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Measuring the Efficiency of Postsecondary Institutions: A Regression-based Approach to Adjusting for Differences in Cost Structures

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Abstract

While efficiency is frequently measured as a ratio between output and input (e.g., credentials per expenditure), differences in cost structures preclude attempts to compare and benchmark performance across institutions. This working paper seeks to refine the use of regression as viable tool for generating adjusted efficiency estimates. Longitudinal data were obtained from IPEDS for public two-year colleges (n= 898) and both public and private not-for-profit four-year institutions (n= 1,496). Panel regression was used to predict educational expenditures from the institution's degree production profile, faculty characteristics, and urbanization. An educational expenditures index was then computed as the difference between actual and predicted expenditures. The test-retest reliability of the index over two consecutive years was good to excellent for four-year institutions (*r*= .91 to .95) and two-year colleges (*r*= .74 to .82). Moderate correlations were observed between the expenditures index and unadjusted credentials per expenditure (*r*= .25 to .55). The results suggest that raw and adjusted efficiency indicators may yield divergent conclusions about institutional performance.

Measuring the Efficiency of Postsecondary Institutions: A Regression-based Approach to Adjusting for Differences in Cost Structures

A central objective of public accountability in higher education is to ensure that colleges and universities produce graduates with high-quality credentials at the lowest possible cost (St. John, Kline, & Asker, 2001). The ideal of efficient degree production has become particularly pressing as states attempt to meet future demands for a highly educated workforce. In the United States, approximately 65 percent of all jobs in 2020 will require some level of postsecondary education (Carnevale, Smith, & Strohl, 2013). And yet, current degree production trends suggest that only 48 percent of adults nationwide will hold an associate's degree or higher by 2025 (Lumina Foundation, 2013). Moreover, many states are decreasing funding for public postsecondary institutions. State and local appropriations decreased between 2000 and 2010 among public community colleges (-20 percent), bachelor's colleges (-20 percent), master's universities (-24 percent), and research universities (-24 percent), while enrollment increased by 23 to 50 percent at these institutions (Kirshstein & Hurlburt, 2012). A political consensus thus frequently demands that institutions do more with less.

Despite the importance of increasing productivity in higher education, the question of whether institutions manage resources efficiently has not been widely examined. Institutional efficiency has been commonly measured with relatively simple performance indicators, including the total educational expenditures per academic credential (e.g., Chronicle of Higher Education, 2012). However, such raw indicators may unfairly characterize an institution's degree of efficiency, for educational expenditures can vary tremendously by the types of credentials produced (e.g., certificates, bachelor's degrees, doctoral degrees) and the disciplines represented (Conger, Bell, & Stanley, 2010). Accordingly, an unadjusted efficiency indicator may not reflect differences in resource management but rather legitimate variation in cost structures. This study thus proposes an alternative efficiency indicator, wherein a common regression method is used to estimate whether educational expenditures are lower or higher than expected, given the institution's degree production profile, faculty attributes, and differences in the cost of living.

Using Multiple Regression to Estimate Institutional Efficiency

Three types of approaches have been utilized to overcome the shortcomings of simple input-output ratios in measuring efficiency: multiple regression, stochastic frontier analysis, and data envelopment analysis (e.g., Archibald & Feldman, 2008; Bailey & Xu, 2012; Johnes, 2006). There are key differences among these approaches in the estimation of the production frontier, the methods for weighting inputs, and the number of outputs that can be simultaneously examined. For example, data envelopment analysis (DEA) can utilize multiple inputs and outputs, and the production frontier is estimated as a piecewise linear function that does not assume a particular functional form. DEA utilizes extreme scores to identify a production frontier for the remaining institutions in the dataset. Whereas an institution that helps define the production frontier is considered efficient, institutions that lie below the frontier are deemed inefficient to varying degrees. The resulting efficiency scores in DEA reflect the proportion of resources that could sustain current production levels relative to institutions that form the frontier.

In contrast, multiple regression imposes a functional form and defines a production frontier through central tendencies. This method is preferred when the objective is to estimate the extent to which institutions deviate from average rather than extreme performance. In the traditional approach, inputs such as educational expenditures are specified as independent variables in a model that predicts graduation rates. The difference between the actual and predicted graduation rate can then be used as an indicator of efficiency. A difference greater than zero in which the actual graduation rate exceeds the predicted rate, for example, would suggest that an institution is attaining a high level of effectiveness given current expenditures.

Past applications of the regression-based approach, however, have not accounted for multiple types of output. Graduation rates, for example, are typically constructed from only one segment of the student body, such as first-time, full-time, degree-seeking students. Accordingly, productivity is neglected in relation to other enrolled students, including those who are part-time, transferring from another institution, certificate-seeking, or enrolled in a graduate program. This is particularly problematic given the current definitions of educational expenditures reported through the Integrated Postsecondary Education Data System (IPEDS), which reflect an institution's total investment in all enrolled students. Various adjustments have been proposed to isolate the amount of total expenditures allocated to undergraduate students (e.g., NACUBO, 2002), though the accuracy of these methods has not been demonstrated. In the absence of precise adjustments, the expenditures variable mainly represents an institution's general resource constraints.

