



**Determinants of State Appropriations for Higher Education from 1985-2005:  
An Organizational Theory Analysis**

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## **Abstract**

This study employs time series methodology to identify factors that best explain variations in state appropriations for higher education since 1985. Relying on an organizational theory framework, state and institutional level variables are analyzed to understand factors associated with levels of state investment in colleges and universities by Carnegie classification.

## **About the Authors**

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## Introduction

During the past decade, much hand wringing has taken place regarding the future of state support for public higher education. Historically, public colleges and universities have been the responsibility of states, and today, a significant percentage of higher education budgets still come from state appropriations (Thelin, 2004). However, many educational leaders suggest that public institutions are facing a financial crisis. One study conducted by Mortenson (2004), for example, argues that state appropriations for higher education have dropped 40 percent since 1978, and current state investment effort per personal income has declined \$32.1 billion below that of 1980, adjusting for inflation. Many higher education leaders suggest that this slide in support is already bringing about many negative consequences, including rising tuition, tightening enrollments, cuts in financial aid, increased attrition rates, and decline in faculty salaries (Ehrenberg, 2006). Lyall and Sell (2006) have referred to this trend toward disinvestment as the defacto privatization of higher education.

Still, other sources have provided another perspective on the issue, illustrating that state appropriations for higher education have increased almost every year during the last decade and a half (Grapevine, 2007; Heller, 2006). Thelin (2004) has been especially critical of studies that suggest cuts in state appropriations for higher education have been drastic. He argues that the fall in the percentage of budgets contributed by state governments is due, in part, to the growth of other revenue sources. Toutkoushian (2006) brings some clarity to this issue by declaring “it is more correct to say that it is the *relative* state funding for higher education and not the *level* of state funding that has decreased over time” (p. 2). The main issue, he suggests, is that the growth in funding has not kept pace with the rising costs of educating students or the ability of states to fund higher education. Overall, conflicting views on the topic may be explained by a

methodological problem: no unifying metric exists to measure state support for higher education, leaving it open for individuals or groups to use their preferred set of measures to argue their particular point of view (Trostel & Ronca, 2007). Overall, there is little agreement as to how to represent the efforts by states to finance higher education, whether it is total dollars, dollars per pupil, dollars per \$1000 personal income, or inflation-adjusted dollars (R. Toutkoushian, personal communication, November 12, 2007).

Regardless of these competing perspectives, one point seems certain: “State funding of higher education remains one of the most prominent and debated issues confronting U.S. higher education today,” (McLendon, Hearn & Mokher, 2006, pg. 21). And university presidents—past and present—agree that states should always have an important stake in funding public colleges and universities (Wiley, 2006; Johnstone, 2002). It may be for this reason that the issue of state support for higher education has emerged as an important theme in the literature. Recent studies on the topic have examined economic, demographic, governance, and political variables associated with levels of state appropriations for higher education (e.g., Hovey, 1999; Kane, Orzag & Gunter, 2003; Lowry, 2001; Toutkoushian & Hollis, 1998; Rizzo, 2006; Hossler, Lund, Ramin, Westfall, & Irish 1997; Archibald & Feldman, 2006; McLendon, et al, 2006; Tandberg, 2007; Weerts & Ronca, 2006). Still, other studies have investigated the impact of state and federal policies that affect state support for public colleges and universities (e.g., Alexander, 2001; Baldwin, 2006).

While the aforementioned studies have provided scholars with a promising roadmap to understanding factors that explain state support for higher education, we note the existence of two important gaps that call for additional research in this area. First, the majority of studies are anchored in economic and political conceptual frameworks, which limits our theoretical

understandings of this issue. We suggest that future studies investigate this topic through other disciplinary lenses, allowing new perspectives to inform our understanding of this important topic. Second, past studies have typically relied on state-level finance data (i.e., share of higher education budgets) as the primary unit of analysis. Consequently, little is known about how state support for higher education may vary among sectors (research universities, regional comprehensive institutions, community colleges) and even at institutions themselves. The goal of this paper is to address these gaps.

### **Purpose and Research Questions**

The purpose of this study is threefold. First, we examine variables that influence state support for higher education, and specifically, factors that distinguish between strongly and weakly supported public systems of higher education across the United States since 1985. Second, we aim to create a robust conceptual framework based on organizational theory to guide future research in this area. Third, our study identifies a sample of institutions, distinguished by Carnegie classification, that receive higher- or lower-than-expected state appropriations. This contribution is significant because it provides future scholars an avenue to conduct more focused investigations on the economic, demographic, political, and cultural factors that may contribute to strong or weak state support for higher education institutions in a particular state. In so doing, our study provides a platform to launch a qualitative research agenda that complements the growing number of multivariate studies on state support for higher education.

The central research questions guiding this study are: 1) what factors best explain differences in levels of state appropriations for public colleges and universities since 1985; 2) in what ways do levels of support vary among various sectors of higher education (i.e., research

universities, regional comprehensive universities, and community colleges); and 3) what institutions, by Carnegie class, have historically received higher or lower state appropriations than expected?

Our study builds significantly on past research conducted by Weerts (2002) and Weerts and Ronca (2006). However, the present analysis addresses important limitations of these past studies. First, this study considers the research questions through a 20-year time horizon (1985-2005) versus a brief snapshot in time (late 1990s). Second, the current study investigates the issue through multiple sectors of postsecondary education (research universities, comprehensive institutions, and community colleges) instead of research universities exclusively.

### **Literature and Theoretical Framework**

As a discipline, the study of organizations is one of the most vigorous areas in the social sciences, encompassing a number of theories and competing approaches to explain a vast array of organizational phenomena (Scott, 1992). We posit that organizational theory is useful in the context of our study because it provides insight into how state level and institutional level factors influences organizational behavior, individual decision-making and subsequent levels of state appropriations for higher education. Scott (1992) identifies three levels of analysis when studying organizational phenomenon. The first investigates organizational life at a micro level—investigating how individual behaviors and attitudes affect an organization and its outcomes. The intermediate level explores structures, divisions, and social processes as a way to characterize organizations and organizational behaviors. The third level is a macro look at the organization, focusing on organizations as independent actors functioning in a larger system of complex relationships.

Borrowing from these general concepts, our investigation of state support for higher education is divided into two levels in this study: the state and the institution. The state level covers a macro perspective, providing a wider lens in which to conceptualize complex relationships within the larger state policy environment. On the institutional level, higher education appropriations will be understood by examining how structures and social processes affect support for particular institutions. From this vantage point, campus behaviors and attitudes affecting state support for these institutions are considered.

These levels are further understood through an examination of three families of organizational theories: rational, political, and cultural systems. We hope to fill gaps or build bridges between these organizational theories as they contribute to an understanding of state support for higher education.

### *Rational Perspectives*

Based on our review of literature, we suggest that the capacity and inclination of states to fund higher education is, in part, rational. Rational choice and bounded rationality theories suggest that optimal decisions are made based on an objective review of data and investigation of alternative choices (Cyert & March, 1963). The rational perspective is appropriate in our analysis because government expenditures are made, in part, on objective measures of current and forecasted conditions and needs in a given state. In other words, higher education receives levels of support commensurate with available revenues and demand. For this reason, some scholars conclude that government expenditures are determined more by rational forces than political ones (Peterson, 1995).

Specifically, a rational indicator predicting levels of state support for higher education is the forecast or current status of a state's economy. A number of studies suggest that unemployment rate, per capita income rate, availability of state revenues, and tax capacity are key factors in determining the level at which the state will fund its public universities (Rizzo, 2006; Toutkoushian, 2006; Lowry, 2001; Layzell & Lyddon, 1990, Hoenack & Pierro, 1990; Strathman, 1994; McLendon, et al., 2006). In short, these studies suggest that funding for higher education depends on measures pertaining to availability of revenue.

Similarly, demographic trend data can provide rational arguments for where states should invest in education in the future (Blumenstyk, 1988). Changes in the overall population of the state, percentage of the population that are college age (18-24), and enrollment or participation rates are varying conditions that adjust the level of higher education funding over time (Layzell & Lyddon, 1990). Overall, the growth or decline of state's population may have positive or negative effects on state appropriations (Toutkoushian & Hollis, 1998; Toutkoushian, 2006).

