dropped its nascent pursuit of DCS participation and focused exclusively on boosting tuition revenue, through enhanced non-resident enrollment that required aggressive tuition discounting. Given the role of base adequacy calculations in Virginia's funding scheme, this tack led VCU's tuition intake to grow to the point that it made receiving incremental state appropriations nearly impossible, thus undermining the state's ability to guide behavior through its funding approach. VCU, in turn, became even more dependent on tuition as state contributions dried up, greatly enhancing revenue volatility and prompting under-informed decisions on where to best direct the incoming revenue because it was not clearly linked to the costs of instructional and institutional service delivery. As the VCU interviewees described, this cycle continued viciously through the end of the period of study.

For their part, UIC respondents related that DCS was abandoned completely during the Great Recession, while the parallel use of the state's Discipline Cost

⁹ A 2016 article in Bloomberg (<https://www.bloomberg.com/news/articles/2016-09-07/illinois-pension-crisis-builds-as-market-turmoil-deals-a-setback#xj4y7vzkg>) is contemporaneous to the state appropriation issue referenced in this dissertation, but the drag on state revenue has accelerated at the time of writing in October 2023.

Study continued but its nexus to outcomes eroded, as began to devolve into a box-checking exercise rather than a core administrative presence in decision making. UIC's management team made the leap to a RCM budget model to provide a cost-centric focus to its financial planning, thus providing an anchor to a revenue enhancement approach similar to that of VCU. So, while DCS had proven too burdensome early in the 2010s, another cost management tool (RCM) was brought into steady operations before the decade was out. Moreover, because RCM outsourced financial discipline to the Colleges managing academic programs, cost control necessarily became ingrained in campus decision making, although it hurt morale among units with disciplines not currently in peak market demand and created some fissures across campus as it diminished the institutional nature of resource decision making.

Finally, through its participation in North Carolina's statewide DCS-based funding model, UNC-CH had neither the ability nor the desire to remove costing analysis from its financial management efforts during the Great Recession. The state did have the ability and triggered a hiatus on the application of the negative aspects of the model – *e.g.* reduced appropriations for PIHE not meeting enrollment and graduation rate targets – during several years in the early 2010s. Policy makers exercised its flexibility to adjust the program temporarily rather than jettisoning the apparatus that helped highlight sponsor goals and values in the process. At the same time, like Virginia and Illinois, North Carolina loosened restrictions on enrollment totals to provide a revenue outlet to PIHE during the downturn, but the cost-focused backstop of the DCS-informed “cell matrix”

remained. Such an approach combines three key elements of RPIHE-related policy that can maximize financial data use in managing and maintaining consistent sponsor knowledge/oversight of university activity without disrupting institutional activity:

- 1) **a cost-centric model that reflects the fact that RPIHE will aim to expend all resources at their disposal and thus prompts desired *types* of spending;**
- 2) **a realistic understanding of the link between stagnant or reduced state funding and tuition that allows enrollment growth within an consistent expense management environment; and**
- 3) **enough flexibility to adjust the policy rules set due to changing economic conditions, given their inherent complexity.**

B. Limitations

The mixed method nature of this dissertation reflects the limitations that research in this branch of the higher education cost typically encounter. The breadth and complexity of spending patterns among scores of universities spread across the country and operating in idiosyncratic state hierarchies that employ thousands of financial decision makers to steward operations worth hundreds of billions of dollars necessitates a healthy appreciation of the limitations inherent in the conclusions summarized in Part A. While the quantitative analysis has explanatory weight in detailing the independent variable's influence on spending types, and the estimating

equation was specified to control for the most powerful factors that can drive the cost outcomes being measured, there remain omissions. Cost factors such as policy architecture, institutional culture, university reputation, etc. undoubtedly still shape the results to an unknown degree, so complete causality cannot be drawn. Thus, by setting the qualitative work in a framework in which the quantitative results identify outcomes, *sufficient* conditions for the cost outcomes stated are met, but portraying them as *necessary* conditions to provoke the cost changes is not appropriate.

In terms of more specific limitations to this dissertation, most important is that *only three of 69 R1 public institutions were studied in the qualitative section*. So, limits on the application of the results found must be highlighted. Nevertheless, the case selection approach solidifies the results as being generally representative of a type of university: All three are large R1 universities with professional medical schools and hospitals. Moreover, they are all part of a statewide system of universities, thus they are required to work with a mediating political body between campus and state leaders in terms of funding requests and policy decisions. Finally, they are all east of the Mississippi River, so some common geographical and cultural features unite their experience. This nexus of shared traits helps give greater weight to the results discussed above but does not overcome requiring a caveat: the causal mechanisms identified in the qualitative portion of this dissertation may not be representative of what is driving the observed outcomes at other universities, particularly those in other parts of the country.

Another limitation to note is the time frame selected for the period of the study. The panel data set for the quantitative section was 15 years to provide a long lens of

examination of the impacts of cost disaggregation as a financial management tool. Yet, there was a massive macroeconomic event in the heart of that span – the Great Recession of 2008-2011 – that likely wielded significant influence over the spending actions taken by the RPIHE under review. The control variables included in the models normalized the resource environments, but the impact on state-developed policies that influence outcomes over many years could not be offset. The qualitative interviews shed light on the policy environments of the three subject RPIHE, yet the averages against which their individual outcomes are compared (in terms of DCS cohort and the entire public R1 group) lack this detail to completely situate the findings. Still, whether the results described would recur in other time periods that faced different environmental challenges cannot be confirmed.