The present study proposes a modest improvement to the regression-based approach in which the traditional concept of expenditures-per-credential is combined with a predictive model that accounts for institutional attributes. This synthesis follows from a definition of efficiency as a particular relationship between expenditures and output, wherein expenditures are minimized for a specific level and type of output (without sacrificing quality). More specifically, efficiency can be measured by comparing actual expenditures and the expenditures that would be predicted from an institution's degree production profile, critical investments in educational quality, and geographical context. Efficiency scores can then be computed as the difference between actual and predicted educational expenditures. Values below zero would indicate that educational expenditures are lower than expected, and values above zero would indicate that educational expenditures are higher than expected. Smaller values, then, would reflect greater degrees of efficiency, ceteris paribus.

Modeling Educational Expenditures

The expenditures of interest are those most closely linked with the instructional mission of colleges and universities. Institutional expenditures are currently reported through IPEDS within several broad categories: instruction; research; public service; academic support (e.g., academic administration, curricular development); student services (e.g., admissions, counseling, student activities); institutional support; operation maintenance of plant; scholarships and fellowships; auxiliary enterprises, such as residence halls and parking (i.e., operations funded through user fees); hospital services; independent operations; and other expenses (NCES, 2013a). While each of these categories may be at least indirectly associated with positive student outcomes, past research has variously demonstrated a positive relationship between student outcomes and three expenditure categories: instruction, student services, and academic support (Astin, 1993; Bailey et al., 2006; Chen, 2012; Gansemer-Topf & Schuh, 2006; Ryan, 2004; Smart et al., 2002; Toutkoushian & Smart, 2001; Webber & Ehrenberg, 2010; Pike et al., 2011).

The identification of relevant predictors of educational expenditures proceeds from the particular purpose of this study, namely the generation of residual scores that gauge institutional efficiency. On the one hand, the model should include independent variables that reflect variation in cost structures that stem from an institution's mission, investments in educational quality, or geographical contingencies. On the other hand, variables must be excluded from the model to the extent they reflect efficient practices or student characteristics that may inflate predicted expenditures. More specifically, this study utilizes three types of predictors: the institution's degree production profile, that is, the level and discipline of credentials conferred; educative conditions defined by faculty attributes; and geographical differences in the cost of living. The model excludes cost-savings measures unassociated with educational quality, FTE student enrollment for four-year institutions, and the academic preparedness of students.

Degree production profile.

The award level of credentials spans undergraduate and graduate instruction, comprising undergraduate certificates, associate's degrees, bachelor's degrees, post-baccalaureate certificates, master's degrees, post-master's certificates, professional doctoral degrees, and research doctoral degrees. Bachelor's degrees constituted 48 percent of all degrees conferred in 2010-11 (NCES, 2012a), followed by associate's degrees (27 percent), master's degrees (21 percent), and doctoral degrees (5 percent). Variation in the level of awards may be a significant source of differences in educational expenditures. In their cost study of public colleges and universities in four states, Conger, Bell, and Stanley (2010) observed that higher levels of instruction were generally associated with greater instructional expenditures. However, since 80 percent of all credit hours were completed at the undergraduate level, they found that undergraduate instruction accounted for over half of total instructional expenditures (66 percent).

Another feature of an institution's degree production profile pertains to the disciplines within which credentials have been conferred. Table 1 shows that 68 percent of bachelor's degrees conferred in the United States represented eight fields: business, social sciences and history, health professions, education, psychology, visual and performing arts, biological and biomedical sciences, and communication and journalism. There is considerable variation in the cost per student credit hour of these disciplines. For instance, Conger, Bell, and Stanley's (2010) analysis of public four-year institutions in Florida, Ohio, and Illinois revealed that the cost per credit hour at the undergraduate level was frequently low in psychology but high in the visual and performing arts, engineering, and the physical sciences. At the graduate level, they found that the cost was relatively low in business and education but high in the physical sciences and the visual and performing arts. Therefore, whereas degrees conferred within such fields as psychology and education should predict lower total educational expenditures, degrees within the physical sciences and visual and performing arts should be associated with higher educational expenditures.

Positive educative conditions.

A second dimension of the model accounts for institutional conditions that may increase educational quality but fail to minimize costs. As noted earlier, the majority of educational expenditures can be attributed to the cost of instruction, and thus increasing the student-faculty ratio or employing less expensive part-time faculty may be pursued as a cost-containment strategy. In the former case, the FTE student-faculty ratio grew at public two-year colleges from 15 students in 1997 (NCES, 2000) to 21 students in 2011 (NCES, 2013b), a period during which enrollment increased by 50 percent and state funding decreased by 19 percent (Kirshstein & Hurlburt, 2012). In the latter, the prospects for cost-savings are substantial: a part-time instructor with a full course load (8 courses) earns between $18,000 and $30,000 per year, compared to the average salary of $47,500 for full-time, non-tenure-track faculty members (Curtis & Thornton, 2013). Many institutions appear to have taken advantage of these cost savings, as the proportion of part-time instructional faculty in higher education has increased over the past three decades from 34 percent in 1980 to 50 percent in 2011 (NCES, 2012b).

