TUITION DEPENDENCY IN AMERICAN PUBLIC HIGHER EDUCATION

by

FRANK J. (MAC) MCCONNELL

(Under the Direction of Robert K. Toutkoushian)

ABSTRACT

The precipitous change in the makeup of funding for higher education in America from a state supported, low student cost model to a high tuition, low state support model has created national animosity and challenges for senior leaders across the academy and is fundamentally challenging the notion of higher education serving a public good. This study seeks to examine changes in the makeup of public higher education funding. Additionally, this study asks if the association between state appropriations and tuition can be different based on how the variables are expressed. This quantitative analysis will utilize pooled regression models to examine data from 1987 – 2013 obtained from the Integrated Postsecondary Education Data System, IPEDS Analytics: Delta Cost Project Database. In this study, I examine the association of tuition price change (dependent variable) with my primary independent (or predictor) variable of interest - state appropriations, to determine if the coefficient changes, either a positive to negative association based on the how the variables for tuition and state appropriations is measured. Additionally, independent variables associated with enrollment level, Carnegie classification, and geographic region are included to further inform the study. I demonstrate through multiple-model regressions that initial positive associations between total tuition revenues and total state appropriations are misleading and that different correlation results occur when the dependent
variable is regressed as tuition per student, tuition per student adjusted for inflation, and tuition revenue as a percentage of total revenue.

INDEX WORDS: Tuition, State Appropriations, Public 4-Year Colleges, Pooled Regression Model, Correlation, Carnegie.
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by

FRANK J. (MAC) MCCONNELL

BBA, North Georgia College, 1979
MBA, Mercer University, 1983

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by

FRANK J. (MAC) MCCONNELL

Major Professor: Robert K. Toutkoushian
Committee: Karen L. Webber
James C. Hearn

Electronic Version Approved:

Suzanne Barbour
Dean of the Graduate School
The University of Georgia
December 2017
DEDICATION

I dedicate this dissertation to the memory of our son, Zak McConnell, and in honor of my wife, Tona, and our son Zeb. My family has always been my source of strength and have made me whole. You each have all my love.

Zak went to be with the Lord on October 29, 2013 while a graduate student at the University of Georgia. My motivation is to complete this degree and walk across the graduation stage for the both of us. I’ll ring the bell on campus a final time in his memory, and will never forget the inspiration Zak, Zeb and Tona have provided me. I am forever grateful.
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I would like to express my heartfelt appreciation to my dissertation committee, and most particularly, Dr. Rob Toutkoushian who served as my major professor. Dr. Toutkoushian’s guidance, direction and mentorship were essential to my development. Additionally, Dr. Jim Hearn and Dr. Karen Webber provided excellent support and feedback throughout the research and writing of this study. I would like to thank all the faculty and staff of the Institute of Higher Education for providing what I think is the finest doctoral program in Higher Education Management in the world. I give special thanks to Dr. Charles Knapp and Dr. Leslie Gordon for their mentorship and guidance throughout the program of study.

To those who are now my lifelong friends in Cohort 4, thank you for sharing this experience with me. Each of you are smart, funny and inspiring. I could not have imagined a finer group of scholars to share this experience with. I shall never forget you.

To Estelle Balch, Jarad Conner, Sherman Day, Chaudron Gille, Michael Leitson, Cyndee Moore, Lacee Sheffield and Carly Womack-Wynn, thank you for assisting me with encouragement, technical expertise and for just simply being there to help me along. I am truly grateful to each of you.

To President Bonita Jacobs, thank you for supporting me and allowing me to pursue this lifelong goal. I could not have achieved this without your support and encouragement.
To Dr. Patricia Donat, thank you for believing in me and encouraging me to pursue this pathway. I very likely would have never attempted this program were it not for your patient encouragement. You are a true scholar and I feel privileged to call you my friend.

I am richly blessed by family and friends.
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Funding for public higher education in America is a complex and dynamic labyrinth. For almost four centuries, public higher education in America has supported the notion of higher education serving the public good with a low cost of attendance for its citizenry. Low cost tuition has been possible because of subsidies, provided as direct state appropriations or as financial aid, that have enabled public institutions to charge tuition rates that are below the actual cost of providing the service (Winston, 1999). That rubric is being challenged today as public higher education in America has migrated from a low tuition, high state appropriation model to a low state appropriation, high tuition model. This change has been precipitated as colleges and universities continue to suffer from the adverse effects of state budget shortfalls that began in the late 1980s, coupled with sustained enrollment increases, and corresponding tuition increases. As summarized by Toma (2010), “Higher education is increasingly operating within a neoliberal frame that emphasizes individual gain and return on investment and minimizes traditional arguments associated with universities and colleges serving the public good” (p. 220).

Labaree (1997) identifies three alternative goals that have historically guided, and often times conflicted with, American public higher education over the years: “democratic equality (schools should focus on preparing citizens), social efficiency (they should focus on training workers), and social mobility (they should prepare individuals to compete for social positions)” (p. 39). The goals related to democratic equality and social efficiency serve the public good whereas social mobility serves the private, or consumer good. Examples of conflicts that occur
from these noble goals relate to institutional needs well beyond available resources, external factors such as governing boards, and political influence.

Even though there has been aggregate growth in operational funding for public education in the last two decades, this funding has been overshadowed by rapidly changing enrollments, competing interests for state funding, and institutional budgetary needs creating a schism between state allocation and increased expenses resulting from both economic shifts and demand for services (McLendon, Hearn, & Mokher, 2009). Enrollment increases after World War II, and the resultant baby boomer influx of new students utilizing the G.I. Bill beginning in the 1960s, has created considerable tension to increase capacity on American campuses, most often utilizing tuition increases. In their study on state funding, Mumper and Freeman (2005) explore the causes and consequences of public college “tuition inflation” (p. 308) and report that institutions could no longer afford to provide the generous subsidies necessary to keep tuition rates low. As a result, the cost burden has shifted to students and extramural funding partners and created new tensions for senior leaders. These new tensions include threats to a university’s ability to attract and retain lower income and racially diverse students. The complexities outlined in this research add to the difficulty university leaders experience in espousing the value proposition associated with obtaining a college degree, both to the student in career earnings and to society through an educated citizenry and other positive externalities.

The high student cost and perceived limited quality of a postsecondary degree, in part prompted by reports of limited learning gains, have contributed to a very contentious relationship between higher education institutions, state legislatures, and the constituencies they serve. Thelin (2011) concludes:
A dominant theme that emerged from the recent past in the United States was that many of the conventional practices and policies that characterized American higher education’s approaches to funding and resources, along with fundamentals of leadership and vision at the start of the twenty-first century, were strained and ineffective. (p. 398)

This discourse has led to explosive concerns and heated public exchanges in the media and in legislatures throughout the United States about the value of higher education (Campbell, 2015). Substantial increases in tuition pricing, staggering perceptions of student debt loads, and fundamental questions about the value of a degree are now part of the national dialogue. Campbell (2015) challenges higher education leaders to take back the national narrative surrounding public higher education to reverse the “affront on higher education” (p. 573) by demonstrating the transformative power of higher education. Johnstone and Marcucci (2010) note a diminution of trust in the government and the public sector, and at times especially, public universities. They maintain that this loss of trust has occurred because of the need to balance expanding enrollments, declining state support, and tuition increases. Tuition increases occurring almost every year for decades have resulted in the loss of some esteem in public higher education and resulted in significant increases in governmental regulation (Johnstone & Marcucci, 2010).

The escalating cost of attendance has created renewed interest in quantifying a return on investment. This is not surprising given the continuing growth of tuition levels in higher education (Perna, 2016). Calculating a return on investment is particularly difficult in a post-secondary environment when one considers institutional diversity, programs, and the student body makeup (Perna, 2016). State legislatures focus a lot of attention on structure and fiscal policy directed at aligning university behaviors with constituent preferences (Fowles, 2014). The alignment of strategies with constituent preferences typically revolve around election cycles and
would include such themes as lowering taxes, creating jobs, decreasing cost of health care, and improving state infrastructure. Most of the legislative attention since the recession of 2008 has been directed on economic development issues, workforce preparation, and jobs. Competing factors for state resources have caused state funding to decline rather dramatically, thereby creating an increased reliance on tuition revenue. Fowles’ (2014) work is supported by resource dependence theory and finds that tuition reliance will yield powerful shifts in institutional expenditures for educational activity and concludes:

    given the fact that institutions of higher education are multi-product firms that serve a diverse clientele of both internal and external stakeholders, this research suggests that the declining trend of state support may have serious implications for the outputs produced by institutions. (p. 283)

    As Mumper and Freeman (2005) note, “The U.S. is now well into its third decade in which public college tuition has increased faster than overall inflation and family incomes” (p. 336). Rising tuition has led to concerns about college affordability and many state and institutional policies have been enacted to address the issue (Delaney & Kearney, 2015). In fact, a recent study by Hinrichs (2017) confirms that tuition revenue per student and federal revenues have risen substantially from 1987 to 2013, while revenue from state and local governments has generally fallen. Senior leaders in higher education are faced with complex issues related to balancing resource allocations among competing interests that can negatively impact perceptions of the institution as well as student success. Examples of issues are types of faculty (full-time, part-time, instructor), tenure-track, request for new academic programs, elimination of non-performing programs, staff support, deferred maintenance issues and administrative personnel.
Toutkoushian (2003) identifies six main sources for postsecondary revenues: students or parents, federal government, state government, private gifts, endowments, and auxiliary enterprises, each dependent on the external environment. In this study, I will examine the relationship between tuition and state appropriations and measure how the association, either positive or negative, may be different based on how variables for tuition and state appropriations are measured. Clearly declines in state appropriations are not the only factors that impact tuition. The latter part of the twentieth-century saw swelling enrollments from baby boomers and private sector demand for faculty, coupled with high rates of inflation, impact revenue (Toutkoushian, 2003). Competing needs for state funds to support explosive health care costs, prison costs, and variable tax revenues challenged limited state resources and negatively impacted funds available for higher education. In fact, state appropriations represent one of the first discretionary sources of state revenues that legislators often sacrifice in order to meet other, less discretionary state costs and often suggest that institutions have the ability to cover these deficits though tuition increases. In the following budget cycle, institutions and governing boards are ridiculed for exorbitant tuition increases, and so the confounding cycle of public higher education funding goes.