Public demand for higher education and other services is another rational factor that influences state appropriations for fund higher education. For example, in states with many elderly residents, studies have shown that higher education is likely to receive less funding than those states with lower percentages of these citizens (Rizzo, 2006; McLendon, et al, 2006; Lowry, 2001; Hoenack & Pierro, 1990). This is due, in part, to the increased demand for services for this segment of the population (e.g., health care).

In addition, legislators may use rational arguments to support various sectors of higher education over others. For example, since community colleges are low cost and provide widespread benefit, they may be seen as the most efficient vehicles to deliver higher education (Rizzo, 2006). Conversely, it may be viewed that research universities have greater potential to

diversify their revenue streams, and thus, can rely less on state support to survive. One rational method used to equitably distribute funds to institutions is through funding formulas. These formulas suggest an allotment of appropriations based on enrollment, faculty salaries, research expenditures, and other factors unique to their mission (McKeown & Layzell, 1994; Leslie & Ramey, 1986).

Thus far, we have discussed rational measures that states may use to determine levels of state appropriations for higher education. We turn now to rational strategies—or competitive strategies—that institutional leaders may rely on to generate state support for their institutions. Competitive strategy theory suggests that organizational leaders choose optimum strategies to compete with other resource-dependent entities given regulators, competitors, and barriers (Child, 1973). Organizations that incorporate these practices increase their legitimacy and survival prospects (Meyer & Rowan, 1977).

We identify three competitive strategies that institutions may employ as rational means to garner support. First, some higher education leaders may explicitly link their programs to foster state economic development, and thus, position themselves as a means to improve state tax capacity. During the late 1980s, states with large increases in appropriations for higher education did so based on this rationale (Hines, Hickrod, & Pruyne, 1989). This connection to economic development also relates to a recent study suggesting that states with higher shares of doctoral degrees awarded in science and technology fields were also likely to increase state support for higher education (Rizzo, 2006).

Second, institutions may seek to increase enrollments as a competitive strategy to garner more state support. However, the outcomes of this strategy are unclear. On one hand, funding for individual campuses depends on enrollments (Lowry, 2001) and as enrollments go up, so does

state appropriations to keep the same relative level of funding (Leslie & Ramey, 1986; Hossler, et al., 1997). On the other hand, this relationship may be marginal, since one study found that growth or decline in enrollments brought no significant funding rewards or penalties (Leslie & Ramey, 1986).

Finally, fundraising may be a competitive strategy to raise state support for higher education. For example, the State of Florida provides matching funds for private gifts to its public colleges and universities. This policy provides a rational incentive for institutions to generate private endowments. However, analysis of this relationship is mixed. One study showed a positive connection to state support and private giving (Weerts & Ronca, 2006) while another found that private giving was negatively associated with state appropriations, suggesting that some state legislators may view private gifts as a replacement for taxpayer support (Rizzo, 2006).

### *Political Perspectives*

Beyond rational measures, decisions about state funding for higher education are the results of political influences at both the state and institutional level (Weerts, 2002). We suggest that these influences can be understood through strategic contingency and resource dependency theory. Strategic contingency theory suggests that the course of an organization will be determined by power actors that best manage uncertainty in an organization (Scott, 1992). Simply put, colleges and universities depend on the influence of powerful actors who are critical to determining an institution's fate. At the state level, for example, a committee chairperson may use his or her position of power to affect appropriations for a particular institution or program (Hovey, 1999). Governors also wield power and increasingly view themselves as bearing the

primary responsibility for reforming state college systems (Schmidt, 1998). At both legislative and gubernatorial levels, it should be acknowledged that individuals act in their own self interest which may impact levels of state support for higher education. Individual self interests may relate to tasks, career, and other extramural factors (Morgan, 2006).

Many scholars suggest that preferences for higher education may be understood by party lines. For example, McLendon, et al. (2006) found that state support for higher education is repressed when republicans control the legislature and governor's office. Conversely, Stampen and Reeves (1986) argue that political party affiliation may not be a key factor in determining postsecondary education policy outcomes, in part, because the meaning of membership in a particular political party varies greatly by region. In his analysis of political variables, Rizzo (2006) found that states most likely to cut higher education are politically competitive, multiparty states and have limited gubernatorial power.

Power must not only be understood at the individual level, but also at the state organizational level. Resource dependency theory suggests that an organization needs to extract resources from the environment to survive and, in effect, place other competing organizations into external dependencies (Pfeffer & Salancik, 1978). This theory helps our understanding of how higher education competes, and typically suffers, in relation to other state priorities. For example, a wealth of evidence suggests that higher education appropriations have been suppressed by K-12 education, Medicaid, and corrections over the last two decades (Hovey, 1999; Jenny & Arbak, 2004; Schuh, 1993; Kane, Orszag & Gunter, 2003; Toutkoushian & Hollis, 1998). Higher education has been especially vulnerable in states where courts have mandated reforms in K-12 schools (Rizzo, 2006).

Beyond state-level agencies, we suggest that higher education institutions themselves have the potential to place each other into competing dependencies. For example, recent studies found that institutions governed by consolidated governing boards received higher levels of state appropriations than those governed under coordinating structures. The rationale for this finding is that consolidated boards mitigate competition between campuses and promote a more unified strategy for attracting higher education funding for all institutions (Lowry, 2001; Weerts & Ronca, 2006). However, not all studies have found this relationship to be significant (Nicholson-Crotty & Meier, 2003; McLendon, et al., 2006). More research is needed to understand this relationship.

Using this line of logic, one may argue that the overall “ecology” of higher education in a state (J. Hearn, personal communication, June 13, 2007) can impact funding for different types of institutions. For example, in states that have multiple flagship-type research institutions (i.e., Indiana University and Purdue University in Indiana), there may be more competition for scarce dollars compared to those institutions that enjoy status as the state’s undisputed flagship university (i.e., the University of Minnesota in Minnesota). One might expect that institutions enjoying undisputed flagship status would receive more support than their peer institutions residing in multi-flagship states.

Finally, politics can also be understood at the institutional level. Powerful campus leaders may have the ability to influence legislators and other key actors to fund their institutions. This power base can be cultivated, in part, by developing coalitions, subsets of individuals and groups that share consensual goals and work toward a common end (Cyert & March, 1963). For example, during the late 1990s, colleges and universities in Virginia formed a successful coalition with the Virginia Business Council to elect pro-higher education legislators, increase

state spending on higher education, and defeat a tax cut proposal that would have negatively affected higher education (Trombley, 1997). As this case suggests, coalitions can provide institutions with a base of power to garner state support for higher education.

### *Cultural Perspectives*

In general, historical, religious, social, and ethnic values define a state's overall culture and views toward supporting education (Marshall, Mitchell, & Wirt, 1989; Layzell & Lyddon, 1990). In this final section of literature, we suggest that enactment theory, obligatory action, symbolic decision making, and institutional theory help one understand the extent to which states will invest in public higher education.

Enactment theory and obligatory action are similar and refer to the gut feelings of legislators, the general public, and others about the extent to which state taxpayers should fund higher education. First, enactment theory suggests that decisions are driven by assumptions of how things should be. That is, a paradigm is developed over time and eventually embedded within the general belief systems of decision makers or the public at large (Suchman, 1997). For example, states that have historically relied on private institutions to educate their citizens feel less of an obligation to fund public institutions (Layzell & Lyddon, 1990) and thus, state support for public higher education is negatively associated with large state enrollments in private colleges and universities (Lowry, 2001; Rizzo, 2006; McLendon, et al., 2006).

State cultures can also be understood, in part, by their political ideology and values. For instance, studies suggest that appropriations for colleges and universities are likely to be higher in liberal states (Archibald & Feldman, 2006) with high voter turnout (Rizzo, 2006). These studies suggest that progressive states are more likely to support public higher education than

more conservative states. On the other end of the spectrum, some states have been slower to invest in higher education due to the historic success of industries in their region that have not required a college degree for entry into the workforce (Weerts & Ronca, 2006). For example, one educational leader lamented about low levels of state support for institutions in Ohio, “The Buckeye State has failed to realize that the classic manufacturing economy that made it so prosperous was not coming back in its original form” (Schmidt, 2006, p. A1)

As the Ohio example suggests, some regions in the U.S. may be more or less inclined to support higher education due to a number of factors. One key factor relates to citizens trust in public agencies, generally. In many regions across the country, a strong anti-tax sentiment has emerged resulting in grassroots proposals to limit government growth and spending. This tax revolt has had negative implications for higher education (Archibald & Feldman, 2006; Hovey, 1999). Conversely, some states may have more confidence in public services generally, which increases chances of support for higher education. This is supported by studies showing that increased spending on K-12, health care, and other services may also be associated with increased support for higher education (Weerts & Ronca, 2006; Archibald & Feldman, 2006). Similarly, states governed by highly professionalized legislatures are more likely to support higher education than citizen assemblies with less formalized government (McLendon, et al. 2006), indicating that citizenries that value a more organized form of government are also more likely to value higher education.