Although both of these factors may be further modified to increase cost savings, recent research suggests that diminished effectiveness may result from reduced frequency and quality of student-faculty interactions. Porter's (2006) analysis of a nationally-representative sample of four-year college students indicated that the student-faculty ratio was negatively associated with a measure of student engagement (e.g., "talked with faculty about academic matters outside of class time"). Umbach (2007) found that, relative to full-time tenured and tenure-track professors, part-time instructors were less likely to use active and collaborative pedagogies, had lower expectations for students' academic effort, and spent less time on course preparation. Exposure to part-time faculty or the percentage of part-time faculty has been associated with lower frequency of both casual and substantive faculty-student interactions (Cox et al., 2010), lower odds of first-year persistence (Eagan & Jaeger, 2008), lower likelihood of attaining a credential at two-year colleges (Jaeger & Eagan, 2009), and lower graduation rates at four-year institutions (Ehrenberg & Zhang, 2005). To be sure, these findings are consistent with research demonstrating the crucial role of student-faculty interactions in promoting intellectual development, self-reported learning, and persistence, particularly when the interactions revolve around academic courses and plans (Kuh & Hu, 2001; Pascarella & Terenzini, 2005). Therefore, the student-faculty ratio and the mix of part- and full-time faculty are included in the expenditures model as they may enhance educational quality beyond their potential impact on degree production.

Cost of living.

The principal contextual factors of interest are those that reflect differences in the cost of living. The prices of goods and services are widely known to vary by degree of urbanization, state, and region. For example, consumer expenditures in such domains as housing tend to be higher in urban than in rural areas, which is arguably attributable to the combination of higher consumer demand and greater scarcity of land in urban areas (Hawk, 2013). Furthermore, the average family income differences among cities, states, and regions can change considerably after adjusting for differences in the cost of living (Aten, Figueroa, & Martin, 2012; Berry, Fording, & Hanson, 2000; Curran et al., 2006). In their examination of the Regional Price Parities index, for instance, Aten et al. (2012) found that the interstate per capita income range decreased from $39,741 to $26,447 after adjusting for price differences in goods and services. The present study makes a similar adjustment to reduce extraneous variation in educational expenditures.

Efficient practices and student characteristics.

The development of valid efficiency scores with a regression model necessitates the omission of amenable practices and certain student characteristics. Variables defined by the presence of innovative cost-containment strategies should be excluded in order to capture institutional effort in the residual term. Moreover, an output-oriented model that seeks to isolate the cost of program completion rather than enrollment should exclude such inputs as FTE student enrollment. Most public two-year colleges, though, maintain an open access admissions policy and thus enroll many students with only a weak commitment to the goal of obtaining a credential (Bahr, 2011). In this case, the inclusion of an FTE student enrollment variable would be necessary to ensure that two-year institutions are not penalized for enrolling a large number of students who are just “trying out” college.

Another class of student characteristics may also become problematic in a regression model, namely those pertaining to academic preparedness. It may be desirable to model differences in the quality of input since many institutions are limited in their ability to recruit highly prepared students. Colleges that serve primarily underprepared students may have higher costs associated with greater usage of academic support services. However, such attributes as the academic preparedness of students have been positively correlated with educational and general expenditures (Astin, 1977; *r*=. 44). Measures of academic preparedness should thus be omitted to avoid inflating the predicted expenditures of institutions with the greatest resources.

The Current Study

The purpose of this study is twofold. First, longitudinal, institution-level panel data are analyzed to predict educational expenditures at baccalaureate colleges, master's universities, research universities, and public two-year colleges. These institutional groups are analyzed separately to help establish homogeneity of cost structures. Second, the regression models are used to generate adjusted efficiency scores that reflect the extent to which educational expenditures deviate from an expected level. Longitudinal data are used to generate three-year average estimates of institutional efficiency, thereby reducing the potential effect of measurement error in any particular year.

The conceptual framework is suggestive of several hypotheses. First, the number of credentials conferred should be positively associated with expenditures, though the magnitude of the relationship is expected to vary by type of credential. Second, credentials conferred in relatively low-cost fields - psychology, business, and education - should predict lower educational expenditures. Credentials in high-cost fields - physical sciences, engineering, and visual and performing arts - should predict higher educational expenditures. Third, the student-faculty ratio should predict lower expenditures, and the proportion of full-time faculty employed should predict higher expenditures. Fourth, being located in urban rather than rural areas should predict higher educational expenditures.

Following the specification of regression models, the associated residual scores (used as indicators of institutional efficiency) are subjected to a test of reliability. Test-retest reliability is estimated with data from two consecutive years. While an appropriate measure was not identified for validation purposes, the degree of concordance was examined with an unadjusted efficiency measure. Insofar as the expenditures index in this study constitutes a distinct proxy for efficiency, it should not be highly correlated with unadjusted credentials per expenditure. Finally, the correlation between the expenditures index and student academic preparedness is examined among four-year institutions. A small correlation would demonstrate that the efficiency measure is not biased against institutions that serve students of a particular level of academic preparation

Method

Data Source

IPEDS data were obtained for all colleges and universities in the nation with the following characteristics: (a) Title IV participating and degree-granting; (b) public or private not-for-profit four-year or above and public two-year colleges; (c) full-time, first-time undergraduate students are present; and (d) Basic Carnegie Classification: research university, master’s university, baccalaureate college, and all public two-year associate’s degree-granting institutions except those designated as “special use” institutions. These restrictions yielded an initial sample of 1,496 four-year institutions and 898 two-year colleges.

Variables

Data were retrieved for educational expenditures, degree production profiles, faculty and urbanization attributes, and academic preparedness of students. Tables 2 and 3 provide descriptive statistics for four- and two-year institutions, respectively.

Educational expenditures.