As demonstrated in the literature review, rich scholarly research has examined state appropriations and how public funding for higher education has changed dramatically in the last half-century (Archibald & Feldman, 2006; Cheslock & Gianneschi, 2008; Li, 2016; Ness & Tandberg, 2013; Okunade, 2004; Weerts, 2014; Weerts & Ronca, 2006; Weerts & Ronca, 2012). Similarly, political influence reverberates throughout higher education funding (Dar, 2012; Doyle, 2012; Kim & Ko, 2015; McLendon, 2003; McLendon et al., 2009; Toutkoushian, 2001;
Political influence is often exerted by the Governor’s office, the state legislature, statewide governing boards, and by the federal level government.

Tuition increases are nothing new. Concern over tuition pricing has been a topic of conversation and contention for decades. According to Rusk and Leslie (1978), “The need to develop a better understanding of how tuition prices are established has become increasingly important as governmental policies have come to encourage greater reliance upon this source of income as a means of financing higher education” (p. 531). Issues surrounding tuition increases, student debt, and workforce development have been particularly exacerbated since the Great Recession of 2008. With the proliferation of social media and other instant news sources these issues are amplified exponentially.

Causes of tuition escalation have been studied widely and will be examined in the literature review (Kane & Orszag, 2003; McLendon et al., 2009; Mumper & Freeman, 2005). Toutkoushian (2003) sums up the crux of the problem related to annual tuition increases since the late 1970s by pointing out that expenditures within higher education have “grown at rates that exceeded the general cost of living” (p. 27). In fact, Mumper and Freeman (2005) note that college prices have been going up at an alarming rate concluding that there is no simple explanation for tuition increases. Koshal and Koshal (2000) espouse a hypothesis that tuition at public institutions is dependent upon state appropriations and that the reciprocal relationship also exists, that state appropriations is dependent upon the tuition rates charged.

While there is abundant research on public higher education funding, and particularly associations between tuition and state appropriations, this study adds to existing literature by examining how the association between tuition and state appropriations can change based on how each variable is measured. As outlined in this study, scholars often cite a negative
relationship between these variables noting that as state appropriations decrease, tuition increases. Others in government and elsewhere note that tuition increases regardless of the level of state appropriations suggesting a positive association. I conclude that both of these seemingly opposite observations are correct, depending on how the variables are measured.

The specific research questions and hypothesis guiding this study is as follows:

**Research Questions**

1. What is the relationship between tuition and state appropriations?

2. Can the calculated association results related to coefficients for state appropriations and tuition increases be different based on how the variables are expressed?

**Hypothesis**

The association between tuition (dependent variable) and state appropriations (independent variable) is significant and the association will be different when tuition levels are expressed as total tuition, tuition per student, tuition per student adjusted for inflation, tuition revenue as a percentage of total revenue, and the state appropriations levels are expressed as total state appropriations, state appropriations per student, state appropriations per student adjusted for inflation, and state appropriations as a percentage of total revenue.

Examining associations beyond aggregate level dollar amounts are critical to a complete understanding of these associations. Three specific adjustments were included in this study because of their relevance in explaining the associations. Expressing these variables in ratio to student counts, adjusted for inflation and as a percentage of total revenue provide for a more complete explanation of the associations presented in this study.

Adjusting for student count, expressed as per student or full-time equivalent, shows that while total tuition and state appropriation has increased over time, when expressed in ratio to
full-time student count, the actual tuition and state appropriation levels per student remain at pre-recession levels. This is a far different message than simply reporting record levels of state subsidy and tuition that often bias legislative interpretations relative to funding for higher education.

Adjusting for inflation in panel data enables an examination of the association of tuition with state appropriations in constant dollars and removes variations caused by changes related to inflation in the economy. Just as in the case of student counts, not controlling for inflation results in incomplete conclusions related to tuition and state appropriation levels.

Finally, it is important to examine tuition and state appropriation levels as percentages of total revenue. This analysis is critical and reveals the shift over time in total funding from a high percentage of state subsidy and relatively low level of tuition to levels today that are essentially the same, or in some cases, exceed the level of state appropriations. As the regression modeling will confirm, the negative association between tuition and state appropriations is shown most clearly when these variables are expressed as percentages of total revenue.

Senior leaders are continually faced with providing explanations for tuition increases, rising costs, and justifying the value of a higher education degree. In the following literature review, I will provide a theoretical framework for this study and examine three areas that have had an impact on higher education funding.
CHAPTER 2
LITERATURE REVIEW

This literature review will focus on three areas impacting higher education funding: state appropriation, tuition, and the influence of political factors on state appropriations and tuition price setting. The literature will document the profound decrease in state appropriations, the rapid increase in tuition, and the impact of political factors as well as highlight the theoretical frameworks impacting higher education. This literature review will be organized into subsections identifying the theoretical framework supporting this research and the prior literature. The prior literature will contain sections related to state appropriation, tuition, and conclude with political implications related to tuition and state funding in public higher education. These variables will converge to highlight the current condition of funding in American public higher education. I begin this review with an analysis of the theoretical underpinnings guiding the study.

Theoretical Framework

Tuition pricing is part of a broad framework that focuses on the economics of higher education and can be traced back to human capital theory (Becker, 1964; Toutkoushian & Paulsen, 2016). My theoretical analysis will expand on Winston’s work related to the economics of higher education and examine Pfeffer’s resource dependence framework that will guide my time-series modeling to quantitatively analyze tuition (price) increases as the dependent variable an examine the association with state appropriations and other select variables over an extended period of 26 years. Winston (1999) identifies higher education as a business that produces and sells educational services to customers (students) for a price and buys inputs such as faculty, staff
and equipment needed to make that product. In what he describes as the economic circumstances of higher education, Winston (1999) notes that most institutions of higher education are not-for-profit firms with strategic directions and institutional imperatives that are far different from for-profit enterprises. Hansmann (1980) distinguishes two primary sources of revenue for non-profits, charitable donations and commercial sales of services that converge to form donative-commercial nonprofits. Winston (1999) notes the contrast from a for-profit firm, “donative-commercial nonprofits can and do subsidize their customers, selling them a product at a price that is below the costs of its production” (p. 17).

Three non-profit circumstances that are fundamental to public tuition pricing relate to student subsidies, peer effects generated by the student-customers, and the notion that higher education is a distinctly hierarchical industry with a range of institutions from rich to poor that impact pricing (Winston, 1999). Figure 1 depicts the differential pricing associated with resident and non-resident students and the impact on sticker price with or without subsidy and show a lower price charged to state residents with the state subsidy being evenly distributed among state residents (Toutkoushian & Paulsen, 2016). The justification behind large pricing differentials is that public institutions utilize a portion of their subsidy to lower in-state student prices in fulfillment of the institutions role as a state-supported institution (Toutkoushian & Paulsen, 2016).
Table 1 provides an illustrative summary of cost, prices, subsidies, and hierarchy for American higher education based on 1995 IPEDS data (Winston & Yen, 1995). Table 1 is published with permission by the copyright holder, the American Economic Association (https://www.aeaweb.org/journals/policies/copyright). Winston (1999) notes the most striking fact in Table 1 is the uneven distribution of average subsidies that relate to differences in the donative resources available to different colleges and universities. Clearly, the elite public and private institutions have more donative resources. The average student subsidy for all institutions (public and private) based on 1995 IPEDS data was $8,200, with total average cost of $12,000
and net average tuition and fees for the year of $3,800. Interestingly, Table 1 shows that students at poorer schools (less donative resources) actually pay a higher net price. In addition to more donative resources, schools with the greatest subsidies attract the most qualified students who in turn provide a peer effect of enhanced customer-input technology that describes the process whereby the students educate both themselves and each other (Winston, 1999). Finally, Winston (1999) speaks to the sharply hierarchical ranking of institutions of higher education from rich to poor and the inherent competitive advantages this brings in term of ability to raise money and to impact their current commercial circumstance.

It is worth noting that high perceived public value of higher education is not unique to the United States, even with decreasing public subsidy. While this notion of serving public good is being questioned worldwide, Johnstone and Marcucci (2010) note:

Universities supported by the state have been heavily subsidized because of this high perceived public value, in spite of the very great (and continuously increasing) cost to the taxpayer and despite the willingness of parents and/or students to pay a tuition fee if necessary in spite of the very great (and continuously increasing) cost to the taxpayer and despite the willingness of parents and/or student to pay a tuition fee if necessary. (p. 12)
### Table 1
Costs, Prices, Subsidies, and Hierarchy, 1995