Finally, our discussion of enactment theory may be best understood by understanding budget decisions. In his classic work, Wildavsky (1964) suggested that the strongest determinant of the size of a budget in a given year relates to the size of the budget in the previous year. This relationship has also been found to be true for higher education (Hossler, et al., 1997, Layzell &

Lyddon, 1990) and points to the power of states' historic commitment to public higher education in predicting future appropriations.

Similar to enactment theory, obligatory action theory suggests that decision-making behavior can be viewed as contractual, implicit agreements to act appropriately in return for being treated appropriately. Unlike decision making in a rational perspective, obligatory action is grounded in cultural norms—the criterion being appropriateness rather than consequential optimality (March, 1981). One study, for example, showed that increases in appropriations for research institutions during the 1990s were associated with campus commitment to public service and outreach. In these cases, states acted appropriately (supported institutions) in return for being treated appropriately (state needs were met). Overall, the study found that campuses that received greater support during the 1990s had developed a positive perception about their work with state officials and the public at large (Weerts & Ronca, 2006).

Support for higher education at the state level may also be symbolic. Symbolic decision-making theory suggests that a powerful actor reinforces or promotes a value through specific actions, as well as complementing language and symbols supporting that particular action and value (Pfeffer, 1981). For example, Governor Zell Miller invested heavily in the University System of Georgia to symbolically cast Georgia as an intellectual center of the south (Weerts, 2002). Conversely, cuts to higher education might be symbolic and pursued as a punishment for bad behavior. For example, at the University of Colorado, one leader of a Colorado based policy institute declared, “When Ward Churchill gets a pay increase, there’s definitely room to cut the fat” (Fischer, 2005, p. A1).

Finally, institutional theory suggests that organizational structures and messages can serve as an important signaling mechanism to the organization’s constituencies about the values

of an organization (Scott, 1992). From this perspective, formal structures of organizations have meaning and importance regardless of whether they affect the behaviors of performers in the technical core (Meyer & Rowan, 1977). For instance, land-grant institutions may be symbolically important to states due to their historic missions as universities of the people. Institutional theory would suggest that support for these institutions may be related more to their status and visibility than their actual outcomes. Similarly, university-community engagement structures have emerged at institutions across the country, in part, to communicate campus values about service to the public and gain political and financial support. However, the outcomes of many of these programs are unclear, leading some to suggest that these activities are merely public relations efforts. As one national organization explained, “Many campuses claim that they are ‘doing engagement’ but in reality, there is more smoke than fire (American Association of State Colleges and Universities, 2002, p. 15).

In sum, our literature review and theoretical framework suggest that state support for higher education is influenced by rational factors (data driven), political factors (power driven) and cultural factors (values/symbols driven). Table 1, adapted from Weerts (2002) illustrates the linkages between the literature and these supporting organizational theories and perspectives.

Table 1			
<i>Theoretical Model of State Support for Higher Education</i>			
	Rational perspective (Data driven)	Political perspective (Power driven)	Cultural perspective (Values/symbols Driven)
State-level variables	<u>Rational choice</u>  <i>Economic:</i> <ul style="list-style-type: none"> <li>• Unemployment rate</li> <li>• Availability of tax revenue</li> <li>• State tax capacity</li> <li>• Per capita income</li> <li>• Per capita taxes</li> </ul> <i>Demographic:</i> <ul style="list-style-type: none"> <li>• State population</li> <li>• Population of college-age (18-24) and elderly residents</li> <li>• Post-secondary participation rates</li> </ul>	<u>Strategic contingency</u> <ul style="list-style-type: none"> <li>• Gubernatorial influences</li> <li>• Legislative influences</li> </ul> <u>Resource dependency</u> <ul style="list-style-type: none"> <li>• Competing State Priorities                             <ul style="list-style-type: none"> <li>• K-12 education</li> <li>• Corrections</li> <li>• Health care</li> </ul> </li> <li>• Governance structure</li> <li>• Composition of higher education system (i.e., # of research institutions)</li> </ul>	<u>Enactment/obligatory action</u> <ul style="list-style-type: none"> <li>• State/public value accorded to higher education (historical)</li> <li>• Public attitudes toward government spending</li> <li>• Strength of private institutions in the state</li> </ul> <u>Symbolic decision-making</u> <ul style="list-style-type: none"> <li>• Gubernatorial and legislative actions (based on perceived value of institution or higher education)</li> </ul>
Institutional-level variables	<u>Competitive strategies:</u> <ul style="list-style-type: none"> <li>• Enrollment</li> <li>• Mission</li> <li>• Economic development initiatives</li> <li>• Fundraising (leverage public support)</li> </ul>	<u>Strategic contingency</u> <ul style="list-style-type: none"> <li>• Campus leadership</li> </ul> <u>Coalition building:</u> <ul style="list-style-type: none"> <li>• Political alliances</li> <li>• Public/private coalitions</li> </ul>	<u>Institutional theory</u> <ul style="list-style-type: none"> <li>• Campus visibility</li> <li>• Structures/status (land grant status, outreach/engagement)</li> <li>• University relations activities</li> </ul>

Source: Weerts (2002)

## Methodology

Our methodology is built to examine the relative strength of the variables identified in our conceptual framework as they explain differences in levels of state support for higher education since 1985. As previously stated, literature on state support for public higher education generally examines state support as measured in terms of total state appropriations. While such a representation lends itself well to various types of quantitative analysis, it tends to focus on either cross-sectional data for all states in a single year or on individual states or institutions over time.

We aim to combine these two approaches in order to present a national picture of state support for higher education over the course of the last 20 years. We specify a mixed effects time series model to describe the annual changes in state support for public higher education. We use random effects to model the nested structure of the data collected on over 1,000 institutions in each of the 50 United States.

Our analysis is primarily exploratory in nature. First, we attempt to identify those covariates that are most closely related to the varying levels of state appropriations public institutions can expect to receive. Second, we partition the residual variance into its component parts so as to better understand the sources of unexplained variation in state funding. The residual error variance is the main focus of our follow-up qualitative study, which will be explained in more detail at the end of this paper.

## **Data**

The analysis employs a panel dataset of 43 variables observed over the 20-year period from 1985 to 2004. The units of analysis are all degree-granting public institutions in the fifty United States that enroll undergraduates, offer at least an associate's degree, and for which state appropriations data is available for every year from 1985 to 2004. There are 1,053 institutions that meet these criteria, and all are included in the dataset. The dataset therefore contains 21,060 observations. We assume that data collected on different institutions within the same state are correlated and also that observations collected over time on the same institution are correlated.

Our dependent variable is the first difference of the natural log of total restricted plus unrestricted state appropriations converted to 2004 dollars. We choose this somewhat complicated representation of state support for postsecondary education because it satisfies both

statistical theory and important considerations from past literature on state budgeting for higher education. We began with the variable, state appropriations (SAP), defined as the total state and local appropriations received by an institution in each year from 1985 to 2004. However, since state appropriations cannot be negative, SAP is bounded below by zero and so cannot satisfy the assumption of approximate normality needed to motivate this analysis. To induce approximate normality, we transformed the data by taking the natural log of state appropriations (LSAP). We then recall our literature review suggesting that the best predictor of next year's higher education budget is this year's budget (Hossler, et al., 1997, Layzell & Lyddon, 1990). In statistical terms, this is to say that there is a high degree of correlation between observations made on the same institution in subsequent years. Thus, we constructed an autocorrelogram of the dependent variable and found that the data reaffirmed these past studies: the correlation between observations made in subsequent years on the same institution was approximately 92%.