Total educational expenditures were computed as the sum of instructional expenditures, student services expenditures, and academic support expenditures. Educational expenditures were adjusted for inflation to 2012 dollars, and the Regional Price Parities index (Aten, Figueroa, & Martin, 2012) was used to adjust for interstate differences in the cost of living. The data years for four-year institutions of 2006, 2007, and 2008 provide a four-year lag with degree production in 2010, 2011, and 2012, respectively. The data years for two-year colleges of 2008, 2009, and 2010 provide a two-year lag with degree production in 2010, 2011, and 2012, respectively. Institutions in full parent-child relationships were excluded from the analysis (84 four-year institutions; 27 two-year colleges).

Number of credentials conferred.

Eleven potential variables reflected different types of credentials conferred at four-year colleges: associate's degrees, bachelor's degrees, master's degrees, doctoral degrees (research), doctoral degrees (professional), doctoral degrees (other), certificates of less than one year, certificates of at least one year but less than two years, certificates of at least two years but less than four years, post-baccalaureate certificates, and post-master's certificates. Four variables reflected different types of credentials conferred at two-year colleges: associate's degrees, certificates of less than one year, certificates of at least one year but less than two years, and certificates of at least two years but less than four years. In addition, a variable for the number of transfer-out students was created for two-year colleges, many of which aim to prepare students for success at a four-year institution.

Proportion of credentials by discipline.

A set of 38 variables was defined with the total number of credentials identified by each code of the Classification of Instructional Programs (CIP): agriculture, architecture, ethnic and cultural studies, biological sciences, business, communication and journalism, communications technologies, computer sciences, construction, education, engineering, engineering technologies, English, consumer sciences, foreign languages, health professions, history, protective services, legal professions, liberal arts, library science, mathematics, mechanic and repair, military, interdisciplinary, natural resources and conservation, parks, recreation, and leisure studies, personal and culinary services, philosophy, physical sciences, precision production, psychology, public administration, science technologies, social sciences, theology, transportation, and the visual and performing arts. Missing values for any particular category were recoded as zero.

Student-faculty ratio.

The student-faculty ratio was defined as the ratio of the total FTE undergraduate students and the total FTE employees whose primary duties include instruction.

Proportion of full-time faculty.

The proportion of full-time faculty on campus was defined by the ratio of full-time employees with primarily instructional duties and the total number of employees with primarily instructional duties.

Urbanization.

The institution's urbanization status was dummy-coded with five categories: large city (population of 250,000 or more); midsize city (population of 100,000 – 249,999); small city (population of less than 100,000); suburb; and town or rural area (reference).

Academic preparedness.

The four-year institution's 25th percentile SAT test score (math plus verbal) for first-time, degree/certificate-seeking undergraduate students served as a proxy for the average academic preparedness of students. ACT scores were converted to SAT scores for institutions that have a relatively low proportion of students who submit SAT scores (see ACT, 2012). A measure of academic preparedness was unavailable for two-year colleges.

Analysis

Some variables had missing data, extreme scores, and non-normal distributions. The problem of missing data did not exceed four percent of cases for any variable with the exception of educational expenditures for four-year institutions (7 percent of cases missing) and the number of transfer students among two-year colleges (14 percent of cases missing). Institutions with missing expenditure data had slightly lower bachelor's degree production, fewer full-time faculty, and higher student-faculty ratios. Two-year colleges with missing data tended to have smaller enrollments and more certificate-seeking students. Missing data were replaced with multiple imputation by chained equations over five data sets. All variables were included in the imputation model. However, the imputed values for the dependent variables were not used in the subsequent analysis stage in order to minimize the potential for bias (see von Hippel, 2007). A sensitivity analysis indicated that the residuals obtained from multiple imputation and listwise deletion were highly correlated among four-year institutions (r= .97 to .98) and two-year colleges (r= .98).Only the final pooled coefficients and standard errors are reported.

Several variables were transformed to induce normality and reduce the influence of outliers. A logarithmic transformation was applied to correct positive skewness for the educational expenditures variable, the number of credentials conferred, most proportions of credentials by discipline, and the student-faculty ratio. A square root transformation was used to correct moderate positive skewness for some proportions of credentials by discipline. An examination of partial residual plots revealed some nonlinear relationships, which were subsequently modeled with centered quadratic terms. Finally, influential multivariate outliers identified through Cook's D and Mahalanobis distance were deleted to ensure stable solutions. These procedures yielded a final sample size of 557 baccalaureate colleges, 582 master's universities, 248 research universities, and 880 two-year colleges.

Separate regression models of baccalaureate, master's, research, and two-year institutions were developed to maximize homogeneity of institutional mission. A repeated measures, hierarchical linear regression analysis was conducted with SPSS 22, which adjusts for non-independence of errors that may result from the longitudinal panel and the clustered nature of the sample (Muthén & Satorra, 1995). Institutions are treated as clustered within states, wherein such factors as per capita income influence the availability of resources for higher education (see Horn, 2013). The potential utility of hierarchical regression was evidenced by small to moderate intraclass correlations for baccalaureate colleges (ρ =.21), master's universities (ρ =.13), research universities (ρ =.07), and public two-year colleges (ρ =.31). A parsimonious model for each institutional sample was developed by entering all variables as a single block and then dropping non-significant variables stepwise. In order to provide a better sense of the relative importance of the predictors, beta coefficients were computed by conducting a regression analysis with standardized variables.