Perhaps most importantly, DCS schools themselves self-select into participation in the cost-disaggregating consortia. As referenced above, conclusions about the effect found in this quantitative analysis would be limited to the DCS participants currently under analysis. An assertion that the effect would occur at all in non-participants cannot be proved, nor can its potential influence on results of any magnitude be verified. However, one may reasonably argue that this self-selection bias would mean that DCS universities share certain traits, such as being of the type of organization that wants deep dives into its financials, even with the resource investment required. The absence of these traits would likely diminish the cost-shaping potential of non-DCS participant schools, as the lack of interest would have deterred participation in the first place.

Finally, the lack of access to the DCS departmental-level data that constitutes the peer outcome data shared with participants limits the reach of this dissertation.

Having this data could provide useful comparative detail on resource allocations that would bolster the conclusions reached by this research. It could allow for specific changes in expenditure type (instruction, research, etc.) to be traced to specific units and decision makers within the RPIHE. The Terms of Use of the DCS governing board are highly restrictive, but future researchers may be properly situated within a DCS participating university to obtain access to this private data set.

C. Future Research

While the limitations described in the previous section are significant, they also signal potential future research questions that other scholars could investigate to amplify our understanding of the role of cost-focused financial management tools on RPHIE expenditures. Most obviously, accessing and utilizing the DCS-peer institution data set in its full form to draw discipline-level conclusions that could interact with this dissertation's findings would inform and fortify the theory of action described in this research. It would provide deeper internal context regarding the data received by all DCS participants to guide their decision-making process. Such access could also guide the formulation of a different set of questions to pose subjects in a qualitative study that don't appear in this research. This goal is a difficult one to achieve given the restrictions on access placed on the data set by DCS, which are primarily based on the DCS participation status of a researcher's host institution and driven by the consortia's pledge to honor the trust put into it by members by erecting

high guards of data confidentiality. So, linking the data to particular schools and their institutional IPEDS results would likely not be feasible, but anonymized reporting may be an option for future study that could expand the applicability of the results to a broader swath of universities.

Three alternative paths of research more specifically aligned to the time and resource constraints cited in Section 3 that limited interviews to three of 69 R1 public universities are: *1) Change the emphasis from the largest R1 publics to include R2, doctoral and comprehensive institutions; 2) Seek greater geographic diversity among the universities studied; and 3) Retain R1 emphasis, but focus on institutions that do not have a state-controlled system office overseeing them, unlike the RPIHE that formed part of this research.*

1) *Type of university*: The difference in experience of cost disaggregation that may result from an institution offering fewer outputs (*i.e.*, not a land grant with a broad public service mission, not having a hospital, having a less research-intensive emphasis, *etc.*) could indicate a lesser or greater perceived benefit to understanding discipline-specific cost analysis of DCS. Because resource inputs from faculty, graduate assistants, and space utilization may be more straightforward when there are fewer options and potential opportunity costs to resource usage than at more complex RPIHE, alternate lessons may be learned that are suited to the scale of each type of PIHE. An intriguing variant on this concept would be to study several PIHE of different size and complexity that

reside within in the same policy structure to test the consistency of the mechanisms described herein.

- 2) *Geographic Diversity*: As noted, this dissertation's three subject RPIHE are located in the Eastern part of the country, so expanding similar analyses to other parts of the country could offer insights into different approaches to university funding, the impact of alternate governmental relationships between sponsor and bureau, and different resource constraints related to the physical location of the campus. Similarly, two of the universities analyzed operate in an urban setting while one does so in a mid-sized town, thus suggesting the benefit of expanding beyond those situations to those in which cost of living drives expense and revenue patterns in different directions.

- 3) *Influence of State System Offices*: Instead of moving outside of the R1 space, researchers could also study other RPIHE within this university cohort. A subgroup within the cohort that was not represented in this dissertation that would add to our understanding in this area of research is R1s that do not have a System Office serving as the coordinating agency of PIHE within a particular state, such as Iowa or Delaware. The lack of this mediating bureau may fundamentally alter the expenditure activity of RPIHE by yielding a much closer connection of sponsor to university. Whether the more direct path better synchronizes funding allocations to desired outcomes or creates too many contrasting political demands on universities due to the absence of a legally mandated control entity to absorb

such pressure (or something else altogether) would be valuable information for policy makers.

Following this thread on the role of system offices, the political dynamics charted in the qualitative section point toward other public policy perspectives that could amplify the focus provided by this dissertation's study of three R1s. For example, UIC is a mid-western school within a Democratic-leaning city and state, while UNC-CH and VCU both exist in Democratic cities but form part of Republican-controlled states. The role of partisan state leadership could take center stage in a study of PIHE expenditures to gauge if the party-affiliation of the sitting governments has an influential role in setting priorities in spending types.

Finally, just two years following the close of this dissertation's 15-year period of study, another seismic macroeconomic event - the COVID-19 pandemic - profoundly altered the financial environments that RPIHE operate within. Studying the changes of spending under cost disaggregation systems like DCS suggests several fascinating follow-up research projects. One avenue would be to document the influence of pandemic-induced total resource constraints in the context of the compulsory changes of expenditure to student support and scholarship functions provoked by the heavy focus on these areas in the funding provided to universities by the Coronavirus Aid, Relief, and Economic Security Act or, CARES Act of 2020, and the related \$14 billion Higher Education Emergency Relief Fund (ED, 2023). Perhaps of more bearing for the longer-term, the contextually driven change of postsecondary instructional modalities from primarily in-person instruction to a

significant presence of online and hybrid alternatives offers a fascinating cost discontinuity to explore. Teasing out how schools with detailed knowledge of discipline-specific and peer data like DCS participants spent their limited funds to accomplish this adjustment during the pandemic (and whether it persisted thereafter) vis-à-vis those that lacked such information would be another valuable contribution to the literature.