This high degree of correlation among observations is an artifact of the practice of baseline budgeting. However, we are not interested in the known effects of baseline budgeting already documented in the literature. Instead, our primary interests lie in the adjustments that are made to each year's budget to arrive at the subsequent year's level of appropriations. Therefore, differencing the data helps to focus our analysis on only the *changes* made to budgets from year to year. Because the log transform converts absolute differences to relative differences, the first difference of the log of total state appropriations is *approximately* equal to the percent change in state appropriations from year to year. Such a variable is desirable from both the viewpoint of statistical theory and also practical interpretability. We thus arrive at our final dependent variable: the first difference of the natural log of annual state appropriations (LSAPD).

Another point of concern in the construction of our dependent variable was the use of the Consumer Price Index conversion factors provided by the U.S. Bureau of Labor Statistics to make this adjustment. Overall, we acknowledge that our variable definition provides a single measure of state support among many discussed in the introduction of this paper. However, we made a decision to use it because it 1) best satisfies statistical theory, 2) provides a readily convertible measure of appropriations over a 20 year period, and 3) builds on other empirical studies that have considered unrestricted and restricted state appropriations as a unit of analysis.

Appendix A and B provide a complete description of each variable collected, a bibliographic reference for that variable, and a rationale explaining why only 21 of the 43 variables collected were included in the formal analysis. Appendix C provides details about the Carnegie classified variables in our study, including our method for collapsing classifications to create more parsimonious categories for comparison. In short, we specify CNEGIE as a three-level factor variable, taking on a value of 1 to indicate that an institution is an associate's college, 2 for a bachelor's/master's college or university, and 3 for research universities.

Three additional variables merit more explanation in this section. First, we use a governing board typology employed in Tandberg (2007), to classify all public institution governance structures into one of four distinct categories: Planning Agency, Weak Coordinating Board, Regulatory Coordinating Board, and Consolidated Governing Board (GOVBD). This typology was built using the State Governance Structures Sourcebook created by McGuinness (1997). Second, the variable COURT is an indicator variable taking on a value of 1 when reforms occur, and zero otherwise. When a court reform occurs, this variable remains 1 for the rest of the dataset. In this way, we indicate that the court reforms are in effect. For a more detailed description of these court reforms, please see the variable codebook in Appendix B.

Third, LNDGRNT takes on a value of 1 if the institution has land-grant status and a value of 0 if it does not. The value will remain the same across the entire dataset for a given institution, since land-grant status does not change over time.

Due to the manner in which our sample was specified, no observations were missing information for the response. In addition, none of the categorical variables exhibited missingness. However, a number of continuously measured covariates exhibited some degree of missingness, so we used linear interpolation to impute all missing values.

In addition to missing values, some variables can only be measured in certain years. For instance, data on voter participation in a presidential election are only available for years in which a presidential election occurs; we linearly interpolate values in between those years. The assumption here is that voter participation serves as a construct for observing political engagement among the populace. Therefore, if the voter participation rate increases from 50% in one year to 70% four years later, it is unlikely that there was an abrupt jump in political engagement among the populace in the year during which 70% participation was observed. Rather, it is more likely that the political engagement of the populace was growing over that four-year time period (50% to 55% to 60% and, finally, to 70%) and achieved a level of 70% in the year observed. For all variables such as this, we impute values using linear interpolation.

### **Expected Relationships**

Table 2 illustrates how the variables used in our analysis align with our theoretical framework and literature review. We expect a number of relationships to exist. First, based on our review of rational choice literature, we expect that higher education appropriations will be positively associated with per capita income (PCINC) and total state revenues (TOTREV).

Conversely, we expect that appropriations will be negatively correlated with a high percentage of state unemployment (UERATE).

Based on past studies, we also expect that demographics would impact state support for higher education. We predict higher levels of appropriations to be associated with a larger percentage of college-aged residents in a state (CPOPLN) and lower appropriations correlated with a high proportion of elderly residents (ELDPR) or high proportion of younger residents (SAGEPR). We also expect that state appropriations for higher education will be less in states that enroll a relatively larger number of two-year college students (TWOYR) since it costs less to educate students at these institutions.

At the institutional level, we expect that higher state appropriations will be associated with increases in enrollment levels (TOTENR). We test conflicting findings from past studies indicating that increased private gifts and contracts is either positively correlated with support or has a negative association with state appropriations (PRGFTS). Finally, our model posits that increases in state appropriations will be positively correlated with associate's institutions (CNEGIE<sub>1</sub>) compared to comprehensive colleges (CNEGIE<sub>2</sub>) and research universities (CNEGIE<sub>3</sub>). We make this distinction based on our assertion that research universities have greater capacity to develop more diverse revenue streams (i.e., gifts, grants, etc.), and thus will be viewed as more independent among state officials.

Second, regarding political variables, the literature suggests that higher education appropriations will be positively correlated with Democratic governors (GOVPRT) and a higher percentage of Democratic legislators in both the upper and lower houses of the legislature (HSPRP, SNPRP). Also, we predict that higher education appropriations will be negatively correlated with increases in state spending on K-12 education, health care, and corrections

(PCEDUC, PCHLTH, PCCORR). We also expect appropriations to be negatively correlated in states with court mandates to reform K-12 schools (COURT). At the institutional level, we expect that institutions will receive higher levels of appropriations when governed by consolidated board systems compared to others (GOVBD). In addition, due to competition among campuses, we expect lower levels of state appropriations for research universities in states with multiple flagship-type institutions (FLAGS).

Finally, regarding cultural variables, we expect that progressive states, as measured by presidential and congressional voter participation (CNGVPR, PRSVPR), will likely be more supportive of funding higher education. Also, we expect that states that have a larger composition of students enrolled in private colleges (PRVENR) will be less inclined to support their public system of higher education. Conversely, we expect appropriations to be positively associated with increasing numbers of public colleges and universities (NUMPUB) as a proxy for a state's value accorded to public higher education. Finally, at the institutional level, we expect that land-grant universities (LNDGRT) have symbolic significance in their states, and thus, may be more likely to receive higher state appropriations compared to other institutions.

We acknowledge an important limitation of our model is that the variables developed for our analysis are incomplete in relation to our theoretical framework. Some constructs in our framework are not easily quantifiable and, thus, not testable using statistical methods. These limitations and opportunities for future study will be discussed at the end of this paper.

Table 2			
<i>Variables Assigned to Theoretical Framework</i>			
	Rational perspective (Data driven)	Political perspective (Power driven)	Cultural perspective (Values/symbols driven)
State-level variables	<p><u>Rational choice</u></p> <p><i>Economic</i></p> <ul style="list-style-type: none"> <li>• PCINC (log of per capita personal income)</li> <li>• UERATE (state unemployment rate: %)</li> <li>• TOTREV (total state revenues: \$)</li> <li>• TWOYR (% of two-year college enrollment)</li> </ul> <p><i>Demographic</i></p> <ul style="list-style-type: none"> <li>• SAGEPR (% of population age 5-24)</li> <li>• CPOPLN (% of population 18-24: college age)</li> <li>• ELDPER (% of population over age 65)</li> </ul>	<p><u>Strategic contingency</u></p> <ul style="list-style-type: none"> <li>• GOVPRT (party of governor: R/D)</li> <li>• HSPRP (% republicans in lower state house—assembly)</li> <li>• SNPRP (% republicans in upper state house—senate)</li> </ul> <p><u>Resource dependency: financial</u></p> <ul style="list-style-type: none"> <li>• PCEDUC (log of K-12 education spending per capita)</li> <li>• PCHLTH (log of health care spending per capita)</li> <li>• PCCORR (log of corrections spending per capita)</li> </ul> <p><u>Resource dependency: structural</u></p> <ul style="list-style-type: none"> <li>• COURT (K-12 court reform occurred)</li> <li>• GOVBD (type of governing board)</li> <li>• FLAGS (# of flagship institutions in state)</li> </ul>	<p><u>Enactment/Obligatory Action</u></p> <ul style="list-style-type: none"> <li>• CNGVPR (Federal congressional elections voter participation %)</li> <li>• PRSVPR (Federal presidential elections voter participation %)</li> <li>• PRVENR (% of private college enrollment)</li> <li>• NUMPUB (# of public institutions in a state)</li> </ul>
Institutional-level variables	<ul style="list-style-type: none"> <li>• CNEGIE (Carnegie class collapsed: research, comprehensive, associates)</li> </ul> <p><u>Competitive strategy:</u></p> <ul style="list-style-type: none"> <li>• PRGFTS (total \$ of private gifts, grants, and contracts)</li> <li>• TOTENR (Total undergraduate enrollment--FTE)</li> <li>• *LSAP (logged total state appropriations: \$)</li> </ul>		<p><u>Institutional theory:</u></p> <ul style="list-style-type: none"> <li>• LNDGRT (land grant status)</li> </ul>