<table>
<thead>
<tr>
<th>Ranked by Dollar Value of Subsidy</th>
<th>Enrollments (FTE)</th>
<th>Average Student Subsidy</th>
<th>Costs: Educational &quot;E&amp;G&amp;K&quot;</th>
<th>Price: Net Tuition &amp; Fees</th>
<th>Price/Cost Ratio</th>
</tr>
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<tbody>
<tr>
<td>All Institutions</td>
<td>3,500</td>
<td>8,200</td>
<td>12,000</td>
<td>3,800</td>
<td>31.5%</td>
</tr>
<tr>
<td>Public</td>
<td>5,100</td>
<td>8,700</td>
<td>9,900</td>
<td>1,200</td>
<td>12.4%</td>
</tr>
<tr>
<td>Private</td>
<td>1,700</td>
<td>7,700</td>
<td>14,200</td>
<td>6,500</td>
<td>45.9%</td>
</tr>
<tr>
<td>Decile 1</td>
<td>3,300</td>
<td>22,800</td>
<td>28,500</td>
<td>5,700</td>
<td>20.1%</td>
</tr>
<tr>
<td>Decile 2</td>
<td>3,800</td>
<td>11,100</td>
<td>14,900</td>
<td>3,800</td>
<td>25.4%</td>
</tr>
<tr>
<td>Decile 3</td>
<td>4,300</td>
<td>9,300</td>
<td>12,300</td>
<td>3,000</td>
<td>24.4%</td>
</tr>
<tr>
<td>Decile 4</td>
<td>4,500</td>
<td>8,200</td>
<td>11,000</td>
<td>2,800</td>
<td>25.6%</td>
</tr>
<tr>
<td>Decile 5</td>
<td>3,700</td>
<td>7,300</td>
<td>9,900</td>
<td>2,600</td>
<td>26.6%</td>
</tr>
<tr>
<td>Decile 6</td>
<td>3,900</td>
<td>6,500</td>
<td>9,400</td>
<td>2,900</td>
<td>30.8%</td>
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<tr>
<td>Decile 7</td>
<td>3,500</td>
<td>5,800</td>
<td>8,700</td>
<td>2,900</td>
<td>33.1%</td>
</tr>
<tr>
<td>Decile 8</td>
<td>3,500</td>
<td>5,100</td>
<td>8,400</td>
<td>3,300</td>
<td>39.5%</td>
</tr>
<tr>
<td>Decile 9</td>
<td>2,900</td>
<td>4,100</td>
<td>8,700</td>
<td>4,600</td>
<td>52.5%</td>
</tr>
<tr>
<td>Decile 10</td>
<td>1,600</td>
<td>1,800</td>
<td>7,900</td>
<td>6,100</td>
<td>77.4%</td>
</tr>
</tbody>
</table>

Source: Winston-Yen, 1995 (updated); based on US Department of Education IPEDS data. Includes 2739 institutions, of which 1420 are public and 1319 are private. All dollar amounts are per FTE student averaged over institutions. Col. 3: Educational costs include the share of E&G spending devoted to instruction plus the rental rate for physical capital. Col. 4: Tuition and fees net of grant aid.
Additionally, this study is informed by a resource dependence perspective. A plethora of organizational and environmental explanatory models were introduced in the 1970s including: institutional theory, transactional cost theory, agency theory, and population ecology, as well as resource dependence theory. In her work on organizational change theories, Demers (2007) identifies these emergent theories as rational adaptation approaches and groups them under headings related to contingency theory and purposeful action. Scholars often cite three macro-sociological approaches to the study of organizations: neo-institutional theory, organizational (population) ecology, and resource dependence (Pfeffer & Salancik, 2003; Wry, Cobb, & Aldrich, 2013).

Although resource dependency represents the overarching framework for this study, other theories such as punctuated equilibrium theory (Li, 2016), revenue theory of costs (Bowen & Carnegie Council on Polic, my Studies in Higher Education, 1980), and academic capitalism (Slaughter & Leslie, 1997) have supported analysis of higher education finance. Davis and Cobb (2010) argue, “Of all these paradigms, resource dependence theory is perhaps the most comprehensive in the scope of its approach to organizations, combining an account of power within organizations with a theory of how organizations seek to manage their environments” (p. 3). Recent scholarly work by Wry et al. (2013), suggests the value of a resource dependence perspective, “Although External Control is remembered primarily for its insights about power and dependence, its most distinctive contribution was arguably to theorize environmental complexity in an empirically tractable way” (p. 476). Finally, the continued applicability of resource dependence is summarized by Fowles (2014) as follows:

Resource dependency theory, developed upon the foundations of open systems theory, provides an alternative framework to understand organizational behavior that focuses not
on the internal dynamics of the organization, but instead on the organization’s external environment with a specific focus on the providers of resources upon which the organization depends for survival. (p. 276)

Pfeffer and Salancik (1978) are recognized as having developed resource dependence theory in their classic work on this subject. The central thesis espoused is the notion that to understand the behavior of an organization you must first understand the ecology or context of that behavior. While uncertainty related to decentralized decision-making is important, resource dependence suggests that the environment, or its context, is equally important.

Resource dependency suggests less focus on internal dynamics and more focus on external factors. Although organizations are constrained by their situations and environments, proactive planning and implementation allows for strategic management of their resource dependence. Regarding the impact of social forces, Pfeffer points out that the emphasis on power as opposed to economic efficiency distinguishes resource dependence from transactional cost theory (Pfeffer & Salancik, 2003). He further explains that power was critical to understanding organizations and suggests a shift away from traditional organizational theories that consider rationality, cost and productivity exclusively.

Similarly, Pfeffer and Salancik (2003) note that, “the events of 2001 and 2002 in corporate America speak to the relevance of resource dependence ideas and the importance of social relations even in, or perhaps particularly in, a world dominated by financial markets” (p. xxi). The implications on higher education are profound, as evidenced in the financial market collapse of 2008, which included failures in educational bond portfolios occurring throughout public and private higher education institutions.
A key theoretical resource dependence position advanced by Pfeffer and Salancik (1978) that clearly applies to public higher education is the notion that organizations are not self-governing, autonomous actors. The practical reality is that governmental appropriation and tuition decisions are generally outside of the institutions control and therefore highly resource dependent. It is also evident that we need new scholarly champions. As Pfeffer and Salancik (2003) note, “there is a limited amount of empirical work explicitly extending and testing resource dependence theory and its central tenets” (p. xvi). As American institutions of higher education attempt to manage uncertainty and deal with external control variables, resource dependence continues to provide a solid framework for organizational understanding.

Within the frameworks outlined related to the economics of higher education and resource dependency, I will now review the scholarly literature related to state appropriation, tuition, and political influence.

**State Appropriations**

State budget shortfalls have negatively impacted public colleges and universities in the United States since the 1980s (Okunade, 2004). In fact, Webber (2017) reports that “the average four-year public university has seen its per-student state/local funding drop more than 30% over the past 30 years” (p. 1). Despite this precipitous drop in state appropriations, Archibald and Feldman (2006) argue that, “Government subsidization of public higher education is primarily a function of the state” (p. 618). State funding for higher education is dynamic and has generally followed an appropriation methodology that Hovey (1999) calls a balance wheel. Hovey (1999) notes that in good state revenue environments, higher education enjoys favorable funding in comparison to other state agencies, but in periods of economic downturn, higher education receives a disproportionate reduction. A recent study by Delaney and Doyle (2011)
examined the balance wheel theory over time and argued the continued applicability in the
twenty-first century and noted that the volatility of annual state appropriation and the difficulty
of senior leadership to perform long range strategic planning has become apparent and limiting
to institutional leaders.

Policymakers who influence higher education funding are motivated to increase college
degree completion, retain in-state students and provide economic stimulus in the regions they
serve (Toutkoushian & Hillman, 2012). As states grapple with competing priorities for
diminishing state revenues, higher education funding has not returned to the levels that were in
existence prior to the recession of 2008, creating continued pressure on institutional leaders to
increase tuition and seek additional extramural funding. Toutkoushian (2003) suggests that
prospects for increased state appropriations to meet demand for higher education are poor. The
legislative response to escalating tuition in 40 states have included proposals to freeze, reduce, or
stabilize rising tuition and fees and to create a public discourse about appropriations for higher
significant decrease in state general appropriation levels resulting from guaranteed tuition laws
and suggest that these laws may not be advisable public policy.

Leslie and Ramey (1986) note that a number of factors impact state appropriation
including the political environment, incremental budgeting, state revenue shortfalls, and
enrollment growth. The authors make clear the multiple factors that influence state appropriation
and support the notion that growth is not the magic panacea for continued state funding growth
and that political forces may in fact have more impact on funding.

More recently, Okunade (2004) studied factors influencing state appropriation in the
United States applying a competing-interests theory to a statistical model of the determinants of
state appropriations for four-year public colleges and universities. Budget shortfalls that began in the 1980s have continued since and were the basis for this research. The study attempts to identify the strongest determinant of annual state general appropriations and the competing factors for state appropriations. The results of the study indicated statistical significance in areas related to student financial aid, tuition and fee policy, enrollment, state-level indebtedness, Medicare expenditures, prison spending, political dynamics, and regional influences. The evidence suggests that annual state indebtedness and the required interest and principal payments are the strongest determinant of state appropriation (Okunade, 2004).

Additionally, Ness, and Tandberg (2013) explored the determinants of state spending on higher education and focused on how capital project funding differs from general fund appropriations. While considerable research has been performed on general state appropriation, very little research exists related to capital expenditures. The results of their quantitative analysis suggest that political characteristics have a major impact on both general appropriation, and perhaps an even greater influence on capital expenditures funded by the state (Ness & Tandberg, 2013).

Also impacting state appropriations is a little researched phenomenon related to taxpayer revolts that began in the 1970s and represented an extreme distaste for what taxpayers considered out of control tax and spend legislative affairs (Archibald & Feldman, 2006). The authors point out that individuals who did not trust legislatures started the anti-tax movement. The most prominent legal development is laws passed that supported tax and expenditure limitations (TEL) which serve to limit the growth of state revenue and/or expenditures based on some independent index. Additionally, in many states supermajority requirements (SMRs) were implemented which typically required two-thirds majority for a legislature to approve tax increases. The
authors were motivated by three levels of generality that includes whether institutions actually affect policy outcomes and more specifically whether the particular institutions spawned by the tax revolt affect policy. The third generality was intended to measure the extent that tax revolt institutions had a meaningful effect on higher education pursuits in particular. The finding of a quantitative analysis revealed that measures such as TELs and SMRs can have a very influential effect on funding (Archibald & Feldman, 2006). I will now review the scholarly literature around public higher education tuition.