Four-year institutions.

Tables 4-6 summarize the regression results for baccalaureate colleges, master's universities, and research universities, respectively. Several variables within each rubric were statistically significant predictors of educational expenditures in each sample, and many nonlinear relationships were detected. Regarding the level of awards, the number of baccalaureate degrees was strongly associated with educational expenditures. For example, a one standard deviation increase in the number of bachelor's degrees was associated with a .76 standard deviation increase in educational expenditures among baccalaureate colleges. The number of master's degrees was also consistently and positively associated with educational expenditures (β =.03 to .25). Among research universities, the number of professional doctoral degrees was the strongest predictor of educational expenditures (β =.28). Certificates exhibited the weakest relationship with educational expenditures among master's and research universities (β =.03 to .05).

In the second category, reflecting the proportion of credentials conferred by discipline, three variables appeared in each institutional sample that predicted higher educational expenditures: (a) credentials in biological sciences (β =.07 to .11); (b) credentials in the visual and performing arts (β =.08 to .11); and (c) credentials in the social sciences (β = .05 to .09). The proportion of credentials conferred in engineering was positively associated with educational expenditures at master's and research universities (β =.04 to .05). A small negative linear effect for engineering credentials (β = -.03) combined with an upwards curvature (β =.07) was detected among baccalaureate colleges. The proportion of credentials conferred in the physical sciences was also positively associated with educational expenditures at master's and research universities (β = .09 to .10). Conversely, negative associations were observed for credentials conferred in business (baccalaureate colleges, master's universities), education (master's universities, research universities), and psychology (master's universities, research universities).

As hypothesized, the two variables reflecting faculty attributes were uniquely associated with educational expenditures. The student-faculty ratio was negatively and consistently associated with educational expenditures, such that a one standard deviation increase in the number of students per faculty was associated with a .06 to .13 standard deviation decrease in educational expenditures. In contrast, the proportion of full-time faculty predicted higher expenditures (β =.02 to .05). The principal contextual attribute, urbanization type, was associated with educational expenditures only in the case of master's universities. Master's universities in large cities (β =.08) had higher expenditures than their counterparts located elsewhere.

Two-year institutions.

As depicted in Table 7, several variables within each rubric were statistically significant predictors of educational expenditures among public two-year colleges. Fulltime equivalent student enrollment was strongly associated with educational expenditures (β = .67). Regarding the number of credentials conferred, a one standard deviation increase in the number of associate's degrees was associated with a .22 standard deviation increase in educational expenditures. The number of certificates conferred (β = .02) and the number of transfer students (β = .05) were also positively associated with educational expenditures. The quadratic terms for associate's degrees and transfer students indicate an upwards curvature in the relationship with expenditures.

In the second category, reflecting the proportion of credentials conferred by discipline, the statistically significant variables exhibited positive, albeit weak, associations with educational expenditures, including health professions, mechanic and repair fields, personal and culinary services, and visual and performing arts. Regarding faculty attributes, the student-faculty ratio was negatively associated with educational expenditures (β = -.05), and the proportion of full-time faculty on campus predicted higher expenditures (β = .05). Finally, urbanization status was strongly associated with educational expenditures. For instance, being located in a large city was associated with a .26 standard deviation increase in educational expenditures, relative to being located in a town or rural area.

Development of Efficiency Indicator

The mean residual values generated from the final regression model were used to develop an efficiency indicator. Residual scores were set to zero if the predicted expenditures fell within the 95 percent confidence interval, which reduces the likelihood that deviations from actual expenditures are attributable to random error (see Porter, 2000). Among four-year and two-year institutions, approximately 33 to 48 percent of predicted expenditures did not differ significantly from actual expenditures. However, only 17 percent of four-year institutions and 10 percent of two-year colleges had identical actual and predicted expenditures across all three data years.

The residual values were converted into z-scores that more readily indicate the proximity of an institution to the average deviation between actual and expected expenditures (i.e., actual expenditures equal expected expenditures). While estimates of institutional efficiency must be compared across institutions of similar type, the common practice of using broad Carnegie Classification categories may neglect significant variation in programmatic costs within groups of baccalaureate, master's, and research institutions. Accordingly, expenditure z-scores were calculated separately within each of the nine sub-types of four-year institutions identified by the Carnegie Classification system: Baccalaureate Colleges: Arts and Sciences; Baccalaureate Colleges: Diverse Fields; Baccalaureate/Associate's Colleges; Master's Colleges and Universities (larger programs); Master's Colleges and Universities (medium programs); Master's Colleges and Universities (smaller programs); Doctoral/Research Universities; Research Universities (high research activity); and Research Universities (very high research activity). Public two-year colleges were treated as one group of institutions since the Carnegie

Classification system has not yet established criteria for distinguishing two-year colleges by programmatic emphasis. The final indicators for four- and two-year institutions had a mean of .00 and a standard deviation of 1.00.

Reliability of Efficiency Estimates

In order to examine the test-retest reliability of the efficiency measure, a correlation matrix was examined containing the residual estimates from 2010, 2011, and 2012. A threshold of .60 was set for acceptable reliability, .70 for good reliability, and .90 for excellent reliability (Nunnally, 1988). The analysis revealed an excellent degree of consistency among four-year institutions: baccalaureate colleges, 2010 and 2011 (r = .93), 2011 and 2012 (r = .92); master's universities, 2010 and 2011 (r = .95), 2011 and 2012 (r = .91); and research universities, 2010 and 2011 (r = .96), 2011 and 2012 (r = .93). The analysis also revealed a good degree of consistency among two-year colleges between the 2010 and 2011 scores (r = .82) and between the 2011 and 2012 scores (r = .74).