D. Conclusion

There is limited research that delves into the nexus of public policy decisions and cost management at public universities. This scarcity is an opportunity for researchers and practitioners to add value to policy discussions in this area. Yet, this same scarcity contributes to the potential for well-intentioned state efforts that seek to link state appropriation decisions to desired policy outcomes to be relatively ineffective and potentially prone to prompting undesired outcomes, as seen in several of the cases described in this dissertation. Policy structures that differentiate funding schemes by the complexity of PIHE receiving funds in the allocation method, provide for guidance on tuition controls (or autonomy) as part of the broader operational guidance accompanying funding programs, and allow for flexibility when macroeconomic conditions change will be better poised to deliver the results intended. More pieces of guidance in this subject would be a welcome to build out of the body of work that can service the public good.

Appendices

Appendix 1 List of IPEDS variables in Estimating Equations

Dependent Variable

1. **Main variable of interest.** *Proportion of Instructional Expense to Total Expense to see use of funds for instruction:* **IPEDS Finance variable F1C011: Instruction - Current year** (Instructional Expense total for Public Institutions using GASB reporting) divided by **IPEDS Enrollment variable FTEUG** Reported full-time equivalent (FTE) undergraduate enrollment.
 - a. **Key control: - IPEDS Finance variable F1C191: Total expenses and deductions - Current year total** (Total expenses for Public Institutions using GASB reporting).
2. **Secondary dependent variables of interest/specification:** The influence of DCS on other areas of expense will be similarly tested using the equivalent IPEDS variables (**F1C021 – Total Research Expense; F1C031 – Total Public Service Expense; F1C051 – Total Academic Support Expense; F1C061 – Total Student Services Expense; F1C071 – Total Institutional Support Expense; F1C101 – Total Scholarship/Fellowship Expense; and F1C111 – Total Auxiliary Expense**) each divided by IPEDS Enrollment variable **FTEUG** Reported full-time equivalent (FTE) undergraduate enrollment.
 - a. **Main control: - IPEDS Finance variable F1C191: Total expenses and deductions - Current year total** (Total expenses for Public Institutions using GASB reporting)

Independent dummy variable:

3. DCS participation for info on use of cost disaggregation with available comparative info (1=Yes, 0=No).

4. Budget system dummy variable - RCM: Use of Responsibility Center Management budget system (1=Yes, 0=No).

Control variables to focus analysis and highlight other possible explanations from IPEDS

5. Carnegie Classification – **CARNEGIE, CCBASIC, C15BASIC**
6. Revenue Items:
 - a. **IPEDS Finance variable F1D01: Total operating revenues**
 - b. **F2D032: State Appropriations:** State government contribution of revenue
 - c. **F1B01: Tuition and Fees – Unrestricted:** Market-based income
 - d. **F2D022: Private gifts, grants, and contracts – Unrestricted:** External funding
7. Enrollment (lagged to match period): Economies of scale due to size of school– **EFTOTLT** - Grand total men and women enrolled for credit during the fall.
8. Graduate enrollment: Reported full-time equivalent (FTE) Graduate enrollment, 12-month instructional activity credit hours: graduates - **FTEGD**.
9. Student preparation/quality proxy: **SATVR75/SATVR75, SATMT75, SATMT25:** SAT Critical Reading and Math scores at 75th and 25th percentile score.
10. Retention Rates (lagged to match period): Success of programs to retain students: **RET_PCF** - Full-time retention rate and **RET_PCP** - Part-time retention rate.
11. Graduation Rates (lagged to match period): Success of programs to take student to completion – **GRRTTOT** - Graduation rate of first-time, full-time degree or certificate-seeking students.
12. Student/Faculty Ratio: Proxy for instructional quality – **STUFACR**

Appendix 2

Interview Question framework provided to subjects

The dissertation's quantitative results identify a clear increase in spending on instruction and scholarship expenditures from universities that participated in the Delaware Cost Study (DCS) during the 15-year period of study vis-à-vis those that did not. Moreover, this activity corresponded with a lower relative per FTE-based outlay than non-DCS Research Public Institutions of Higher Education (RPIHE) on institutional support and student support activities. The aim of the interviews is to build context around the financial management decisions taken by RPIHE with (or without) DCS data and those of their state funding sponsors.

Questions for university leaders:

- Were the spending outcomes indicated by this dissertation those intended by the RPIHE, and were they a direct result of DCS participation alone or part of a larger effort?
 - If so, how does each year's successive DCS input influence managerial responses?
 - If not, what other factors led to the outcomes at these RPIHE?
- What level of leadership (e.g. President, Provost, Deans, Chairs, Chief Financial Officer, etc.) within universities promoted a change in activity related to DCS?
 - Which levels of the organization were charged with enacting the changes?
- What trade-offs did decision-makers weigh when shifting resources

between uses (e.g. from institutional support to instruction)?

- Was there slack, ease of control, presumed efficiencies to be gained, etc. that indicated institutional support or student service spending would be part of the resource reallocation solutions?
- How long did it take the university to move from effort to desired result?
- How, if at all, were state funding sponsors involved in the process?

Appendix 3

UNCS Cost Formula Example

Enrollment-Change Funding Request Example


Campus: **UNC-ABC**

Program Category	Student Credit Hours			SCH per Instruction # Position			Instruction # Position Required			
	UG	Masters	Doctoral	UG	Masters	Doctoral	UG	Masters	Doctoral	
Category I	3,700	729	0	708.64	169.52	115.56	5,221	4,300	0.000	
Category II	6,030	484	8	535.74	303.93	110.16	11,255	1,582	0.073	
Category III	2,118	288	0	406.24	186.23	109.86	5,214	1,546	0.000	
Category IV	0	0	0	232.25	90.17	80.91	0.000	0.000	0.000	
Total	11,848	1,501	8				21,690	7,438	0.073	
	Total All SCHs 13,357									Subtotal Position: 29,201
% of Total	88.7%	11.2%	0.1%							