**Tuition**

Since the later part of the twentieth century, tuition increases have been a source of great consternation in America. Hearn, Griswold, and Marine (1996) state that, “No recent trend in higher education has been more visible, or more controversial, than the ongoing increases in the costs of college attendance” (p. 241). Public colleges and universities reliance on state appropriations have steadily declined over the past two decades and tuition and fees have emerged as the most viable alternative to replace lost funding. Kelchen (2016) notes the emergence of student fees, separate from tuition, being used in a non-traditional application that supports instruction instead of student programs. Nationally, states that were the hardest hit by the recession of 2008 reduced their state appropriation to higher education and also saw the largest percentage increase in tuition (Johnson, 2014). Rising tuition cost and the question of educational value represent a significant risk factor for American higher education. Campbell (2015) states that, “the public discourse on higher education has been filled with explosive concerns about the high costs, limited learning gains, and quality of higher education in the United States today” (p. 527). The author further describes the “frenzy” or explosion of studies aimed at assessment of higher educational quality (p. 528). Mumper and Freeman (2005) argue
that, “For nearly three decades, tuition inflation has been the subject of continuing family concerns, student anxiety, gubernatorial proclamations, and congressional investigations” (p. 307). In his comparative analysis of the cost and value of higher education, Thelin (2015) accurately refutes the nostalgic notion of the sustainability of a continuing model of low tuition cost and indefinite state subsidies as untenable, both a century ago and today.

An examination of state measures such as tuition caps, curbs, freezels, institutional incentives and financial aid policy were explored by Kim and Ko (2015). The research questions that guided this study were formed to explore state tuition control policies targeted at minimizing tuition increases are effective and to identify which policies would be more effective in accomplishing this goal. The study period was from 2003 to 2006, a time of rapidly escalating tuition increases and decreased state funding. Their findings revealed that linking tuition to financial aid, and the provision of institutional incentives tied to limited tuition increases, have had some success in controlling tuition. Additionally, the study revealed that tuition is more likely to increase when the primary authority for tuition setting is located at the institutions as opposed to the legislature or a governing body. Kim and Ko (2015) identity the competing demands of institutional progress and governments desire to keep college affordable and highlight the importance of state influence in price setting while also noting the impact of increased financial aid funding demands associated with a high tuition, high aid environment.

This quantitative statistical analysis describes what the authors call a principal and agent model that highlights the scenario of a moral hazard occurring in a public university (agent) having an organizational self-interest that differs from the goals of the state (principal) (Kim & Ko, 2015).

Guaranteed tuition policies emerged as a tuition control strategy that has received national attention in the last decade. The impacts of these measures and their potential impact on
state appropriations have yielded surprising results. For example, Delaney and Kearney (2015) added to the limited body of research on guaranteed tuition and found that legislative pressure on controlling tuition increases initially had a positive effect, with widespread adoption of guaranteed programs in 44 states by 2011. Predictability in pricing for students and families was cited as the impetus for these programs; however, the actual benefits to students are debatable when evaluated in the rubric of student retention, progression and graduation. Findings revealed by Delaney and Kearney (2015) show a significant decrease in state general appropriation following implementation of a guaranteed tuition law. In Illinois, the results showed an approximate 20% decrease in state general appropriation as compared to 2004 levels.

Tuition discounting as a tool for revenue generation, a long standing strategy for private colleges, developed into an important revenue generation tool for many state public institutions during the latter part of the twentieth century (Baum & Ma, 2010). Tuition discounting, the practice of awarding institutionally-funded financial aid in the form of grants and scholarships, can generate additional revenue for public institutions, but is only sustainable at an approximate 13% tuition discount rate (Hillman, 2012).

Mumper and Freeman (2005) examine the causes and consequences of public college inflation. Their review looked at 25 year trends in public college prices and concluded that the real price of attendance had an unmistakable upward trend that suggested that there were multiple reason for the increases but no clear conclusion as to the primary driver. Hauptman and Merisotis (1990) suggest that there is no overarching explanation for tuition price increases.

Researchers have used various methodologies for measuring associations around tuition and state appropriations. For example, Hinrichs (2017) found a negative association between tuition and state appropriations by measuring trends in inflation adjusted revenues per-student
across five major revenue categories: tuition, federal appropriations (with grants and contracts), state and local appropriations, private gifts and investment returns. Doyle (2012) utilized three dependent variables in his examination of the politics of tuition and state financial aid that included: state tax appropriations on an inflation adjusted per-student basis, tuition and fees per student adjusted for inflation, and finally the total amount of inflation adjusted state student financial aid per-student. Mumper and Freeman (2005) studied the causes and consequences of public college tuition inflation by measuring average tuition and fees in constant (inflation adjusted) dollars and measured state appropriations as a percent of $1,000 in personal income. Kelchen (2016), in his analysis of tuition and student fees, adjusted for inflation and additionally added three measures of selectivity: ACT/SAT scores, the percent applicants selected and the yield rate of accepted students that actually enrolled.

In the next section, I will examine the literature studying the impacts of political influence on state appropriation and tuition pricing.

**Political Influence**

Doyle (2012) examined the politics of public college tuition and state financial aid policy and asked the question, “to what extent do state policy makers’ preferences affect levels of tuition and financial aid in the states?” (p. 617). Doyle’s work provided substantial evidence that the ideological positions of state policy makers affect tuition levels, and perhaps surprisingly that private institutions play a role in the political process that impacts tuition setting and financial aid (Doyle, 2012). Finally, Doyle (2012) provides empirical evidence for his argument that, “the process of setting tuition and financial aid in the 50 states is at its heart a political process” (p. 623).
The impact of system-level political influence was studied by McLendon et al. (2009) over a 20 year period from 1984 to 2004 to determine what system-level political characteristics impacted state postsecondary funding concluding that, “our research indicates that certain attributes of state political systems and institutions affect government spending on higher education in statistically significant ways” (p. 705). The independent variables examined include republican legislative and gubernatorial control, legislative professionalism, term limits, gubernatorial strength, citizen ideology, and higher education interest groups. Specifically, McLendon et al. (2009) assert that strong empirical evidence concludes, “independent of other factors, partisanship, legislative professionalism, term limits, interest groups, and gubernatorial power influence appropriations levels” (p. 705). With declines in state revenues, escalating costs in competing priorities such as health care and prison systems, Cheslock and Gianneschi (2008) argue that “state legislators more and more often find themselves in the unenviable position of debating the relative essentiality of state services, including postsecondary education” (p. 208).

As demonstrated in this literature review, political influence and the politics of higher education funding are complex and unavoidable considerations in public higher education. Toutkoushian (2001) acknowledges that institutions are becoming more reliant on student revenues, both in the public and private sector. Dar (2012) recently noted:

that the complexity of the higher education sector, as a provider of both public and private goods, funded by public and private sources, and often presenting barriers to entry based on academic merit or socioeconomic status, is a source of instability in political coalitions and produces ideologically inconsistent combinations of policy preferences (p. 787).

I next turn to the data and methods proposed in this study.
CHAPTER 3
DATA AND METHODS

This chapter will identify the data used in this study, the dependent and independent variables being examined, the methodology being used, and the resulting descriptive statistics, correlations, and models.

Data

The data for this study was obtained from the Integrated Postsecondary Education Data System, IPEDS Analytics: Delta Cost Project Database 1987-2013 for all fifty states. The Delta Cost IPEDS Database is a longitudinal database containing institutional data related to postsecondary finance. I selected variables related to tuition, state appropriations, enrollments, classifications, and regions to inform this study. The Delta database is a comprehensive source of data on postsecondary institutions as reported through required annual IPEDS institutional surveys and is appropriate for this research. In fact, Thelin (2014) notes that the Delta Cost Project of the American Institutes for Research contributed multiple reports, in addition to the comprehensive database, that were central to policy deliberations at the state and national level during the twenty-first century.

Toutkoushian and Hillman (2012) note three advantages of using panel datasets that include the use of a panel datasets to allow for simultaneous examination and control for time-series and cross-sectional changes in the variables being examined, the use of panel data to substantially increase the sample size to minimize the effect of having too few degrees of freedom, and finally to control for unobservable state characteristics, by holding those constant.
over the sample period. It should be noted that although I am using a panel dataset, I am not using statistical methods related to fixed and random effects. Additionally, my analysis does not control for time-series trends or unobservable institutional characteristics.

This study included only four-year public institutions and excluded private institutions and two-year public institutions because of their systematically different funding paradigms. The variables examined from the Delta Cost Project included tuition, state appropriations, full-time equivalent enrollment, Carnegie classifications, and regional census data. Select variables (see Appendix) are expressed in relation to full-time equivalent students and adjusted for inflation using the Consumer Price Index to convert to 2013 dollars.

Stata/IC 14.2 for Mac was the primary tool used in this quantitative analysis.

**Dependent Variable**

In this study I examined gross total revenue from tuition and fees, including student aid, as the dependent variable. In addition to simply examining total tuition and fees in relationship to the independent variables, tuition expressed in ratio to full-time equivalent, adjusted for inflation, and as a percent of total revenue were examined to determine if the positive or negative associations changed based on how the dependent and independent variables were measured.

**Independent Variables**

The independent variables examined were state appropriations, full-time equivalent student count, Carnegie classifications, and census by region. The variable of primary interest is state appropriations, the additional variables related to full-time equivalent student count, Carnegie classification, and region were selected to help inform the analysis by determining the relationship of each with tuition. The independent variables were selected because of their expected influence on tuition and fees. As noted in the literature review, state appropriations
impact tuition and fee levels through subsidies that serve to lower in-state tuition rates and through state financial aid directed at students. As shown in Table 3, Carnegie classification (representative of general university classifications) impact pricing as evidenced by doctoral institutions having the highest levels of tuition and fees with pricing moving proportionally downward in each lower classification. Table 4 shows that tuition and fee levels vary by region, with the Northeast being the highest. The number of prestigious, both public and private, schools in the Northeast are thought to impact higher tuition levels in this region.