Relationship with Other Measures

The degree of concordance with a traditional measure of efficiency was tested by examining the correlation between the proposed measure and raw credentials per expenditure. The expenditure index scores were reverse-coded such that positive correlations reflect greater correspondence. Across the three data years, positive moderate correlations were observed between the expenditures index and total credentials per educational expenditures among research universities (r = .45 to .46), master's universities (r = .55), baccalaureate colleges (r = .35 to .49), and two-year colleges (r = .25 to .31).

Correlations with a measure of academic preparedness were examined to explore the potential for bias since indicators of input quality were not included in the model. Among four-year institutions, only weak associations were observed among the efficiency scores and the SAT 25th percentile score: research universities (*r* = .09), master's universities (*r* = .01), and baccalaureate colleges (*r* = .05). Conversely, larger correlations were found between unadjusted credentials per expenditure and the SAT 25th percentile score: research universities (*r* = -.54), master's universities (*r* = -.15), and baccalaureate colleges (*r* = -.37). (A measure of academic preparedness was unavailable for two-year colleges.)

Proposed Criteria for Interpretation

The interpretation of the expenditure z-scores can be facilitated with a five-category system, which reduces the salience of trivial differences between similar institutions (see Volkwein & Grunig, 2005). The interval for "moderate" efficiency was defined as -.15 thru .39, which captures approximately 35 percent of four-year institutions and 28 percent of two-year colleges. The asymmetry in this interval is intended to acknowledge that institutions with higher-than-expected expenditures may be investing in educational quality without a direct effect on degree production. Institutional expenditure scores equal to or greater than one standard deviation above the mean ($x >= 1.00$) are rated "Very High," indicating that expenditures are much higher than expected. Scores within one standard deviation above the mean but above the "moderate" mark ($.39 < x < 1.00$) are rated as "High." Scores equal to or less than one standard deviation below the mean ($x <= -1.00$) are assigned a rating of "Very Low." Scores that fall within one standard deviation below the mean and below the "moderate" mark ($-.15 > x > -1.00$) are assigned a rating of "Low." The resulting ratings can be portrayed at both the institutional and public system levels. In order to aggregate institutional performance to the state level, an average performance score weighted by FTE student enrollment was calculated for each state (see Table 8).

Discussion

The purpose of this study was to illustrate a method of creating a proxy for measuring efficiency, which was defined in terms of the difference between actual and expected educational expenditures. A hierarchical panel regression analysis was used with a national sample to produce three-year average estimates of institutional efficiency. Separate regression analyses were conducted for two-year colleges, baccalaureate colleges, master's universities, and research universities to reduce heterogeneity in institutional cost structures. The regression models confirmed that educational expenditures can be reliably predicted from an institution's degree production profile, the density and employment status of faculty, and urbanization, though relevant predictors varied by institutional type. For example, consistent with past research on differences in the cost of instruction by discipline (Conger, Bell, & Stanley, 2010), the production of credentials in engineering, visual and performing arts, and the sciences predicted higher educational expenditures. In contrast, the proportion of credentials conferred in education, business, and psychology predicted lower expenditures. However, each institutional sub-sample yielded a distinct set of predictive disciplines. Among two-year colleges, for instance, mechanic and repair credentials were associated with higher expenditures, while holding other variables constant.

Although the resulting efficiency scores were quite reliable between consecutive data years, it is less clear whether the measure is valid. Moderate positive correlations were observed between the present efficiency indicator and unadjusted credentials per educational expenditure. This suggests that the expenditures index is measuring a similar, yet distinct aspect of institutional performance. Moreover, the regression-based approach appears to minimize bias against institutions with particular levels of academic preparedness. While there was little relationship between the expenditures index and the academic preparedness of students, moderate correlations were revealed with the unadjusted efficiency measure. Particularly among baccalaureate and research institutions, greater efficiency defined by credentials per expenditure was associated with lower academic preparedness, which is likely a product of higher educational expenditures among selective institutions (Astin, 1977).

The question of validity is particularly pressing since a primary assumption of this approach is that lower expenditures for degree production are not achieved by diminishing educational quality. Moreover, an important caveat in using this indicator is that high expenditure scores may result from unmeasured, yet positive, investments associated with educational quality. Two critical variables were included in the regression models to help control for this possibility, namely the density and employment status of faculty (see Cox et al., 2010). Nonetheless, an institution could conceivably increase degree completion through such unsavory means as reducing academic rigor. Accordingly, the proposed measure of efficiency must be interpreted in the context of other indicators that reflect institutional effectiveness in promoting degree completion and fostering student learning.

Implications and Limitations

The state-level results demonstrate that seemingly inefficient public systems may in fact be utilizing resources wisely. Four-year public institutions in Iowa, for example, appear to be very inefficient when using a raw measure of credentials per total educational expenditures (nearly one standard deviation below the mean). However, the actual expenditures of these institutions were relatively close to the predicted expenditures, given the types of credentials conferred, faculty attributes, and the cost of living. In contrast, public two-year colleges in Kansas exhibit an average level of efficiency when using the unadjusted metric but actually have higher-than-expected expenditures, which may reflect institutional inefficiency. Raw efficiency indicators may thus fail to accurately portray whether institutions are minimizing educational expenditures given their unique attributes.