Total Position Required	29,201
Instruction Salary Rate of Campus	\$75,500
Instruction Salary Amount	\$2,204,676
Other Academic Costs 44.89%	\$989,679
Total Academic Requirements	\$3,194,354
Library Rate 11.48%	\$366,712
Gen 'Instit Suppo Rate 54.05%	\$1,726,549

Calculation of Appropriation Request			
Requirement Generated by SCH Model			\$5,287,615
Tuition Revenue:	<i>ETE</i>	<i>Rate</i>	<i>ETE x Rate</i>
In-State U/G FTEs	300	3,000	900,000
Out-of-State U/G FTEs	91	14,300	1,301,300
Resper G. S.116-143.6	9	3,000	27,000
In-State Grad FTEs	56	3,400	190,400
Out-of-State Grad FTEs	18	14,500	261,000
Total FTEs	474		
Total Expected Revenue			2,679,700

Request Amount	
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Appendix 4: IBHE Cost Study Example

Metro		
Chicago Campus	2	Biological Sciences FT-453
Include expired orgs codes/names		

2005-2023 Profile for: University of Illinois at Chicago

[Also available: RPI Academic Program Data](#)

Dept: 453 - Biological Sciences

Item	CODE_TITLE	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
BUDGET																					
		<small>For More detailed Budget/Expenditure data goto the OBES website.</small>																			
10200	Total Original State Budget	\$4,85	\$4,87	\$5,10	\$5,48	\$5,65	\$5,35	\$5,92	\$5,80	\$5,97	\$5,90	\$6,48				\$4,54	\$4,69	\$4,80	\$4,96		
10300	State Academic Salaries	\$2,52	\$2,52	\$2,74	\$3,11	\$3,24	\$3,00	\$3,26	\$3,02	\$3,14	\$3,03	\$3,40				\$3,23	\$3,18	\$3,41	\$3,56		
10400	State Staff Salaries	\$731	\$773	\$779	\$724	\$736	\$706	\$580	\$597	\$655	\$632	\$793				\$691	\$839	\$696	\$809		
10500	State Assist Salaries	\$1,10	\$1,06	\$1,06	\$1,12	\$1,15	\$1,17	\$1,61	\$1,66	\$1,65	\$1,72	\$1,77				\$164	\$164	\$164	\$164		
10600	Subtotal Salaries	\$4,36	\$4,36	\$4,58	\$4,96	\$5,13	\$4,89	\$5,45	\$5,29	\$5,46	\$5,39	\$5,97				\$4,08	\$4,18	\$4,27	\$4,54		
10700	Salaries as % of Total	89.9%	89.5%	90.0%	90.6%	90.9%	91.4%	92.2%	91.2%	91.4%	91.4%	92.1%				89.8%	89.2%	88.9%	91.4%		
10800	State Wages	\$10,3	\$10,3	\$10,3	\$10,6	\$10,7	\$10,7	\$10,7	\$10,7	\$10,7	\$10,7	\$10,7				\$10,7	\$10,7	\$33,1	\$33,1		
10900	State Supplies and Services	\$367	\$391	\$391	\$391	\$391	\$341	\$341	\$391	\$391	\$387	\$390				\$343	\$388	\$391	\$284		
11000	State Equipment	\$97,8	\$97,8	\$97,8	\$97,8	\$97,8	\$97,8	\$97,8	\$97,8	\$97,8	\$97,8	\$97,8				\$104	\$104	\$104	\$104		
11100	State Other/ Miscellaneous	\$13,0	\$13,0	\$13,0	\$13,0	\$13,0	\$13,0	\$13,0	\$13,0	\$13,0	\$13,0	\$13,0				\$3,10	\$3,10	\$3,10	\$3,10		
11200	Permanent State Budget Adjust	\$0	\$0	\$0	\$0	\$0	\$0	\$0	(\$6,4	\$0	\$0	\$0				\$0	\$0	\$0	\$0		
11300	Temp State Budget Adjust	\$28,3	\$27,0	\$33,9	\$0	\$0	\$1,50	\$11,5	\$7,50	\$0	\$0	\$0				\$1,78	\$4,70	\$0	\$2,10		

EXPENDITURES																					
20100	Total Expenditures by Account (All Funds)	\$8,70	\$8,89	\$10,3	\$10,0	\$11,0	\$10,6	\$11,2	\$10,3	\$11,4	\$10,6	\$10,4	\$10,5	\$9,90	\$8,99	\$9,82	\$10,4	\$10,7	\$12,0		
20200	Academic Salaries	\$3,96	\$3,97	\$4,44	\$4,78	\$5,00	\$4,88	\$5,08	\$4,29	\$3,91	\$3,86	\$4,06	\$4,05	\$4,34	\$4,15	\$4,10	\$4,81	\$4,95	\$5,64		