\* Response variable

### Fitting the Model

A central goal of our analysis is to identify the subset of covariates discussed in the literature that most significantly explains the variance in state funding for higher education over

the last 20 years. However, unlike most analyses in which the final model and the parameter estimates associated with individual predictors are of primary import, we are less interested in what the model explains and more interested in what it does not explain. This is to say, we attempt to maximize the model's fit—sometimes at the cost of easy interpretability—in order to maximize the explained variance. A strict interpretation of the change in the response resulting from a 1-unit change in covariate  $x$  is not of primary concern, and indeed should not be, given the exploratory, model-building nature of this analysis. Instead, we transform the response and covariates in order to maximize goodness-of-fit and ease comparison among parameters. We center and scale our continuous covariates by subtracting the mean and dividing by twice the standard deviation, as described in Gelman (2007). This standardization technique allows us to compare readily the parameter estimates associated with the continuous covariates both with each other and with the non-standardized factor covariates.

### **Full Model**

For our initial model, we include all of the 21 covariates suggested as relevant by the literature. The Greek letters zeta and nu represent the random effects at the state and institution levels, respectively. The phi preceding the first epsilon term represents the first-order autoregressive term, and the second epsilon term is the one that should be familiar from ordinary least squares. In this model, we use Carnegie class, CNEGIE, as a construct for institutional mission. This model is specified in the following equation:

$$\begin{aligned}
 LTSAPD_{ijk} = & \beta_{0i} + \beta_{1i(j)}CNEGIE + \beta_{2i}CNGVPR + \beta_{3i}CPOPLN \\
 & + \beta_{4i}COURT + \beta_{5i}ELDPER + \beta_{6i}FLAGS + \beta_{7i}GOVPRT \\
 & + \beta_{8i}PCCORR + \beta_{9i}PCEDUC + \beta_{10i}PCHLTH + \beta_{11i}PCINC \\
 & + \beta_{12i}PRSVPR + \beta_{13i}PRVENR + \beta_{14i}SAGEPR + \beta_{15i}TANBRD \\
 & + \beta_{16i}TOTREV + \beta_{17i}TWOYR + \beta_{18i}UERATE + \beta_{19i}HSPRP \\
 & + \beta_{20i}SNPRP + \beta_{21i(j)}TOTENR + \beta_{22i(j)}LNDGRT + \beta_{23i(j)}PRGFTS \\
 & + \zeta_{0i} + \upsilon_{0i(j)} + \phi\varepsilon_{ijk-1} + \varepsilon_{ijk}.
 \end{aligned}$$

Table 3				
<i>Final Model</i>				
Random effects				
	Std. dev.	Residual		
State	0.03	N/A		
Institution	0.4E-06	0.10		
First-Order Serial Correlation (AR 1)				
$\phi = -0.08$				
Fixed effect				
	Value	Std. error	t-value	p-value
(Intercept)	0.02	0.005	3.53	0.00
PCEDUC	-0.02	0.005	-3.17	0.00
PCHLTH	-0.01	0.002	-3.28	0.00
PCCORR	-0.02	0.002	-7.86	0.00
PCINC	-0.03	0.006	-4.52	0.00
UERATE	-0.05	0.002	-25.17	0.00
CPOPLN	-0.01	0.002	-6.72	0.00
PRSVPR	0.01	0.004	3.10	0.00
GOVPRT	0.01	0.002	3.59	0.00
COURT	-0.01	0.03	-4.29	0.00
NUMPUB	0.02	0.008	2.44	0.02
CNEGIE <sub>2</sub>	-0.01	0.002	-4.65	0.00
CNEGIE <sub>3</sub>	-0.01	0.002	-7.14	0.00
PCINC:NUMPUB	0.02	0.006	3.25	0.00
Standardized within-group residuals				
Min	Q1	Med	Q3	Max
-10.21	-0.44	-0.03	0.41	10.00

After specifying the model shown in the above equation, we implement an all-subsets-regression approach to model selection. We consider all possible models with a single predictor, two predictors, three predictors, and so on. We compute the BIC of each model as it is fitted, and select as our final model the one with the lowest BIC score. This model is summarized in Table 3.

Some key assumptions of our model should be noted here. First, we have assumed that the within-group errors are independently and identically distributed normal with mean zero and constant variance. Furthermore, we have assumed that they are independent of the random effects. Second, we assume that the random effects are normally distributed with mean zero, constant variance, and are independent among groups. In our analysis, we are primarily interested in the fixed effects; we have only specified random effects to the extent necessary to partition the error variance and gain a better understanding of the grouping factors most responsible for the unexplained variance in our model.

## **Discussion**

Our analysis reveals some interesting findings in relation to our theoretical framework. We discuss these findings through the rational, political, and cultural theory perspectives developed in our literature review. First, regarding the state-level rational perspective variables, state appropriations are likely to be lower in states with higher percentages of unemployment (UERATE). This variable had the strongest statistical significance in our study, reinforcing rational theories about the link between the economic health of a state and higher education appropriations.

However, one variable assigned to the rational framework yielded an unexpected directional effect: state appropriations were likely to be *lower* in states with higher per capita personal income (PCINC). This seemingly non-intuitive finding becomes clearer when per capita income interacts with the number of public institutions in a state (PCINC: NUMPUB). As per capita income and the number of institutions increased, so did state appropriations. We interpret this to mean that wealthier states that have historically valued public higher education (as evidenced by a high number of public institutions) are likely to maintain that investment and retain a public education tradition. Conversely, we deduce that wealthy states with fewer public institutions may have a private education ethic, and thus, are less inclined to support public higher education, despite their stronger tax capacity (measured by per capita income). These findings may be most related to institutions in New England states that are wealthy but have long standing traditions of private education, and face less of a public obligation to support higher education. This assertion is bolstered by one study suggesting that wealthy states exert less tax effort than poorer states in their support for public higher education (Alexander, 2001).

Another unexpected finding related to our analysis of demographic variables is that higher education appropriations were lower in states with increased percentages of citizens who are college aged, or 18-24 (CPOPLN). In our conceptual framework, we posited that a higher percentage of these residents would equate to greater demand for public higher education, and thus, higher appropriations. However, a plausible explanation for our opposite finding is that youthful states have a smaller percentage of citizens making a contribution to the tax base, and thus these states have less capacity to support higher education. In other words, 18-24 year-olds in these states are either in college (being supported by states) or earning low to modest wages without a college degree (contributing little to the tax base).

Examining rational perspectives at the institutional level, we note that the only significant variable was Carnegie class. We set the coefficient for community colleges (CNEGIE<sub>1</sub>) equal to zero as we consider this to be our baseline category. We note that the coefficients associated with master's colleges and universities (CNEGIE<sub>2</sub>) and research universities (CNEGIE<sub>3</sub>) are both negative. Recalling that our response is the annual percentage change in the log of state appropriations, this suggests that master's colleges and research universities are more likely than community colleges to experience cuts in funding. This finding supports past literature suggesting that community colleges may have the most stable support from their states due to their open access, relatively inexpensive cost of instruction, and overall dependence on public revenues for survival (Rizzo, 2006). It further supports our assertion that research universities are more susceptible to factors that cause volatility in appropriations because they are more expensive, provide less access, and have greater ability to generate their own revenue. For these reasons, research institutions may be viewed as more independent and thus, among the first line of institutions to receive appropriations cutbacks. Interestingly, we note that competitive strategies related to fundraising (PRGFTS) and enrollment levels (TOTENR) showed no effect in our analysis.

Second, our examination of political perspectives through strategic contingency and resource dependency theory also yielded intriguing results. Like prior studies, our analysis suggests that political party affiliation may be associated with appropriations for higher education. However, our study found that increases in appropriations were associated with republican governors, rather than democratic ones (GOVPRT). This is surprising given past research suggesting the opposite to be true. Our finding lends strength to National Center for Public Policy and Higher Education President Patrick Callan's assertion, "There tends to be a

belief in the academy that Democrats treat higher education better than Republicans, but such perceptions don't reflect what happens in the real world of politics" (Schmidt, 2005, p. A14).