Several methodological limitations could be addressed in future research. First, this study only analyzed educational expenditures, which precludes inferences about resource management in other arenas, such as administrative support and operation/plant maintenance. Second, data limitations did not allow an analysis of intra-institutional variation in efficiency. Data on faculty time and departmental expenditures, for instance, would enable the development of a more refined measure of efficiency (see University of Delaware, 2014). Third, low frequencies for some degree types may have resulted in the attenuation of correlations and biased regression weights. Future studies can address this problem by combining degree categories with similar cost structures. Finally, the regression-based approach and proposed cut-off scores may have overestimated the prevalence of efficiency by comparing institutional performance to average performance. Alternative methods such as data envelopment analysis that compares institutions with a more aspirational production frontier may yield divergent findings.

In conclusion, the societal impact of colleges and universities in the United States is partly determined by how efficiently they utilize their resources. Attempts to measure and promote efficiency, however beset by obstacles, are arguably crucial to reaching the long-term educational attainment goals espoused within state and national public agendas. An accurate determination of whether taxpayer dollars are being efficiently used for educational purposes must account for variation in institutional cost structures, including degree production profiles, educational quality, and the cost of living. This study demonstrated that comparisons of actual and predicted expenditures offer a reliable and distinctive alternative to using such common indicators as credentials per expenditure. The resulting performance ratings should incite further investigation of effective practices at high-performing institutions and state systems.

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Table 1. Percent of Bachelor's Degrees Conferred during 2009-10 by Academic Field

Field	*Percent of Total*
Business	21.71
Social sciences and history	10.47
Health professions and related programs	7.86
Education	6.14
Psychology	5.89
Visual and performing arts	5.56
Biological and biomedical sciences	5.24
Communication, journalism, and related programs	4.93
Engineering	4.40
English language and literature/letters	3.23
Liberal arts and sciences, general studies, and humanities	2.85
Homeland security, law enforcement, and firefighting	2.65
Computer and information sciences	2.40
Multi/interdisciplinary studies	2.28
Parks, recreation, leisure, and fitness studies	2.02
Agriculture and natural resources	1.60
Public administration and social services	1.54
Physical sciences and science technologies	1.42
Family and consumer sciences/human sciences	1.32
Foreign languages, literatures, and linguistics	1.30
Engineering technologies	0.97

Mathematics and statistics	0.97
Philosophy and religious studies	0.76
Architecture and related services	0.61
Theology and religious vocations	0.53
Area, ethnic, cultural, gender, and group studies	0.52
Transportation and materials moving	0.30
Communications technologies	0.29
Legal professions and studies	0.24
Library science	0.01
Military technologies and applied sciences	0.00
Precision production	0.00

Source. NCES. (2014). *Bachelor's degrees conferred by degree-granting institutions, by field of study: Selected years, 1970-71 through 2009-10.*

Table 2.

Descriptive Statistics for Four-Year Institutions

	M	SD	M	SD	M	SD
Dependent variable	2006		2007		2008	
Educational expenditures	88024978	168825733	91400309	176252578	96361614	187537371
Number of credentials conferred	2010		2011		2012	
Associate's degrees	45.68	168.58	49.57	182.31	50.37	188.60
Bachelor's degrees	998.86	1412.07	1037.18	146.09	1071.92	1506.88
Master's degrees	383.93	646.96	404.76	678.86	416.39	711.69
Doctoral degrees (research)	33.97	107.40	35.58	111.18	36.89	113.83
Doctoral degrees (professional)	46.40	133.77	48.05	135.31	49.91	138.01
Doctoral degrees (other)	.44	4.94	.41	3.50	.43	3.81
Less-than-one-year certificates conferred	6.09	42.12	6.38	43.80	7.47	49.98
Less-than-two-year certificates conferred	4.84	29.06	5.29	28.82	5.18	25.35
Less-than-four-year certificates conferred	.94	15.15	.96	16.02	1.19	18.31
Post-baccalaureate certificates	17.46	105.09	18.86	96.83	19.27	83.09
Post-master's certificates	11.24	49.37	10.96	46.30	10.71	44.83
Proportion of credentials conferred by discipline	2010		2011		2012	
Agriculture	.01	.02	.01	.02	.01	.02
Architecture	.00	.02	.00	.02	.00	.02

Ethnic and cultural studies	.00	.02	.00	.02	.00	.01
Biological sciences	.04	.04	.04	.04	.05	.04
Business	.21	.14	.20	.13	.19	.13
Communication and journalism	.03	.03	.03	.03	.03	.03
Communications technologies	.00	.01	.00	.01	.00	.01
Computer sciences	.02	.04	.02	.04	.02	.04
Construction	.00	.01	.00	.01	.00	.01
Education	.14	.13	.14	.13	.13	.13
Engineering	.03	.08	.03	.08	.03	.08
Engineering technologies	.01	.03	.01	.03	.01	.03
English	.03	.03	.03	.03	.03	.04
Consumer sciences	.01	.02	.01	.03	.01	.02
Foreign languages	.01	.02	.01	.02	.01	.02
Health professions	.10	.12	.10	.12	.11	.13
History	.02	.02	.02	.02	.02	.02
Protective services	.02	.05	.02	.05	.02	.05
Legal professions	.01	.04	.01	.04	.01	.04
Liberal arts	.04	.10	.04	.10	.04	.10
Library science	.00	.01	.00	.01	.00	.01
Mathematics	.01	.01	.01	.01	.01	.01
Mechanic and repair	.00	.01	.00	.02	.00	.01
Military	.00	.00	.00	.00	.00	.00
Interdisciplinary	.02	.05	.02	.04	.02	.04
Natural resources and conservation	.01	.02	.01	.03	.01	.03
Parks, Recreation, and	.02	.03	.02	.03	.02	.03