Item	CODE_TITLE	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
20700	Wages	\$90,5	\$82,2	\$72,8	\$96,5	\$87,6	\$67,3	\$85,0	\$134	\$149	\$106	\$86,6	\$63,6	\$46,5	\$75,3	\$113	\$182	\$192	\$156		
20800	Benefit Costs	\$233	\$273	\$328	\$358	\$348	\$436	\$455	\$267	\$255	\$215	\$150	\$138	\$172	\$170	\$151	\$203	\$299	\$348		
20900	Federal Work Study	\$88,6	\$76,0	\$45,4	\$38,8	\$28,2	\$14,9	\$27,5	\$16,1	\$18,3	\$23,1	\$16,7	\$22,7	\$11,6	\$11,3	\$30,2	\$30,5	\$6,43	\$20,6		
21000	Supplies and Services	\$1,47	\$1,54	\$2,09	\$1,98	\$2,22	\$1,91	\$1,90	\$2,02	\$3,50	\$2,88	\$2,58	\$2,38	\$1,89	\$1,31	\$1,47	\$1,36	\$1,42	\$1,69		
21100	Equipment/Software	\$198	\$101	\$339	\$215	\$334	\$257	\$434	\$544	\$624	\$498	\$465	\$829	\$215	\$40,7	\$408	\$199	\$273	\$516		
21200	Miscellaneous	\$9,85	\$35,1	\$22,6	\$38,1	\$26,0	\$55,1	\$87,3	\$86,4	\$57,5	\$46,0	\$36,3	\$49,4	\$62,8	\$46,6	\$47,7	\$41,3	\$25,2	\$77,2		
21300	Plant Expenditures			\$2,90	\$10,3	\$149	\$61,4	\$0	\$0	\$0	\$604	\$0	\$5,56	\$0	\$0	\$0	\$0	\$0	\$0		
21400	Transfers					\$3,60	\$0	(\$10,	(\$15,	(\$14,	(\$15,	(\$30,	(\$36,	(\$27,	(\$1,9	(\$2,5					
21500	Admin Allowances	\$5,50	\$11,6	\$12,2	\$5,19	\$4,40	\$8,58	\$9,40	\$4,29	\$261	\$76	\$145	\$83	\$1,38	\$104	\$2,40	\$81	\$59	\$51		
22000	Total Expenditures by Account (State Funds)	\$5,52	\$6,01	\$6,71	\$6,45	\$6,81	\$6,28	\$6,77	\$6,94	\$7,76	\$7,88	\$8,24	\$9,16	\$8,20	\$7,46	\$8,13	\$8,55	\$8,15	\$8,63		
22200	Academic Salaries	\$2,94	\$3,03	\$3,36	\$3,55	\$3,75	\$3,35	\$3,65	\$3,55	\$3,33	\$3,35	\$3,71	\$3,72	\$3,92	\$3,75	\$3,66	\$4,18	\$4,18	\$4,73		
22300	Staff Salaries	\$771	\$755	\$781	\$433	\$457	\$465	\$592	\$606	\$666	\$727	\$761	\$713	\$741	\$685	\$788	\$800	\$858	\$854		
22400	Assistant Salaries	\$1,14	\$1,39	\$1,52	\$1,47	\$1,63	\$1,61	\$1,62	\$1,68	\$1,90	\$2,00	\$2,06	\$2,11	\$2,17	\$2,25	\$2,51	\$2,63	\$2,41	\$2,37		
22500	Subtotal Salaries	\$4,85	\$5,18	\$5,66	\$5,45	\$5,84	\$5,43	\$5,86	\$5,84	\$5,89	\$6,08	\$6,54	\$6,55	\$6,84	\$6,68	\$6,96	\$7,62	\$7,45	\$7,96		
22600	Salaries as a % of Total	86.3%	86.3%	84.4%	84.5%	85.8%	86.4%	86.6%	84.2%	76.0%	77.1%	79.3%	71.5%	83.4%	89.6%	85.6%	89.1%	91.4%	92.2%		
22700	Wages	\$41,5	\$36,0	\$48,0	\$66,0	\$41,4	\$24,8	\$36,0	\$51,6	\$95,3	\$66,6	\$59,3	\$60,9	\$33,9	\$57,2	\$64,0	\$134	\$103	\$88,2		
22800	Benefit Costs					\$689				\$2,18	\$4,22	\$3,85	\$3,80						\$5,00		
22900	Federal Work Study	\$13,1	\$11,8	\$3,87	\$4,68	\$1,61	\$1,50	\$2,65	\$2,25	\$2,13	\$3,33	\$3,97	\$6,20	\$2,92	\$1,81	\$6,26	\$6,84				
23000	Supplies and Services	\$559	\$702	\$829	\$833	\$739	\$607	\$634	\$752	\$1,17	\$1,21	\$1,33	\$1,71	\$1,13	\$642	\$713	\$664	\$548	\$510		
23100	Equipment/Software	\$48,9	\$67,8	\$158	\$92,5	\$182	\$144	\$217	\$266	\$560	\$473	\$274	\$763	\$132	\$28,3	\$344	\$91,3	\$30,9	\$6,26		
23200	Miscellaneous	\$4,80	\$7,50	\$1,00	\$3,38	\$0	\$15,4	\$16,6	\$26,6	\$28,3	\$41,8	\$28,0	\$56,5	\$51,1	\$45,0	\$42,3	\$34,7	\$15,2	\$60,4		