Additionally, the independent variables were expressed as state appropriations (state03new), tuition expressed as fte or full-time equivalent (tuitfte), state appropriations expressed as fte (statefte), tuition express in fte and adjusted for inflation (tuitfteadj), state appropriations adjusted per fte and for inflation (statefteadj), tuition expressed as a percentage of total revenue (tuitpct), state appropriations expressed as a percentage of total revenue (statepct), full-time equivalent count (fte_count), Carnegie institutional classifications for doctoral (carndoc), masters (carnmast), bachelors (carnbach), and finally geographic locations (northeast), (south), (midwest) and (west).

**Descriptive Statistics**

Table 2 provides the descriptive statistics of the data contained in this panel data set. Each variable contained approximately 10,500 observations and 434 unique public institutions. The dependent variable used in this study is total revenue from tuition and fees. The other variables included state appropriations, student count, Carnegie classification, and region. The means for aggregate tuition and fees and aggregate state appropriations were $5,236 and $6,227 respectively. Additionally, the tuition percentage, a ratio of tuition revenue divided by total revenue (tuitpct) is .280 while the state appropriation percentage (statepct) is .387. While this
percentage is representative of a 26-year average, this relationship is changing as recorded by Hinrichs (2017) who reports tuition revenue percentage as nearly equal to revenues for state and local appropriations by 2013.

Table 2
Descriptive Statistics (tuition and state appropriation in thousands)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition</td>
<td>$52,361.24</td>
<td>$82,857.38</td>
<td>$49.13</td>
<td>$1,174,564.00</td>
</tr>
<tr>
<td>State App.</td>
<td>$62,274.74</td>
<td>$81,089.00</td>
<td>$1.21</td>
<td>$702,289.00</td>
</tr>
<tr>
<td>Tuition/Student</td>
<td>$4,662.50</td>
<td>$3,151.08</td>
<td>$182.49</td>
<td>$28,363.35</td>
</tr>
<tr>
<td>St. App./Student</td>
<td>$6,018.08</td>
<td>$2,941.49</td>
<td>$0.20</td>
<td>$30,750.82</td>
</tr>
<tr>
<td>Tuition/Student*</td>
<td>$5,892.60</td>
<td>$3,100.59</td>
<td>$348.34</td>
<td>$28,363.35</td>
</tr>
<tr>
<td>St. App./Student*</td>
<td>$8,246.48</td>
<td>$3,907.20</td>
<td>$0.30</td>
<td>$41,235.77</td>
</tr>
<tr>
<td>Tuition - % Tot. Rev.</td>
<td>28%</td>
<td>12%</td>
<td>2%</td>
<td>87%</td>
</tr>
<tr>
<td>State App. - % Tot. Rev</td>
<td>39%</td>
<td>12%</td>
<td>0%</td>
<td>93%</td>
</tr>
<tr>
<td>FTE Enrollment</td>
<td>9,308</td>
<td>8,125</td>
<td>288</td>
<td>48,072</td>
</tr>
<tr>
<td>Carnegie Doctoral</td>
<td>28%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carnegie Masters</td>
<td>57%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carnegie Bachelors</td>
<td>15%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast Region</td>
<td>17%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>South Region</td>
<td>43%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Region</td>
<td>18%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midwest Region</td>
<td>22%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Adjusted for Inflation


Carnegie classifications in Table 2 show that 28 percent of public universities are doctoral granting, 57 percent are masters granting, and 10 percent baccalaureate granting institutions. Additionally, 15 percent of public schools being examined are located in the Northeast, 23 percent in the Midwest, 43 percent are located in the South, and 17 percent are located in the West.
Figures 2, 3, 4, and 5 graphically represent the values for tuition and state appropriations over time and shows the difference in each variable based on how the four selected values are measured: total dollars, per student, adjusted for inflation, and as percent of total revenue, respectively. The graphs are similar in all models in that tuition has generally increased every year in the study period. Figure 2 shows a steep increase in tuition beginning in the mid 2000’s and a significant decline in state appropriations beginning in 2008 as the Great Recession began. While state appropriations remained relatively stable with modest increases until 2008, Figures 4 and 5 shows that state appropriations per FTE as a percentage of total revenue has generally declined during the entire period under study. It is worth noting that, excluding two-year and private colleges, tuition revenue exceeded state appropriations soon after the Great Recession of 2008.
Figure 2. Total Tuition and Total State Appropriations
Figure 3. Tuition and State Appropriations Adjusted for Inflation
Source: Integrated Postsecondary Education Data System, IPEDS Analytics: Delta Cost Project Database 1987-2013 for all fifty states
Figure 4. Tuition and State Appropriations per FTE
Figure 5. Tuition and State Appropriations as a Percent of Total Revenue
Table 3 shows the numbers of institutions sorted by type and programmatic offering. It is noted that the higher the Carnegie classification ranking, the higher the average tuition. Average tuition at Doctoral institutions is 47.3% higher than baccalaureate institutions. These averages speak to the significant funding differentials across institution types. It is not surprising that many institutions seek higher classification levels due in part to the critical need for additional funding.

Table 3
*Average Four-year Public Tuition (1987 – 2013) by Carnegie Classification*

<table>
<thead>
<tr>
<th>Total</th>
<th>Average Tuition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor's Institutions</td>
<td>66</td>
</tr>
<tr>
<td>Master’s Institutions</td>
<td>245</td>
</tr>
<tr>
<td>Research Doctoral Institutions</td>
<td>123</td>
</tr>
<tr>
<td>Grand Total</td>
<td>434</td>
</tr>
</tbody>
</table>

Source: Integrated Postsecondary Education Data System, IPEDS Analytics: Delta Cost Project Database 1987-2013 for all fifty states, excluding associate and other degree granting institutions, averaged and adjusted for inflation.

Table 4 shows the numbers of institutions sorted by region within the United States. It is worth noting that the highest average tuition occurs in the Northeastern region and is 23.5% higher than the South. Higher average tuition in the Northeast is not surprising considering the historic development of higher education in America in this geographic area of the country and the co-location of prestigious private institutions influencing higher tuition pricing.
Table 4

*Average Four-year Public Tuition (1987 – 2013) by Region*

<table>
<thead>
<tr>
<th>Region</th>
<th>Total</th>
<th>Average Tuition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midwest</td>
<td>96</td>
<td>$6,019</td>
</tr>
<tr>
<td>Northeast</td>
<td>74</td>
<td>$6,840</td>
</tr>
<tr>
<td>South</td>
<td>185</td>
<td>$5,539</td>
</tr>
<tr>
<td>West</td>
<td>79</td>
<td>$5,758</td>
</tr>
<tr>
<td>Grand Total</td>
<td>434</td>
<td>$5,893</td>
</tr>
</tbody>
</table>

Source: Integrated Postsecondary Education Data System, IPEDS Analytics: Delta Cost Project Database 1987-2013 for all fifty states, excluding associate and other degree granting institutions, averaged and adjusted for inflation.

**Correlations**

Table 5 contains the correlations associated with the variables chosen for examination. Correlation coefficients represent a foundational statistic in examining how variables are related to each other. Examining the direction of the correlation (either positive or negative) provides a level of predictability and is important in this study. It is important to note that the correlation values simply mean that the outcomes move in the same or opposite directions, and while informative, are not meant to impute causation (Urdan, 2017).

Variables for state appropriations (state03 new), tuition per student (tuitfte), state appropriations per student (statefte), tuition per student adjusted for inflation (tuitfteadj), state appropriations per student adjusted for inflation (statefteadj), and tuition as a percent of total revenue (tuitpct) are positively (variables move in the same, positive direction) associated with tuition (tuition03new). The independent variable for state appropriation as a percent of total revenue (statepct) moves in the opposite direction of gross tuition and fees (tuition03new) and is negatively correlated. While one might expect a strong association between tuition and state appropriation, a strong positive correlation is surprising since state appropriations are provided,
at least in part, by the legislature to control, limit or reduce tuition rates (Toutkoushian & Hillman, 2012). It is important to note that the correlations between tuition and state appropriations change when the variables are measured differently. As shown in Table 5, when adjusted for both number of students and for inflation, or when expressed as shares of total revenue, the correlations change from positive to negative. Regression modeling will be performed to further inform the association of state funding on tuition pricing and should align with this correlation analysis.
Table 5
Correlations for Tuition in Relationship to State Appropriation, Student Count and Percent of Total Revenue, 1987-2013

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition</td>
<td>1.00</td>
<td>0.71</td>
<td>0.72</td>
<td>0.25</td>
<td>0.73</td>
<td>0.09</td>
<td>0.16</td>
<td>-0.50</td>
</tr>
<tr>
<td>State App.</td>
<td>0.71</td>
<td>1.00</td>
<td>0.34</td>
<td>0.58</td>
<td>0.37</td>
<td>0.51</td>
<td>-0.23</td>
<td>-0.22</td>
</tr>
<tr>
<td>Tuition / Student</td>
<td>0.72</td>
<td>0.34</td>
<td>1.00</td>
<td>0.24</td>
<td>1.00</td>
<td>0.89</td>
<td>-0.06</td>
<td>-0.67</td>
</tr>
<tr>
<td>State App. / Student</td>
<td>0.25</td>
<td>0.58</td>
<td>0.24</td>
<td>1.00</td>
<td>0.97</td>
<td>0.40</td>
<td>0.51</td>
<td>0.12</td>
</tr>
<tr>
<td>Tuition / Student*</td>
<td>0.73</td>
<td>0.37</td>
<td>0.97</td>
<td>0.24</td>
<td>1.00</td>
<td>0.89</td>
<td>-0.01</td>
<td>-0.62</td>
</tr>
<tr>
<td>State App. / Student*</td>
<td>0.09</td>
<td>0.51</td>
<td>-0.06</td>
<td>0.89</td>
<td>-0.01</td>
<td>1.00</td>
<td>-0.62</td>
<td>1.00</td>
</tr>
<tr>
<td>Tuition - % of Tot. Rev.</td>
<td>0.16</td>
<td>-0.23</td>
<td>0.56</td>
<td>-0.40</td>
<td>0.51</td>
<td>-0.62</td>
<td>1.00</td>
<td>-0.45</td>
</tr>
<tr>
<td>State App. - % of Tot. Rev.</td>
<td>-0.50</td>
<td>-0.22</td>
<td>-0.67</td>
<td>0.12</td>
<td>-0.69</td>
<td>0.32</td>
<td>-0.45</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*Adjusted for Inflation

Source: Integrated Postsecondary Education Data System, IPEDS Analytics: Delta Cost Project Database 1987-2013 for all fifty states, averaged and adjusted for inflation.
Research Methods

This quantitative research design utilized a pooled regression ordinary least squares estimation. Through a panel data time-series analysis I examined the association between tuition and state appropriations to determine how the association for tuition regressed against state appropriations can differ based on how the tuition and state appropriation variable is presented. The time period for this study will be 26 years. Toutkoushian (2001) affirms that the use of a panel data approach allows for a significant increase in sample size thereby reducing standard errors and can allow for more complete model specifications and analysis. Multiple regression is an appropriate design methodology that enables expanded analytic capacity beyond two-variable linear regression and allows for the examination of associations among several predictor (independent) variables and a dependent variable (Urdan, 2017).