As expected, resource dependency was a powerful theoretical construct in explaining the extent to which higher education will be funded compared to other agencies in a state. Like past studies, we found that higher education appropriations decreased with increases in state per capita spending on K-12 education (PCEDUC), health care (PCHLTH), and corrections (PCCORR). In addition, structural reforms in states—namely, court ordered reforms of K-12 education (COURT)—are associated with less state investment in higher education. These findings point to the importance of power at the state-organizational level that shapes the landscape of higher education funding. Interestingly, these power struggles did not seem to emerge at the state higher education level themselves; the type of governing board (GOVBD) and the number of flagship-type institutions (FLAG) in a state were not significant in predicting appropriations for institutions.

Finally, our study suggests that state-level cultural theories may be among the most compelling to explain levels of state support for higher education in a state. We make this conclusion for three reasons. First, it is noteworthy that institutional factors, overall, mattered little in comparison to state-level variables. Examination of the random effects suggests that approximately 10% of the variability in public funding for higher education occurs between states rather than within states over the years. In other words, the funding patterns for research universities and community colleges in the same state are more similar than the funding patterns for two flagships in two different states. Meanwhile, almost none of the variance in our analysis is explained at the institution level. Simply put, our analysis suggests that state-level variables

related to culture, politics, and the economy have more of an effect than institutional factors in predicting state support for higher education.

Second, our analysis supports past literature showing that the best predictor of institutional appropriations relates to what the institution received in previous years. As noted previously, we have differenced our data in order to remove some of the extreme autocorrelation amongst our observations from year to year. Prior to doing so, we determined that the autocorrelation coefficient among total state appropriations was over 92%. However, once the data is differenced, we can only find evidence of autocorrelation between 3% and 8%. There are two interesting implications here. The first is that the high degree of correlation between total state appropriations is to be expected as the practice of baseline budgeting entails taking each year's budget and adjusting it for the following year. The result is that each institution's annual budget is simply an adjusted version of the previous year's budget. What is more interesting is that after differencing, there remains only 3% to 8% autocorrelation; changes made by the state to an institution's budget in any year offer almost no information about the degree of budgetary increase or decrease that will come in the following year. Thus, while budgets may be highly correlated, the actual adjustments to them occur almost seemingly at random.

Finally, our study supports past studies suggesting that progressive states may be more apt to support higher education. Our findings indicate that states with a greater percentage of presidential voting participation (PRSVPR) were likely to have higher appropriations than those with lower voting participation. Table 4 illustrates our revised conceptual framework based on our study's findings.

In conclusion, our study suggests that rational, political, and cultural perspectives are all useful constructs to explain differences in state support for higher education since 1985.

However, some of these constructs are more compelling than others. For example, the rational frame supports past research that the economic health of the state (as measured by unemployment rate) is important. However, economic health does not necessarily translate into appropriations for higher education. Rather, the cultural frame is instructive here, helping us consider the values of the state populous (inclination for public education) and overall measures of progressive behavior (voting participation).

Within the political framework, resource dependency theory emerged as an important construct illustrating how higher education is often squeezed out due to other state budget priorities. In this competitive context, community colleges, seemingly, are supported first, and master's and research universities receive secondary support.

The main implication of our study is that the forces shaping higher education appropriations work largely at the state level. Thus, despite their efforts, institutional lobbyists may have limited impact in states with poor state economies, intense budget competition, and histories of poor support for higher education. We suggest that this idea needs further testing, however, in light of a new study showing a relationship between the level of state appropriations and the size of the higher education lobby (Tandberg, 2007). The last section of this paper introduces a stronger lens through which to examine institutional level differences in appropriations and what might be learned from campuses that receive higher or lower levels of state support based on our model.

Table 4			
<i>Findings Organized by Theoretical Framework</i>			
	Rational perspective (Data driven)	Political perspective (Power driven)	Cultural perspective (Values/symbols driven)
State-level variables	<p><u>Rational choice (economic)</u></p> <ul style="list-style-type: none"> <li>• PCINC (decreased appropriations associated with increases in per capita personal income)</li> <li>• UERATE (decreased appropriations associated with increases in state unemployment rate)</li> </ul> <p><u>Rational choice (demographic)</u></p> <ul style="list-style-type: none"> <li>• CPOPLN (decreased appropriations associated with increases in % of population 18-24: college age)</li> </ul>	<p><u>Strategic contingency</u></p> <ul style="list-style-type: none"> <li>• GOVPRT (increased appropriations associated with republican governors)</li> </ul> <p><u>Resource dependency</u></p> <p><i>Financial:</i></p> <ul style="list-style-type: none"> <li>• PCEDUC (decreased appropriations associated with increased K-12 education spending per capita)</li> <li>• PCHLTH (decreased appropriations associated with increased health care spending per capita)</li> <li>• PCCORR (decreased appropriations when associated with increased corrections spending per capita)</li> </ul> <p><i>Structural:</i></p> <ul style="list-style-type: none"> <li>• COURT (decreased appropriations associated with states that underwent K-12 court reform)</li> </ul>	<p><u>Enactment/obligatory Action</u></p> <ul style="list-style-type: none"> <li>• PRSVPR (increased appropriations associated with increased % of federal presidential election voter participation)</li> <li>• NUMPUB (increased appropriations associated with increases in # of public institutions in a state)</li> <li>• PCINC: NUMPUB (increased appropriations associated with high per capita income and large number of public institutions.</li> </ul>
Institutional-level variables	<ul style="list-style-type: none"> <li>• CNEGIE (Appropriations most steady for community colleges, least for research universities)</li> </ul>		

### Limitations and Future Research

One of the goals of this study has been to develop a robust theoretical framework to guide future research on state support for higher education. In so doing, we have discussed a number of competing and complimentary theories that may explain levels of state appropriations for colleges and universities. However, our attention to this literature also reveals an important

limitation of our study: a lack of data and defined variables that align with constructs articulated in our theoretical framework. We acknowledge that important holes exist in our analysis, particularly in the institutional-level political and cultural perspective variables. We suggest that future research using additional variables in our framework could make our analysis more complete.

As stated in our methods section, we made a decision to narrow the scope of our study by defining state support for higher education as total restricted plus unrestricted state appropriations. As such, we acknowledge that our definition of the dependent variable provides a single measure of state support. We suggest that future studies consider our research questions using other measures of state effort for higher education.

Another important limitation is the relatively short time period used to construct our analysis. The earliest readily available data was from 1985, and even for years during which data is available, the quality varies. We suggest that future studies gather information on a single state's public institutions beginning when they were founded. Using a subset of covariates discussed in this analysis, and accounting for political and economic shocks over time, a precise temporal presentation of a single state's support history should be possible.

Finally, we conclude this paper by charting a course for future research in this area using qualitative methodology. As discussed in our methodology section, we determined our final model using an anti-conservative, unsupervised algorithm. The result should be a model that fits the data overly well. However, as we discussed, not a single institution-level covariate remained in the model.