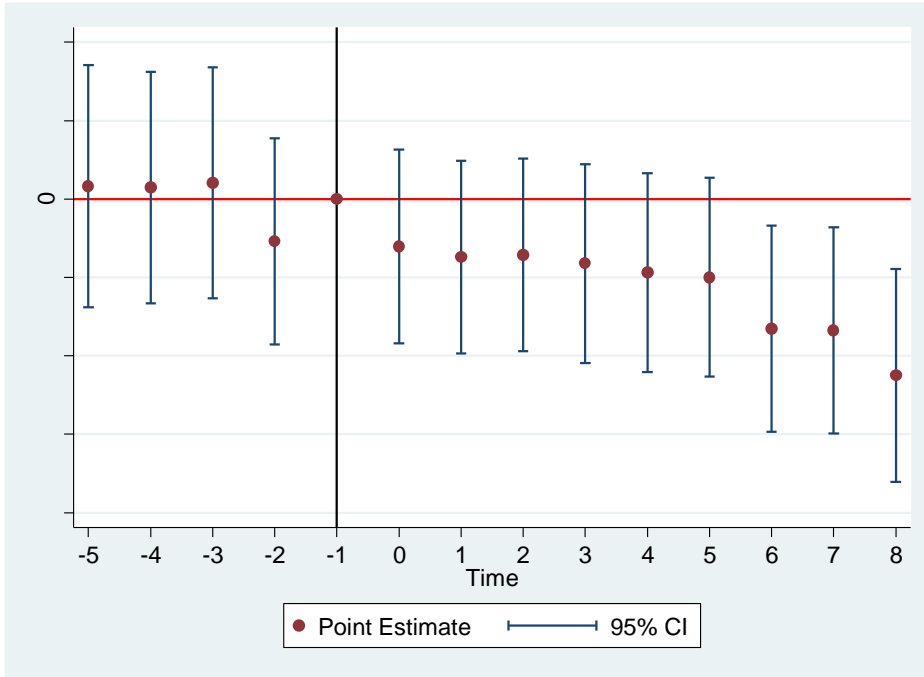
Discipline Cost Study

Item	CODE_TITLE	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
80100	Direct Instruction Cost	\$103	\$102	\$122	\$123	\$133	\$118	\$114	\$135	\$139	\$133	\$143	\$119	\$114	\$116	\$121	\$136	\$132			
80200	Cost with Dept Overhead	\$169	\$176	\$193	\$188	\$206	\$180	\$183	\$202	\$211	\$184	\$208	\$239	\$197	\$173	\$185	\$214	\$196			
80300	Cost with College Overhead	\$174	\$180	\$197	\$192	\$217	\$189	\$210	\$220	\$217	\$189	\$221	\$249	\$205	\$181	\$193	\$224	\$204			
80400	Cost with Univ Overhead	\$236	\$239	\$262	\$260	\$292	\$260	\$286	\$297	\$296	\$259	\$298	\$328	\$275	\$252	\$265	\$299	\$273			

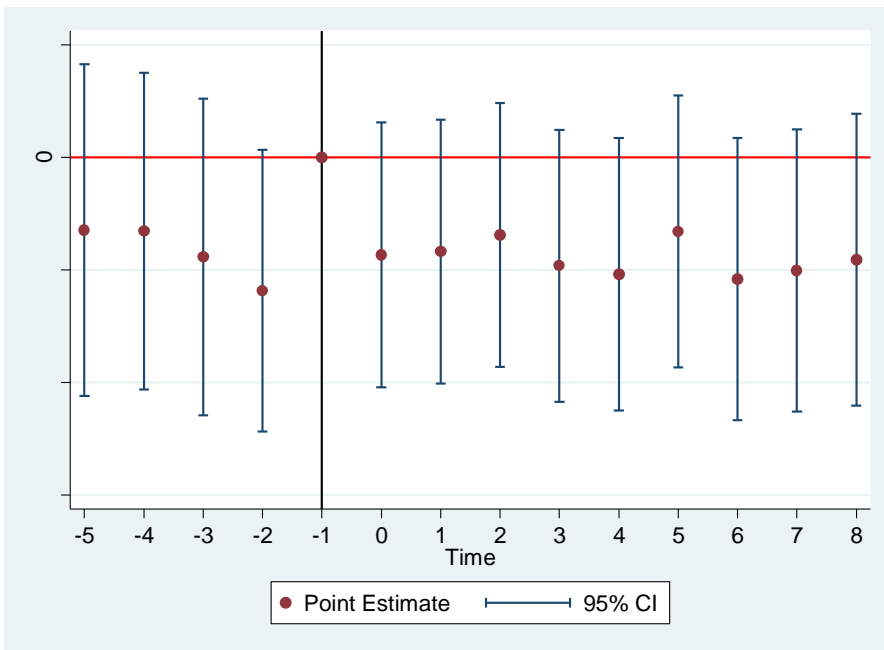
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Appendix 5
Parallel trends of outcomes not shown as significant in TFWE model