A typical regression model contains the following equation:

\[ \hat{y} = b_0 + b_1x_1 + b_2x_2 + \ldots + b_px_p + \epsilon_i \]

where \( \hat{y} \) is the predicted variable of the dependent variable, \( b_0 \) is the y axis intercept, \( b_1, \ldots b_p \) are estimated parameters or regression coefficients corresponding to the independent (predictor) values \( x_1, \ldots, x_p \), and \( \epsilon_i \) is the random error term for the \( i \)-th observation (Peng, So, Stage, & St. John, 2002).

In this study, I will examine the association of tuition levels (dependent variable) with my primary independent (or predictor) variable of interest - state appropriations, to determine if the coefficient changes, either in a positive or negative association, based on the how the dependent variable for tuition is cast. Additionally, independent variables associated with enrollment level, Carnegie classification, and geographic region are included to further inform the study.
This study will utilize multiple regression models to examine the dependent variable in four ways: total tuition, tuition per student, tuition per student adjusted for inflation, and tuition revenue as a percentage of total revenue. The equations to support these models are as follows:

Model 1:
\[
tuition03new = \alpha + b_0 \text{State03new} + b_1 \text{Fte\_count} + b_2 \text{Carndoc} + b_3 \text{Carnmast} + b_4 \text{Carnbach} + b_5 \text{Northeast} + b_6 \text{South} + b_7 \text{West} + \varepsilon_i
\]

Model 2:
\[
\text{Tuitfte} = \alpha + b_0 \text{State03new/fte} + b_1 \text{Fte\_count} + b_2 \text{Carndoc} + b_3 \text{Carnmast} + b_4 \text{Carnbach} + b_5 \text{Northeast} + b_6 \text{South} + b_7 \text{West} + \varepsilon_i
\]

Model 3:
\[
\text{tuitfteadj} = \alpha + b_0 \text{State03new/fte/adj} + b_1 \text{Fte\_count} + b_2 \text{Carndoc} + b_3 \text{Carnmast} + b_4 \text{Carnbach} + b_5 \text{Northeast} + b_6 \text{South} + b_7 \text{West} + \varepsilon_i
\]

Model 4:
\[
\text{tuitpct} = \alpha + b_0 \text{State03new/pct} + b_1 \text{Fte\_count} + b_2 \text{Carndoc} + b_3 \text{Carnmast} + b_4 \text{Carnbach} + b_5 \text{Northeast} + b_6 \text{South} + b_7 \text{West} + \varepsilon_i
\]

Of particular interest is the relationship between tuition revenue and state appropriations. I would expect this relationship to show a negative association. Hinrichs (2017) observes that revenue from state and local sources was three times the level of tuition for public institutions in 1987, but by 2013 nearly equal in some cases. This suggests a negative relationship between tuition revenue and state appropriations. According to Toutkoushian and Hillman (2012), “the in-state tuition rates at public institutions are, almost by definition, negatively correlated with the level of state appropriations, as legislatures provide funding to public institutions in part to reduce tuition rates for state residents” (p. 65). As outlined in this study, the high degree of
consternation around tuition increases make these correlation assumptions critical to a complete understanding of the relationship between tuition and state appropriations. It would not be uncommon for legislators, governing boards, and other higher education observers to reach an incomplete conclusion if the only variables being considered were empirical data on total tuition and total state appropriations. In the case of legislators and the Governor, it would be easy to assume that universities could cover a decline in state allocation with tuition increases, or to determine that past tuition increases would allow them to reduce the amount of state appropriations with the expectation that tuition would remain steady or increase minimally. It is not an uncommon argument by decision makers that adequate funding already exists because regardless of allocations made to institutions, tuition goes up.

The four models being regressed in Chapter 4 will show that by simply regressing total tuition (Model 1) and total tuition per fte (Model 2) against state appropriations and state appropriations per FTE the results are an unexpected positive association. Models 3 and 4 add additional context, adjusting for inflation (Model 3) and examining tuition as a percentage of total revenue (Model 4), both yielding negative association, as expected. This provides a more comprehensive explanation of the relationship when regressed against state appropriations. Understanding the generally negative relationship between tuition and state appropriations helps dispel, in part, the notion that continuous tuition increases are simply profit motives of institutional leaders.

Assumptions included in this analysis are that the dependent variable is continuous, that the independent variables are uncorrelated with each other and with the error term, that the error term has a mean of zero, constant variance, and finally that the errors are uncorrelated with each other (Toutkoushian, 2005). This analysis will measure select predictor variables and their
association over time with the dependent variable (tuition). Additionally, a goodness-of-fit measurement, specifically $R^2$, will explain how well each independent or predictor variable is associated with variations in tuition. The value of $R^2$ is always between 0 and 1, with $R^2 = 0$ meaning that none of the deviations in tuition are explained by regression model, and $R^2 = 1$ indicating that all of the deviations in the model are explained by the dependent variable (Toutkoushian, 2005).

Next, I will analyze the results of the regression models.
CHAPTER 4

RESULTS

Table 6 contains a summary of four fixed effects models that were developed to regress tuition levels (identified as the dependent variable) against selected independent variables for state appropriations (my primary variable of interest), student enrollments, Carnegie classifications and regional geography to determine if these associations change based on how tuition and state appropriations is expressed. Specifically, tuition is expressed as total tuition, tuition per student, tuition adjusted for inflation, and tuition as a percentage of total revenue. The regressions show that by simply regressing total tuition (Model 1) and total tuition in ratio to full-time equivalent students (Model 2) against state appropriations and other variables shown, result in a positive association between tuition level and state appropriations that was not anticipated. Models 3 and 4 add additional context, adjusting for inflation (Model 3) and examining tuition as a percentage of total revenue (Model 4), both yielding negative associations of tuition levels to state appropriations, as expected, and provided a more comprehensive explanation of the coefficients.

The R-squared estimate is the proportion of variance in the dependent variable, in this case tuition, which can be explained by the independent variables. R-squared measures the overall strength of association and is not particular to any specific independent variable. \( R^2 \) is known as the coefficient of determination for the combined independent (predictor) variables and it provides a percentage of variance explained (Urdan, 2017).
Other statistics contained in the models include the Standard Error which are the standard errors associated with the coefficients. The t-statistic is used to test whether a given coefficient is significantly different from zero.

In addition to state appropriations, I controlled for three additional independent variables: student count, institution type (Carnegie classification), and geographic region because of their anticipated association with tuition. To summarize these explanatory variable associations, Table 6 shows negative associations for student counts, Carnegie doctoral, South region and West region. These negative associations suggest that for every 1% decrease in state appropriations, the specified percentage increase (shown in Table 6) in tuition is predicted. Additionally, the regression results revealed a positive association for Carnegie masters, Carnegie bachelors and Northeast region. These positive associations suggest that for every 1% increase in state appropriations, the specified percentage decrease (shown in Table 6) in tuition is predicted. Future studies should expand on why the association between doctoral and other Carnegie classifications as well as why different geographic locations result in different associations.

**Model 1**

My primary interest area in these regressions relates to the coefficient calculation, and most particularly the association between tuition levels and state appropriations. The coefficients are the values for the regression equation for predicting the dependent variable from the independent variable. Model 1 shows a positive association of .149 between state appropriations (state03new) and aggregate tuition (tuition03new). This suggests that for every $1,000 increase in state appropriations, a $149 increase in tuition is predicted, holding all other variables constant. This was not an expected outcome. This positive association is influenced by what Johnstone and Marcucci (2010) describe as “natural unit cost increase inflation” (p. 16),
that in normal years postulate that costs exceed the average rate of consumer prices. Considering aggregate tuition levels only as shown in this regression model, one might conclude incorrectly that tuition increases and state appropriations are always positively associated.

R-squared in Model 1 is 0.612. The t-statistic in Model 1 is 11.80. The coefficient for state appropriations (state03new), student counts (fte_count), Carnegie doctoral (carndoc), Carnegie masters (carnmast), northeast region (northeast), south region (south) and west region (west) are significantly different from 0 because their p-value is smaller than 0.05 and statistically significant. The coefficient for Carnegie bachelors (carnbach) and constant (_cons) is not statistically significant at the 0.05 level since the p-value is greater than 0.05.

Model 2

In Model 2 the source, or outcome, variable is tuition expressed in ratio to full-time equivalent students. Model 2 shows a positive association of .169 between state appropriations per student and tuition per student. This suggests that for every $1,000 increase in per student state appropriations per full-time student, a $169 increase in tuition is predicted, holding all other variables constant. This was not an expected outcome. As in Model 1, considering aggregate tuition levels only could lead a legislator or governing board member to conclude incorrectly that tuition increases and state appropriations are always positively correlated.