Table 5		
Typology of State Appropriation Levels by Institutional Type		
	Higher than predicted appropriations	Lower than predicted appropriations
Research universities, doctoral/research universities—extensive (E) and intensive (I)	<u>Doctoral/research extensive</u> 1) SUNY- Stony Brook 2) SUNY- Buffalo 3) Northern Illinois 4) University of Maryland 5) University of Connecticut  <u>Doctoral/research intensive</u> 1) UMASS- Lowell 2) Texas A & M Kingsville 3) Texas Southern University 4) George Mason University 5) UMASS-Boston	<u>Doctoral/research extensive</u> 1) Virginia Commonwealth 2) University of Oregon 3) University of Virginia 4) UMASS-Amherst 5) University of Mississippi  <u>Doctoral/research intensive</u> 1) San Diego State 2) SUNY—Environmental and Forestry College 3) North Dakota State University 4) College of William and Mary 5) University of North Dakota
Regional comprehensive universities, master’s colleges and universities—I and II	<u>Masters colleges I</u> 1) Worcester State College (MA) 2) Minot State University 3) Bridgewater State College (MA) 4) Texas A & M International University 5) Kean University  <u>Masters colleges II</u> 1) Thomas Edison State College 2) University of Mary Washington 3) SUNY- Purchase 4) Metropolitan State University 5) Southern University at New Orleans	<u>Masters colleges I</u> 1) CUNY City College 2) Virginia State University 3) CUNY College of Staten Island 4) University of Minnesota-Duluth 5) CUNY Queens College  <u>Masters colleges II</u> 1) Castleton State College 2) Lake Superior State 3) Eastern Oregon State 4) Ferris State 5) University of Wisconsin-Parkside
Two-year colleges (associate’s colleges)	1) Mt. San Jacinto Community College District (San Jacinto, CA) 2) Feather River Community College District (Quincy, CA) 3) Cuesta College (San Luis Obispo, CA) 4) Coahoma Community College (Clarksdale, MS) 5) College of the Desert (Palm Desert, CA)	1) Skyline College (San Bruno, CA) 2) College of Marin (Kentfield, CA) 3) Canada College (Redwood City, CA) 4) College of San Mateo (San Mateo, CA) 5) Chaffey Community College (Rancho Cucamonga, CA)

We could draw a number of conclusions from this finding: institutions are themselves irrelevant in explaining the extent to which they are funded; we have failed to consider the relevant covariates; or perhaps a mixture of the two. Based on this last conclusion, we have

generated a list of institutions ordered by the values of their residuals. We average the residuals for each institution over the years under observation and determine those institutions best fit (residuals of approximately zero) and worst fit (large absolute values of residuals) by the present model. These institutions represent a set of colleges and universities, listed by Carnegie class, that have received more or less state appropriations than expected based on our model predictions. Table 5 illustrates a typology of the top five institutions in each class that fall into these categories.

A brief glance at Table 5 leads us to ask a number of questions. For example, why do research extensive/intensive universities in New York and Texas receive higher levels of state support than expected than those in Virginia? Conversely, why do master's colleges and universities receive less money than expected in New York, and higher than expected in Massachusetts? Finally, community colleges in California were not well fit in our model compared to other states. What explains these phenomena? This series of questions prompts us to ask a larger, overarching question: What variables did we miss in our quantitative model or theoretical framework that could be used to explain differences in state appropriations between states and institutions? To address this question, we call for a multi-case study of these institutions to identify new variables that could be incorporated into our model. A qualitative data collection protocol anchored in the rational, political, and cultural perspective frameworks articulated in this study could help guide this analysis. Completing this next step would allow us to develop a revised conceptual framework to better understand one of the most intensely discussed public policy issues in higher education today.

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**Appendix A: Variables Included in the Analysis**

Covariate name	Covariate description	Units
LSAP†,*	Logged Total State Appropriations	2004 Dollars
CNEGIE†	Carnegie Class, Collapsed	Nominal
CNGVPR‡	Federal congressional elections voter participation	Percent
CPOPLN‡	State population age 18-24	Percent
COURT‡	K-12 court reform occurred	Yes/No
ELDPER‡	State population age 65	Percent
FLAGS‡	Number of flagship institutions	Count
GOVPRT‡	Party of the State Governor	Republican/Democrat
HSPRP‡	Republicans in Lower State House	Percent
LNDGRT†	Land grant status	Yes/No
NUMPUB‡	Total public institutions in a state	Integer number
PCCORR‡	Log of Corrections Spending	Per capita
PCEDUC‡	Log of K-12 Education Spending	Per capita
PCHLTH‡	Log of Healthcare Spending	Per capita
PCINC‡	Log of Personal Income	Per capita
PRGFTS†	Total private gifts, grants, and contracts	2004 Dollars
PRSVPR‡	Federal presidential elections voter participation	Percent
PRVENR‡	Private college enrollment	Percent
SAGEPR‡	Population age 5-24	Percent
SNPRP‡	Republicans in Upper State House	Percent
TANBRD‡	Tandberg's Governance Board Typology	Nominal
TOTENR†	Total Undergraduate Enrollment	FTE
TOTREV‡	Total State Revenues	2004 Dollars
TWOYR‡	Two-year PSE enrollment	Percent
UERATE‡	State Unemployment Rate	Percent

All variables followed by ‡ are state-level covariates, those followed by † are institution-level covariates, and the \* indicates the response as initially collected.

## Appendix B: Variable Codebook

### *Institution-level variables*

- ADSTAPS** Annual difference in state appropriations. This value of ADSTAPPS is determined by taking the value of STATEAPPS in a given year and subtracting the value of STATEAPPS in the previous year.
- Source: Integrated Postsecondary Education Data System
- CNEGIE** Membership in one of three Carnegie class groupings: Doctoral/Research Extensive and Intensive, Master's Colleges and Universities, and Medical and Law Schools; Liberal Arts and General Baccalaureate Institutions; and Associates and other Two-Year Institutions.
- Source: Integrated Postsecondary Education Data System
- LNDGRT** Land-grant status of the institution. In the computation of this variable, years were made uniform. Once an institution received land-grant status, it retained it for the course of the analysis. This variable is dichotomous in that a value of one indicates that the institution has land-grant status and a value of zero indicates that it does not.
- Source: Integrated Postsecondary Education Data System
- PRGFTS** Total restricted plus unrestricted private gifts, grants, and contracts in 2004 dollars.
- Source: Integrated Postsecondary Education Data System
- SAP** Total restricted plus unrestricted state appropriations converted to 2004 dollars using the Consumer Price Index conversion factors provided by the U.S. Bureau of Labor Statistics.
- Source: Integrated Postsecondary Education Data System
- TOTENR** Total undergraduate full-time equivalent enrollment. Three part-time undergraduates were counted as a single FTE.
- Source: Integrated Postsecondary Education Data System
- UNITID** IPEDS Unit ID used by as a unique identifier for all postsecondary educational institutions in the United States.
- Source: Integrated Postsecondary Education Data System

*State-level variables*

CNGVPR Voter participation rate, by state, in U.S. congressional elections.

Source: U.S. Census Bureau. (January 11, 2007). Reported voting and registration for total and citizen voting-age population by state for Congressional elections, 1974 to 2002. Retrieved May 31, 2007, from <http://www.census.gov/population/www/socdemo/voting.html>

COLPRV Share of higher education students enrolled in private colleges.

COURT Indicator of whether or not a state had K-12 court reform in a given year. Value of “1” if court reform occurred, “0” if otherwise

Source: Hunter, M.A. State by state: Litigation. New York, NY: Columbia University.

CPOP Number of persons, by state, between the ages of 18 and 24, inclusive.

Source: U.S. Census Bureau (2007, June). Selected age groups by states’ archives. Retrieved May 30, 2007, from <http://www.census.gov/popest/archives/>

CPOPLN Percent of population, by state, between the ages of 18 and 24, inclusive. This quantity is computed as:

$$CPOPLN = \frac{CPOP}{POPLN}$$

Source: Derived Variable

ELDLY Number of persons, by state, age 65 and older.

Source: U.S. Census Bureau (2007, June). Selected age groups by states archives. Retrieved May 30, 2007, from <http://www.census.gov/popest/archives/>

ELDPER Percent of population, by state, age 65 and older. Computed as:

$$ELDPER = \frac{ELDLY}{POPLN}$$

Source: Derived Variable.

FLAGS Number of Doctoral/Research Extensive institutions in a state.