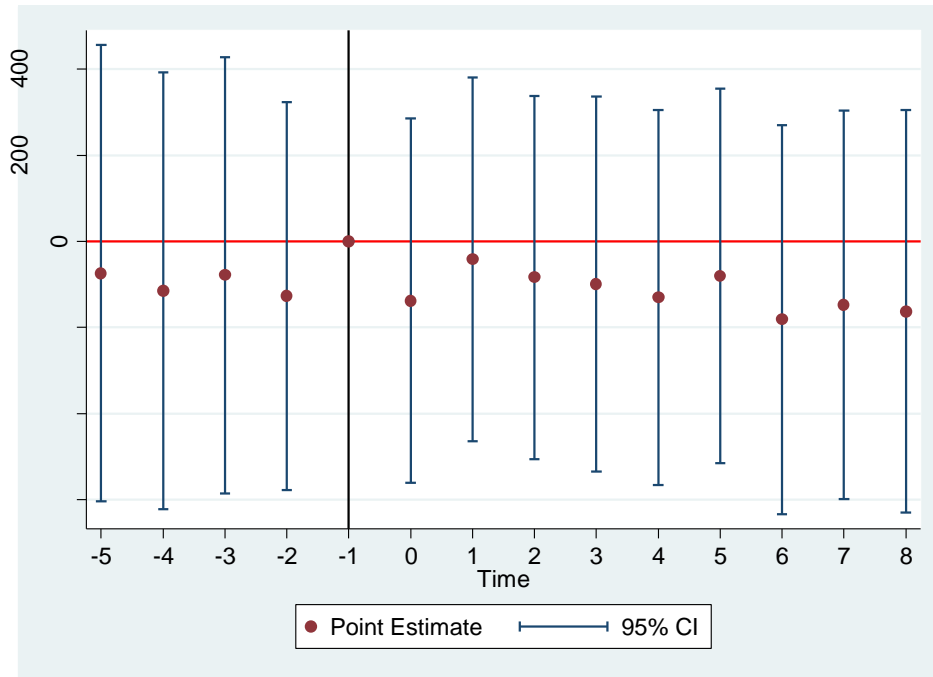
Research Support



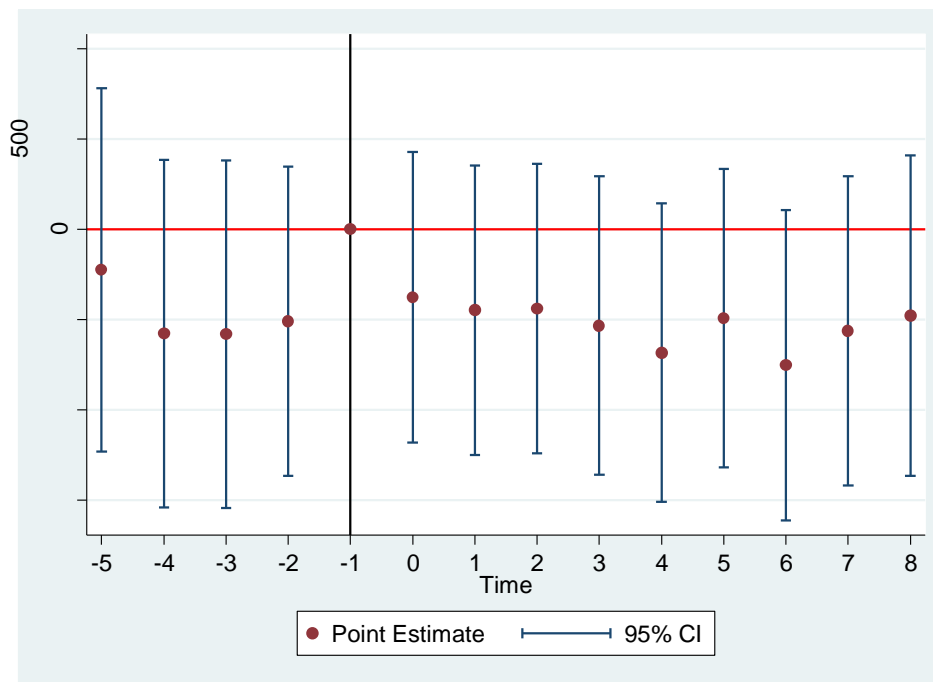
Academic Services



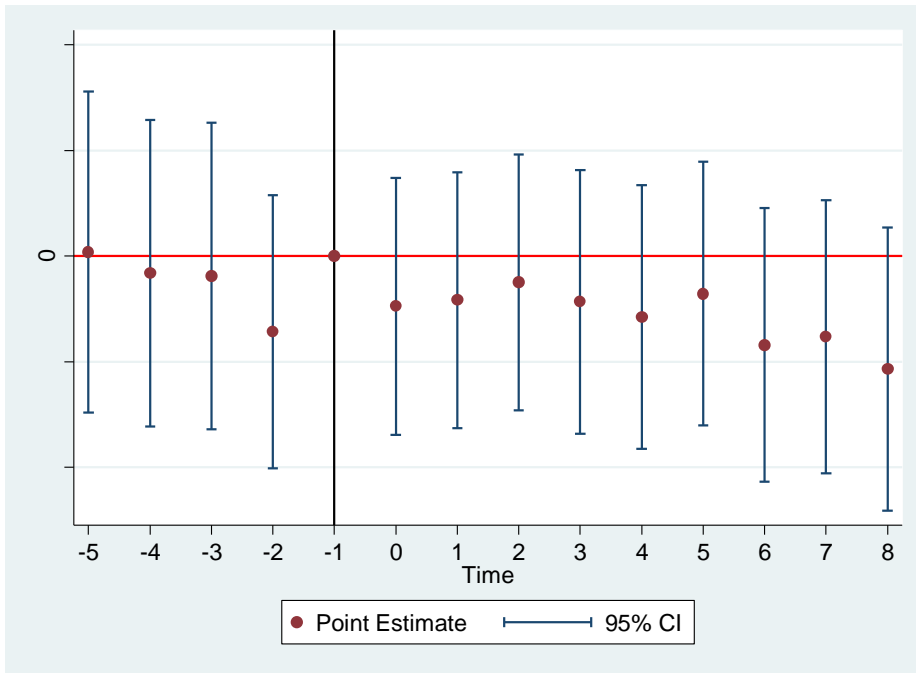
Scholarships



Auxiliaries



Total Expense



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Clarke, D., and K. Tapia Schythe. 2020. EVENTDD: Stata module to panel event study models and generate event study plots.

<https://EconPapers.repec.org/RePEc:boc:bocode:s458737>.

Appendix 6
Additional Results from Qualitative interviews that inform policy conclusions

Additional Result #1: *Cost disaggregation was more successful when prompted by state sponsors rather than internal forces because the latter were more susceptible to losing strength when individual leaders departed.*

In the late 2000s, VCU's Provost had prompted the exploration of DCS as a potentially valuable financial tool with roots in instructional cost metrics. Yet, campus leadership ultimately decided not to pursue DCS institutionally due to a perception that the cost and time commitment to marshal the data were too great to justify. That decision, rendered temporarily moot in the early 2010s by the bountiful switch to a credit-hour tuition charging system that brought in new funds VCU would alternatively have sought to reallocate internally, stemmed principally from a void in campus leadership rather than the express desires of key decision makers. Repeated turnover in the CFO's office – 5 different individuals occupied the CFO role in a single decade – had left the RPIHE without a financial leader that was familiar enough with its structures and culture to enact internal changes to resource stewardship. The arrival of stability in the central Finance function in the late 2010s led to the university's adoption of RCM rather than a revisiting of DCS. By then, the limitations of state support through the 'base adequacy' funding approach – and later the Covid-19 pandemic – redoubled VCU's focus on revenue generation as the priority rather than cost management.