R-squared in Model 2 is 0.177. The t-statistic is 16.32. The coefficient for state appropriations (state03new), student counts (fte_count), Carnegie doctoral (carndoc), Carnegie masters (carnmast), northeast region (northeast), south region (south), west region (west) and constant (_cons) are significantly different from 0 because their p-value is smaller than 0.05 and statistically significant. The coefficient for Carnegie bachelors (carnbach) is not statistically significant at the 0.05 level since the p-value is greater than 0.05.
Model 3

In Model 3, the source, or outcome variable is tuition expressed in ratio to full-time equivalent students and adjusted for inflation. Model 3 shows a negative association of -.128 between inflation adjusted state appropriations per full-time student and inflation adjusted tuition per full-time student. This suggests that for every $1,000 decrease in inflation adjusted per student state appropriation, a $128 increase in inflation adjusted tuition per full-time student is predicted, holding all other variables constant. This conforms to what was expected regarding a negative association between state appropriations and tuition levels (Toutkoushian & Hillman, 2012).

R-squared in Model 3 is 0.234. The t-statistic for Model 3 is negative 17.18. The coefficient for state appropriations (state03new), student counts (fte_count), Carnegie masters (carnmast), Carnegie bachelors (carnbach), northeast region (northeast), south region (south), west region (west) and constant (_cons) are significantly different from 0 because their p-value is smaller than 0.05 and statistically significant. The coefficient for Carnegie doctoral (carndoc) is not statistically significant at the 0.05 level since the p-value is greater than 0.05.

Model 4

In Model 4, both tuition and state appropriations are expressed as a percentage of total revenue resulting in a negative association of -.494. This suggests that for every 1% decrease in state appropriations, a .494% increase in tuition is predicted, holding all other variables constant. This conforms to what was expected regarding a negative association between total tuition levels and total revenues.

R-squared in Model 4 is 0.34. The t-statistic for Model 4 is negative 61.18. The coefficient for state appropriations (state03new), Carnegie doctoral (carndoc), Carnegie masters
(carnmast), Carnegie bachelors (carnbach), northeast region (northeast), south region (south) and west region (west) and constant (_cons) are significantly different from 0 because their p-value is smaller than 0.05 and statistically significant. The coefficient for student counts (fte_count) is not statistically significant at the 0.05 level since the p-value is greater than 0.05.

It is interesting to note the substantial difference in the calculated regression coefficients and the R-Squared values in Model 1 compared to Models 2, 3 and 4. The primary reason behind the relatively large 0.612 R-Squared value in Model 1 compared to 0.177, 0.236 and 0.337 for Models 2, 3 and 4 respectively relates to issues associated with scale measurement. Historical trends in total revenue and expense show that costs increase over time. Without considering any scale adjustments, if one assumes that tuition revenue and state appropriations increase in total over time, then a positive association would not be surprising. However, if researchers only considered Model 1, an incomplete understanding of the association between tuition and state appropriations would occur. Simply listing aggregate totals not adjusted for inflation or by the number of students greatly reduces the utility of the Model 1 results in this study.

Models 2, 3 and 4 have R-Squared values and associations that are more representative of the proportion of the variance of the dependent variable (tuition, as measured) which can be explained by the independent variables (state appropriations, Carnegie classifications and geographic region, as measured). Adjusting the variables for inflation and per-student addresses scale measurement issues and provides (in the case of Models 3 and 4) expected negative associations.
### Table 6
**Fixed Effects Models Explaining Association of Tuition with Selected Variables for Public Four-Year Universities**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total Tuition</td>
<td>Tuition per Student</td>
<td>Tuition per Student Adjusted for Inflation</td>
<td>Tuition as percent of Total Revenue</td>
</tr>
<tr>
<td><strong>Student Counts</strong></td>
<td>6.937***</td>
<td>0.132***</td>
<td>0.133***</td>
<td>-0.000000128</td>
</tr>
<tr>
<td></td>
<td>(52.04)</td>
<td>(28.40)</td>
<td>(30.25)</td>
<td></td>
</tr>
<tr>
<td><strong>Carnegie Doctoral</strong></td>
<td>-16716.0***</td>
<td>-507.7**</td>
<td>201.0</td>
<td>-0.0543***</td>
</tr>
<tr>
<td></td>
<td>(-5.90)</td>
<td>(-3.24)</td>
<td>(1.35)</td>
<td>(-10.57)</td>
</tr>
<tr>
<td><strong>Carnegie Masters</strong></td>
<td>-14131.4***</td>
<td>-605.4***</td>
<td>-1181.4***</td>
<td>0.0296***</td>
</tr>
<tr>
<td></td>
<td>(-5.67)</td>
<td>(-4.37)</td>
<td>(-9.00)</td>
<td>(6.56)</td>
</tr>
<tr>
<td><strong>Carnegie Bachelors</strong></td>
<td>-1901.9</td>
<td>-398.6*</td>
<td>-1153.8***</td>
<td>0.0161**</td>
</tr>
<tr>
<td></td>
<td>(-0.66)</td>
<td>(-2.49)</td>
<td>(-7.59)</td>
<td>(3.08)</td>
</tr>
<tr>
<td><strong>Northeast Region</strong></td>
<td>5487.3***</td>
<td>851.6***</td>
<td>1488.5***</td>
<td>0.00779**</td>
</tr>
<tr>
<td></td>
<td>(3.30)</td>
<td>(9.22)</td>
<td>(16.98)</td>
<td>(2.60)</td>
</tr>
<tr>
<td><strong>South Region</strong></td>
<td>-5900.5***</td>
<td>-348.9***</td>
<td>-361.2***</td>
<td>-0.0247***</td>
</tr>
<tr>
<td></td>
<td>(-4.56)</td>
<td>(-4.87)</td>
<td>(-5.31)</td>
<td>(-10.55)</td>
</tr>
<tr>
<td><strong>West Region</strong></td>
<td>-14143.1***</td>
<td>-962.1***</td>
<td>-591.2***</td>
<td>-0.0362***</td>
</tr>
<tr>
<td></td>
<td>(-8.80)</td>
<td>(-10.72)</td>
<td>(-6.91)</td>
<td>(-12.35)</td>
</tr>
<tr>
<td><strong>State Appropriations</strong></td>
<td><strong>0.149</strong>*</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td>(11.80)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>State App. Per Student</strong></td>
<td>-----</td>
<td><strong>0.169</strong>*</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(16.32)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>State App. per Student Adj for Inflation</strong></td>
<td>-----</td>
<td>-----</td>
<td><strong>-0.128</strong>*</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(-17.18)</td>
<td></td>
</tr>
<tr>
<td><strong>State App. as Percent of Total Revenue</strong></td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td><strong>-0.494</strong>*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(-61.18)</td>
</tr>
<tr>
<td><strong>_cons</strong></td>
<td>-4663.5+</td>
<td>3104.2***</td>
<td>6432.0***</td>
<td>0.484***</td>
</tr>
<tr>
<td></td>
<td>(-1.81)</td>
<td>(19.95)</td>
<td>(43.24)</td>
<td>(83.93)</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>10504</td>
<td>10504</td>
<td>10504</td>
<td>10504</td>
</tr>
<tr>
<td><strong>R-Squared</strong></td>
<td>0.612</td>
<td>0.177</td>
<td>0.236</td>
<td>0.337</td>
</tr>
</tbody>
</table>

Standard errors are shown in parentheses
+ p<.10, * p<.05, ** p<.01, *** p<.001
CHAPTER 5
SUMMARY AND CONCLUSION

Overview of the Study

Tensions surrounding tuition pricing, reductions in state appropriations, and the notion of public higher education serving a public good thereby generating positive externalities for our citizenry are at perhaps at an all-time high and being challenged as never before in the history of American public higher education. Thelin (2014) notes the following:

In contrast to the optimism and prosperity that translated into generous funding for higher education after World War II, a theme at the start of the twenty-first century was that colleges and universities faced a bleak future in terms of public support from state governments and taxpayers. (p. 318)

A primary objective of this study is to understand the relationship between tuition pricing and state appropriations. Appropriately interpreting the statistics surrounding these variables is fundamental in understanding, in part, what has happened to revenue streams associated with American public higher education. The research questions and hypothesis being examined included:

Research Questions

1. What is the relationship between tuition and state appropriations?

2. Can the calculated association results related to coefficients for state appropriations and tuition increases be different based on how the variables are expressed?
Hypothesis

The association between tuition (dependent variable) and state appropriations (independent variable) is significant and the association will be different when tuition levels are expressed as total tuition, tuition per student, tuition per student adjusted for inflation, tuition revenue as a percentage of total revenue, and the state appropriations levels are expressed as total state appropriations, state appropriations per student, state appropriations per student adjusted for inflation, and state appropriations as a percentage of total revenue.

This study utilized multiple regression models to examine the dependent variable in four ways: total tuition, tuition per student, tuition per student adjusted for inflation, and tuition revenue as a percentage of total revenue regressed against state appropriations (my primary variable of interest) and other select variables to determine if the association changed based on how tuition was expressed.

Summary of Key Findings

As reported in Chapter 4, Table 6 is a composite table that incorporates the four fixed effects regression models being examined to measure the coefficients of the dependent variable of tuition revenue expressed four different ways: total tuition, tuition expressed in ratio to student counts, tuition adjusted for inflation, and tuition as a percent of total revenue with corresponding expressions for state appropriations: total state appropriations, state appropriations per student, state appropriations per student and adjusted for inflation, and state appropriations as a percent of total revenue. Regression analysis preformed in each of the four models showed that associations between tuition and state appropriation change based on how tuition is expressed. In highlighting the association between tuition and state appropriation, Models 1 regressed total tuition against total state appropriation and Model 2 regressed total
tuition expressed in ratio to student count against state appropriation expressed in ratio to student count. Model 1 and 2 revealed a positive .149 and .169 association, respectively. The positive association was not expected as increases in state funding should result in limited increases or decreased tuition levels. Models 3 and 4 revealed different outcomes. Model 3 regressed tuition per student against state appropriations per student, both adjusted for inflation and resulted in a negative association of .128. Additionally, Model 4 examined tuition revenue as a percentage of total revenue and, similar to Model 3, revealed a negative association of .494. The negative associations contained in Model 3 and Model 4 were as expected. The value for the coefficient of determination, or R-squared, in Model 1 was .612, Model 2 was .177, Model 3 was .236, and finally Model 4 was .337. R-squared represents the percentage of variable variation that is explained by the models.