Source: (2003, May 14). Retrieved June 28, 2007, from <http://www.washington.edu/tools/universities.html>

- GOVBRD** Governance Board Typology. This is a four-level ordinal categorical variable coded as follows:  
1 = Planning agency  
2 = Weak coordinating board  
3 = Regulatory coordinating board  
4 = Consolidated governing board
- Source: Tandberg, D. A. (2007). *Politics, budgetary trade-offs, and state funding of public higher education*. Unpublished Doctoral Dissertation: Penn State University.
- GOVPRT** Political affiliation of the governor. This is an indicator variable taking on value “1” if republican, “0” if otherwise.
- Source: The Council of State Governments. The book of the states: The governors. Lexington, KY: Sharing Capitol Ideas.
- HSEDEM** Number of Democrats in lower state house.
- Source: The Council of State Governments. The book of the states: The legislators: Numbers, terms and party affiliations. Lexington, KY: Sharing Capitol Ideas.
- HSEOTH** Number of lower house officials not affiliated with either the Republican or Democratic parties.
- Source: The Council of State Governments. The book of the states: The legislators: Numbers, terms and party affiliations. Lexington, KY: Sharing Capitol Ideas.
- HSEPRP** Proportion of Republicans in state house.
- HSEREP** Number of Republicans in lower state house.
- Source: The Council of State Governments. The book of the states: The legislators: Numbers, terms and party affiliations. Lexington, KY: Sharing Capitol Ideas.
- HSGRAD** Number of high school graduates (both public and private schools) in a state in the previous six years.
- Sources:  
Private: Snyder, T.D. Digest of education statistics: Private elementary and secondary schools, enrollment, teachers and high school graduates, by state. Retrieved July 9, 2007, from <http://nces.ed.gov/pubsearch/getpubcats.asp?sid=091#061>

Public: Snyder, T.D. Digest of education statistics: Public high school graduates, by state. Retrieved July 9, 2007, from <http://nces.ed.gov/pubsearch/getpubcats.asp?sid=091#061>

NUMPUB Number of public institutions in a state.

Sources:

(Digest of Ed Stats; Book of States) 2004-1989: Snyder, T.D. Digest of education statistics: Degree granting institutions and branches, by type, control of institution, and state. Retrieved July 5, 2007, from <http://nces.ed.gov/pubsearch/getpubcats.asp?sid=091#061>

1985-1988: The Council of State Governments. The book of the states: Number of institutions of higher education and branches, by level of control of institution and state. Lexington, KY: Sharing Capitol Ideas.

PCCORR Per capita corrections expenditures by state, 2004 dollars.

Sources:

1992-2004: U.S. Census Bureau. (2007, July 9). Federal, state, and local governments: State government finances. Retrieved May 29, 2007, from <http://www.census.gov/govs/www/state.html>

1985-1991: U.S. Census Bureau. (n.d.). Government finances database: Revenues. Retrieved May 29, 2007, from <ftp://ftp2.census.gov/pub/outgoing/govs/special60/>

PCEDUC Per capita K-12 educational expenditures by state in 2004 dollars.  
Source: Snyder, T.D. Digest of education statistics: Current expenditures for public elementary and secondary education, by state. Retrieved June 22, 2007, from <http://nces.ed.gov/pubsearch/getpubcats.asp?sid=091#061>

PCHLTH Per capita health care expenditures by state in 2004 dollars.

Sources:

1992-2004: U.S. Census Bureau. (2007, July 9). Federal, state, and local governments: State government finances. Retrieved May 29, 2007, from <http://www.census.gov/govs/www/state.html>

1985-1991: U.S. Census Bureau. (n.d.). Government finances database: Revenues. Retrieved May 29, 2007, from <ftp://ftp2.census.gov/pub/outgoing/govs/special60/>

PCINC Per capita personal income by state converted to 2004 dollars using Consumer Price Index conversion factors.

Source: U.S. Bureau of Economic Analysis. (2007, March 27). State annual personal income. Retrieved May 29, 2007, from <http://www.bea.gov/regional/spi/default.cfm?satable=SA30>

POPLN Total state population.

Source: U.S. Census Bureau. (2007, June). State population estimates archives. Retrieved May 30, 2007, from <http://www.census.gov/popest/archives/>

PRSVPR Voter participation rate, by state, in U.S. presidential elections.

Source: U.S. Census Bureau. (2007, January 11). Reported voting and registration for total and citizen voting-age population by state: Presidential elections 1972 to 2004. Retrieved May 31, 2007, from <http://www.census.gov/population/www/socdemo/voting.html>

PRVENR Total state enrollment of higher education students in private colleges.

Source: Snyder, T.D. Digest of education statistics: Total fall enrollment in private degree-granting institutions, by state or jurisdiction. Retrieved July 2, 2007, from <http://nces.ed.gov/pubsearch/getpubcats.asp?sid=091#061>

REGION U.S. Census Bureau Census Regions. This is a nominal, categorical variable with eight levels, coded as follows:

- 1 = New England (CT, ME, MA, NH, RI, VT)
- 2 = Mid East (DE, DC, MD, NJ, NY, PA)
- 3 = Great Lakes (IL, IN, MI, OH, WI)
- 4 = Plains (IA, KS, MN, MO, NE, ND, SD)
- 5 = Southeast (AL, AR, FL, GA, KY, LA, MS, NC, SC, TN, VA, WV)
- 6 = Southwest (AZ, NM, OK, TX)
- 7 = Rocky Mountains (CO, ID, MT, UT, WY)
- 8 = Far West (AK, CA, HI, NV, OR, WA)

Source: Integrated Postsecondary Education Data System

REPPRP Mean of proportion of Republicans in state senate and proportion of Republicans in state house (Nebraska set to 0.5)

Source: Derived variable.

SAGE Number of persons, by state, between the ages of 5 and 24, inclusive.

Source: U.S. Census Bureau (2007, June). Selected age groups by states archives. Retrieved May 30, 2007, from <http://www.census.gov/popest/archives/>

SAGEPER Percent of population, by state, between the ages of 5 and 24, inclusive.  
Computed as:

$$SAGEPER = \frac{SAGE}{POPLN}$$

Source: Derived Variable.

SENDEM Number of Democrats in state senate.

Source: The Council of State Governments. The book of the states: The legislators: Numbers, terms and party affiliations. Lexington, KY: Sharing Capitol Ideas.

SENOTH Number of state senators affiliated with neither the Republican nor Democratic parties.

Source: The Council of State Governments. The book of the states: The legislators: Numbers, terms and party affiliations. Lexington, KY: Sharing Capitol Ideas.

SENPRP Proportion of republicans in state senate

Source: Derived variable

SENREP Number of Republicans in state senate.

Source: The Council of State Governments. The book of the states: The legislators: Numbers, terms and party affiliations. Lexington, KY: Sharing Capitol Ideas.

TOTENR Total state enrollment of higher education students.

Source: Snyder, T.D. Digest of education statistics: Total fall enrollment in degree-granting institutions, by state or jurisdiction. Retrieved July 2, 2007, from <http://nces.ed.gov/pubsearch/getpubcats.asp?sid=091#061>

TOTREV Total state revenue in 2004 dollars.

Sources:

For 1992-2004: U.S. Census Bureau. (2007, May 2). Federal, state, and local governments: State government finances. Retrieved May, 31, 2007, from <http://www.census.gov/govs/www/state.html>

For 1985-1991: The Council of State Governments. The book of the states: State general revenue, by source and by state. Lexington, KY: Sharing Capitol Ideas.

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**TWOYR**      Percent of PSE students, by state, enrolled in two-year colleges.

Source: Derived Variable

**TYENR**      Total state enrollment of higher education students in two-year colleges.

Source: Snyder, T.D. Digest of education statistics: Total fall enrollment in degree-granting institutions, by control and type of institution and state or jurisdiction. Retrieved July 2, 2007, from <http://nces.ed.gov/pubsearch/getpubcats.asp?sid=091#061>

**UERATE**      State unemployment rate, not seasonally adjusted.

Source: U.S. Bureau of Labor Statistics. (2007). Local area unemployment statistics. Retrieved May 29, 2007, from <http://data.bls.gov/cgi-bin/surveymost?la>

### Appendix C: Carnegie Classification Variables

CNEGIE <sub>1</sub> Community and technical colleges	CNEGIE <sub>2</sub> Regional comprehensive colleges and universities	CNEGIE <sub>3</sub> Research universities
<ul style="list-style-type: none"> <li>• Associates colleges</li> </ul>	<ul style="list-style-type: none"> <li>• Masters colleges and universities I</li> <li>• Masters colleges and universities II</li> <li>• Baccalaureate colleges (liberal arts)</li> <li>• Baccalaureate colleges (general)</li> <li>• Baccalaureate/associates colleges</li> </ul>	<ul style="list-style-type: none"> <li>• Doctoral/research universities—extensive</li> <li>• Doctoral/research universities—intensive</li> </ul>

Source: Carnegie Foundation for the Advancement of Teaching (2002). *The Carnegie Classification of Institutions of Higher Education*, 2000 Edition. Menlo Park: The Carnegie Foundation for the Advancement of Teaching. Retrieved July 10, 2006 from <http://www.carnegiefoundation.org/classifications/index.asp?key=809>