All interview subjects for UIC agreed that the attraction of DCS lay in its peer comparison data, which had been unavailable to it through Illinois's internally geared Discipline Cost Study approach. The desire to put funding requests highlighting R1 to R1 comparisons (rather than Illinois only comparison) of costs not properly represented by the state funding discussions into stakeholder hands was a prime motivator. Yet, that thrust came from the Provost's Office and not that of the CFO. Significantly for respondents, the CFO's office was focused intensively on managing the unpredictable state support component of the budget that oscillated between feast (fiscal 2012-2015) and famine (fiscal 2016-2018) and its impacts on UICs RCM portfolio. With many spending decisions outsourced to colleges by RCM, academic leadership alone had the ability to focus on costs, but both UIC subjects noted that this focus was inconsistent and deprioritized in lockstep with improving revenues. The CFO's efforts increasingly centered on revenues as the 2010s unfolded, especially after DCS was cast aside by UIC in 2014.

As for UNC-CH, DCS was brought to the campus from a top-down state-sponsored initiative. State legislators had been influenced by the national attention caused by Congressional mandates to study the cost of higher education as part of the 1998 Amendments to the Higher Education Act (U.S. Department of Education, 2001). The resultant study was co-authored by Dr. Michael Middaugh, then Vice President for Institutional Research at the University of Delaware, who had organized the DCS consortia in 1994. Unsurprisingly, the report highlighted the costing approaches that DCS utilized. North Carolina state sponsors required DCS's use by all PIHE in the state in 1999 and updated the approach in 2005 (near the onset of this

dissertation's period of study) with newly benchmarked DCS-based cost information. Respondents confirmed that state officials' explicit goals were to fund all PIHE transparently and adequately, but to do so in a way that relied on an external data source (DCS) that provided a clear reference point for what resources post-secondary activity required. Legislators expressed wariness of the varied and complicated funding requests its many institutional presidents were presenting and desired a means of standardizing appropriation changes from year to year. The North Carolina approach continued for over twenty years (overlapping the entirety of the period of study) without major changes, let alone a move to cast it aside. The continuity provided by statutory mandates rather than internal campus power dynamics and leadership efforts gave UNC-CH's cost approach staying power.

In sum, DCS participation within the three RPIHE studied was either prompted by academic leaders or state sponsors. **The state-driven example proved the most long-lived while Provost-led efforts could not be sustained over time.**

Additional Result #2: Implementation of resource allocation by central financial leaders under DCS was more coordinated and strategic than in institutions with lesser DCS influence, but communication issues proved a hindrance in all cases.

As indicated, UIC's version of RCM enabled it to channel state funds to institutional support to a much greater degree than the other two RPIHE. RCM's key tool, the central 'tax' on academic units for access to institutional support from key units like Facilities, Information Technology, Human Resources, and Finance

(indirect expenses), pushed expenditure choices to each college. So, its central finance office felt little compunction or need to implement resource allocation guidance of the kind related to DCS or its internally grown state Discipline Cost Study treatment of instructional costs. Rather, as described by its AVC, financial leadership focused on calculating the central tax to be low enough for the semi-independent academic colleges to reap revenue gains associated with a strong student enrollment and retention strategy and its consequent tuition inflows. Meanwhile, because the academic units were dependent on generating revenue to pay all direct instructional expenses, a set of incentives pointed the way toward higher spending on instruction and scholarships, without a direct mandate from central financial managers to do so. This approach was feasible because central finance retained most of the incremental state funding support provided. This tactic was undoubtedly inconsistent but was ultimately less prone to risk over the entire period of study than the aggregated tuition streams produced by separate college-driven tuition schemes. The CFO was free to do so because of a general ambivalence among state sponsors as to how the funds sent to UI SYSTEM schools were ultimately used. The UI SYSTEM interviewees fulfilling the system oversight role, who were closer to state sponsors and UIC leadership than either of these parties were to each other, also shared that they were neither clear on how UIC used the state funding nor on how the state viewed the linkage between its funding and desired outcomes. Perhaps more importantly, UI SYSTEM considered it outside of its purview to direct universities on how to utilize base appropriation amounts. This viewpoint was similarly true for IBHE.

Such an oversight view was mirrored by VCU's interaction with SHEV. As for the implementation of resource allocation decisions, VCU's sharp focus on revenues substituted central guidance for market discipline in financial decisions. The lack of strong central leadership through the final decade of this dissertation's period of study led to an *ad hoc* approach to university-wide guidance that manifested in large swings in spending figures in all categories from year to year. Virginia's 'base adequacy' approach had locked in relatively low incremental state appropriation increases, as the variable tuition amounts that it had turned to for growth early in the wake of the Great Recession crowded out potential state funding boosts, even as costs grew to serve the growing student cohort. Furthermore, the market-driven nature of the tuition and enrollment swings made a coherent, forward-looking strategy for where to place revenue almost impossible. The AVC noted that this environment led to the "loudest voice" driving resource allocations rather than a data-driven strategic approach that directed dollars to areas of documented student and/or cost growth. Inevitably, this scattershot allocation damaged the morale amongst departments not on the receiving end of funding who could be offered nothing by way of explanation about why these resourcing choices were made.

Finally, as detailed in Section 3, UNC-CH experienced clear guidance on the generation of the funding figures, facilitating a campus-wide approach to most core resource allocations. The consistency in this transmission led to reliable knowledge of what would be available in a given year and how pieces of the existing pool could be redirected to different desired outcomes. What was less successful was communication from UNCS and campus leadership on how marginal changes to state

funds could be generated and/or distributed across the institution. This tamped down entrepreneurial efforts for growth, which fed into a lack of options for dealing with the salary growth concerns felt by all units on campus. Nevertheless, the cost-based controls prevent risky departures into market-based tuition pursuits present at the other campuses to varying degrees, maintaining stability in central and unit finances. Across the respondent university representatives, DCS was characterized as enhanced coordination of resource utilization, but not pervasive enough along the public hierarchy to avoid communication issues from creating unplanned spending imbalances.

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