The variables related to tuition, state appropriations and per student counts examined in this analysis are consistent with other scholarly research as evidenced by Kim and Ko (2015) in their research on the impacts of state control polices on college tuition increase. The authors selected tuition as the dependent variable and utilized four control variables that included change in undergraduate student enrollment, percentage change tuition and fees in core revenues, and percentage change of state/local appropriation in core revenues. Similarly, Kim and Ko (2015) note, “Not surprisingly, the increase in state appropriation proportion in core revenue was negatively associated with tuition amount and proportion increases” (p. 830).

**Implications**

The basic defining values of American public higher education as a public good with low tuition and high levels of state support are at a crossroads. Johnstone and Marcucci (2010) assert that, “governments must continue to recognize the worth of higher education, to the individual
and to society alike” (p. 283). Institutions and governing boards must continually defend the value proposition that is associated with public higher education. Continued increases in tuition beyond the cost of inflation and further declines in state funding to support higher education is not sustainable and calls for continued examination of funding modalities. This study added to the expansive literature on the subject by analyzing the associations of tuition and state appropriations to help facilitate a better understanding of the complexities of higher education funding.

**Limitations and Directions for Further Research**

The results from this study add to the significant body of literature on higher education funding and confirm the hypothesis that the association between tuition and state appropriations is significant and the association between the variables will be different when tuition levels are expressed as total tuition, tuition per student, tuition per student adjusted for inflation, and tuition revenue as a percentage of total revenue. Additional control factors such as costs of instruction and cost by sector will need to be examined and included, as appropriate, to provide more definitive conclusions of the hypothesis regarding state appropriations impact on tuition. Future analysis could test these regressions against fixed or random effects to evaluate those models usefulness in predicting tuition revenue. The calculated R-squared values in each of the models indicate that other factors also have an impact on tuition levels. Future studies could examine other revenue sources contained in the Delta Cost Study, such as federal appropriations, private gifts, grants, and contracts, and endowment earnings to examine their association with tuition revenue.

Additional limitations relate to the samples of institutions included in the study as each have unique characteristics that can relate to mission, size and targeted student population.
Powell, Gilleland, and Pearson (2012) note that large research-intensive doctoral institutions have far different revenue streams and costs when compared to small community colleges. By isolating only four-year public colleges and universities the results of this analysis are only generalizable to this specific population.

Parent-child relationships exist in the IPEDS and Delta Cost Study panel data sets. A parent-child relationship exists when multi-campus institutions and associated branch campus data is reported as part of the main campus. This rolling up of data can bias certain analyses, particularly when different institutional classifications types are reported as one unit. The Delta Cost Project identifies these institutions by using matched-sets for identification and for data parsing as needed for particular studies.

While parent-child relationships can limit some data sets and analysis, Jaquette and Parra (2014) found, “IPEDS is useful for research questions where the dependent variable(s) and independent variable(s) can be reasonably measured at the organizational level” (p. 528). Because my study examined the associations of tuition with selective independent variables for state appropriation, student counts, Carnegie classification and geography in aggregate measurements, the regression results were not biased by the parent-child occurrences in the Delta Cost Project.

Missing data and financial reporting changes are accounted for in the Delta Cost Project IPEDS Database through the use of two different imputation procedures. The first is a yearly regression imputation that is used to replace missing data in eligible variables. Each imputed value is flagged for identification. The second imputation procedure was developed to improve comparability of expenditure data related to financial reporting changes promulgated by financial and governmental accounting boards.
It should be noted that other variables beyond state appropriations, student count, Carnegie classification and region impact tuition revenue. Future studies could examine the impact of out-of-state student preference as opposed in to in-state preference for public institutions because of greater tuition revenue. Additionally, the impacts of financial aid (need-based or merit based), college selectivity and state legislative support are examples of factors that could affect tuition revenue.

In their classic study, Hearn et al. (1996) identified six major themes regarding tuition and student aid policies:

1. Region is the factor most closely connected to state tuition and approaches.
2. Population impacts only the magnitude of student-aid commitments, and not tuition policy.
3. Economically developed states have lower-priced entry points into postsecondary education.
4. The influences of the education resources were mixed within a state.
5. Positive effects for centralized governance arrangements were surprising and merit further study.
6. There is a modest connection between financial aid policies and tuition policies.

While I would expect most, if not all, of the themes identified by Hearn et al. (1996) are relevant in the 21st century, future studies could confirm their continued applicability.

Finally, Doyle (2012) speaks to the balance needed regarding financial aid and tuition pricing, “In all cases, state decisions about the level of funding to provide to higher education and their degree of involvement in process of collecting revenue translate into a direct effect of state policy on tuition and financial aid policy” (p. 619).
Conclusion

To better understand the relationship between tuition and state appropriation it is important to consider measures beyond total tuition and state revenue. Not considering tuition in ratio to full-time student count, adjusted for inflation or as a percentage of total revenue can lead to misinterpretations of the data and faulty conclusions. As shown in the regression models, the initial positive association between tuition and state appropriations, when just considering aggregate revenue, does not provide a full picture of the predictive nature of the relationship. By reflecting tuition in ratio to full-time equivalent, adjusting for inflation, and showing as a percent of total revenue, the associations do change. In fact, when adjusted for inflation, and shown as a percentage total revenue (Models 3 and 4), the association is negative as researchers would expect.

In 2000, former President of the University of Michigan, James Duderstadt commented:

Today one might even conclude that America’s great experiment of building world-class public universities supported primarily by tax dollars has come to an end. It could be that the concept of a world-class, comprehensive state university might not be viable over the longer term. (Duderstadt, 2000, p. 313)

I do not believe public investment in public higher education is coming to end, however the notion of tax dollars as the primary funding source certainly is. Johnstone and Marcucci (2010) note the diverging trajectories of steeply rising costs for higher education and flat or declining trajectories of available public revenues. Issues surrounding tuition pricing and state appropriation levels are complex. As evidenced in this study, casual observations regarding tuition pricing can often be misinformed and add to a narrative of public higher education that is counterproductive and harmful. Higher education leaders in the 21st century must define and
defend an appropriate balance between public tax support, tuition support and other revenue modalities to ensure America’s position as the world leader in public higher education.
REFERENCES


Hovey, H. A. (1999). State spending for higher education in the next decade: The battle to sustain current support. National Center for Public Policy and Higher Education.


https://doi.org/10.2307/1981463


### Variable Definitions

<table>
<thead>
<tr>
<th>Variable from Delta Cost Project</th>
<th>Variable Name</th>
<th>Label</th>
<th>Definition – From IPEDS Glossary and Data Dictionary (unless variable is calculated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>tuition03</td>
<td>Tuition</td>
<td></td>
<td>Total revenue from tuition and fees (including student aid applied to tuition and fees).</td>
</tr>
<tr>
<td>state03</td>
<td>State Appropriations</td>
<td></td>
<td>Revenues received by the institution through acts of a state legislative body (except grants and contracts and capital appropriations). Funds reported in this category are for meeting current operating expenses, not for specific projects or programs.</td>
</tr>
<tr>
<td>fte-count</td>
<td>FTE Count</td>
<td></td>
<td>Total Fall full-time equivalent enrollment</td>
</tr>
<tr>
<td>carnegie2010</td>
<td>Carnegie Classifications</td>
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<td>Carnegie classifications by Sector as of 2010</td>
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<td>census_region</td>
<td>Census by Region</td>
<td></td>
<td>Census, U.S. Census Bureau</td>
</tr>
<tr>
<td>Tuition03new</td>
<td>Tuition</td>
<td></td>
<td>Total revenue from tuition and fees (including student aid applied to tuition and fees).</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Calculation</td>
<td></td>
</tr>
<tr>
<td>----------</td>
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</tr>
<tr>
<td>State03new</td>
<td>State Appropriations</td>
<td>Revenues received by the institution through acts of a state legislative body (except grants and contracts and capital appropriations). Funds reported in this category are for meeting current operating expenses, not for specific projects or programs.</td>
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</tr>
<tr>
<td>Tuitfte</td>
<td>Tuition adjusted per student (FTE)</td>
<td>Calculated</td>
<td></td>
</tr>
<tr>
<td>Statefte</td>
<td>State Appropriation per Student Adjusted (FTE)</td>
<td>Adjusted with Consumer Price Index converted to 2013 dollars.</td>
<td></td>
</tr>
<tr>
<td>Tuitftheadj</td>
<td>Tuition per Student Adjusted for Inflation</td>
<td>Calculated</td>
<td></td>
</tr>
<tr>
<td>Stateftheadj</td>
<td>State Appropriation per Student Adjusted for Inflation</td>
<td>Calculated</td>
<td></td>
</tr>
<tr>
<td>Tuitpct</td>
<td>Tuition as percentage of Total Revenue</td>
<td>Calculated</td>
<td></td>
</tr>
<tr>
<td>Statepct</td>
<td>State Appropriation as a percentage of Total Revenue</td>
<td>Calculated</td>
<td></td>
</tr>
<tr>
<td>Carndoc</td>
<td>Carnegie Doctoral</td>
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<td>Carnbach</td>
<td>Carnegie Bachelors</td>
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<tr>
<td>West</td>
<td>census_region 4</td>
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