Leisure Studies						
Personal and culinary						
services	.00	.03	.00	.03	.00	.03
Philosophy	.01	.02	.01	.03	.01	.04
Physical sciences	.01	.02	.01	.02	.01	.02
Precision production	.00	.00	.00	.01	.00	.00
Psychology	.05	.05	.06	.05	.06	.05
Public administration	.02	.04	.02	.04	.02	.04
Science technologies	.00	.00	.00	.00	.00	.00
Social sciences	.06	.07	.06	.07	.05	.06
Theology	.02	.07	.02	.07	.02	.06
Transportation	.00	.03	.00	.03	.00	.03
Visual and performing arts	.04	.05	.04	.05	.04	.05
Faculty and Contextual	2006		2007		2008	
Attributes						
Student-faculty ratio	14.55	5.92	14.45	6.47	14.35	6.24
Proportion full-time faculty	.61	.22	.60	.22	.59	.21
Urbanization: large city	.17		.17		.17	
Urbanization: medium city	.12		.12		.12	
Urbanization: small city	.15		.15		.15	
Urbanization: suburb	.22		.22		.22	
Urbanization: town or rural	.33		.33		.33	

Table 3.

Descriptive Statistics for Two-Year Institutions

	M	SD	M	SD	M	SD
Dependent variable	2008		2009		2010	
Educational expenditures	29451024	25919323	30339738	26952660	35224733	32255935
Number of credentials conferred	2010		2011		2012	
Associate's degrees	572.83	536.59	617.18	565.66	685.21	692.67
Less-than-one-year certificates conferred	247.73	393.90	266.31	417.56	274.44	432.77
Less-than-two-year certificates conferred	142.16	171.06	172.27	218.57	176.53	247.55
Less-than-four-year certificates conferred	8.51	28.38	8.54	28.67	7.92	27.25
Transfer students	155.19	154.51	147.82	155.92	169.33	176.09
Proportion of credentials conferred by discipline	2010		2011		2012	
Agriculture	.01	.04	.01	.04	.01	.04
Architecture	.00	.00	.00	.00	.00	.00
Ethnic and cultural studies	.00	.00	.00	.00	.00	.00
Biological sciences	.00	.01	.00	.01	.00	.01
Business	.11	.07	.11	.07	.10	.06
Communication and journalism	.00	.01	.00	.01	.00	.01
Communications technologies	.00	.01	.00	.01	.00	.01
Computer sciences	.03	.03	.03	.03	.03	.03

Construction	.02	.04	.02	.04	.02	.04
Education	.02	.04	.02	.03	.02	.04
Engineering	.00	.01	.00	.01	.00	.01
Engineering technologies	.04	.05	.04	.55	.04	.05
English	.00	.01	.00	.01	.00	.01
Consumer sciences	.02	.03	.02	.03	.02	.03
Foreign languages	.00	.01	.00	.01	.00	.01
Health professions	.27	.15	.26	.15	.25	.14
History	.00	.00	.00	.00	.00	.00
Protective services	.04	.05	.04	.05	.04	.04
Legal professions	.01	.01	.01	.01	.01	.01
Liberal arts	.25	.18	.25	.18	.26	.17
Library science	.00	.00	.00	.00	.00	.00
Mathematics	.00	.00	.00	.01	.00	.00
Mechanic and repair	.05	.06	.05	.06	.05	.06
Military	.00	.01	.00	.01	.00	.01
Interdisciplinary	.02	.04	.02	.04	.02	.05
Natural resources and conservation	.00	.02	.00	.02	.00	.02
Parks, Recreation, and Leisure Studies	.00	.01	.00	.01	.00	.01
Personal and culinary services	.02	.03	.02	.03	.02	.03
Philosophy	.00	.00	.00	.00	.00	.00
Physical sciences	.00	.01	.00	.01	.00	.01
Precision production	.02	.04	.02	.04	.02	.04
Psychology	.00	.01	.00	.01	.00	.01
Public administration	.01	.02	.01	.02	.01	.02

Science technologies	.00	.01	.00	.02	.00	.01
Social sciences	.01	.03	.01	.03	.01	.03
Theology	.00	.00	.00	.00	.00	.00
Transportation	.01	.05	.01	.04	.01	.05
Visual and performing arts	.02	.03	.02	.03	.02	.03
Student, Faculty, and Contextual Attributes	2008		2009		2010	
FTE student enrollment	4682	4475	5174	4843	5290	4939
Student-faculty ratio	19.13	5.90	21.49	6.32	21.66	6.49
Proportion full-time faculty	.36	.17	.35	.16	.34	.15
Urbanization: large city	.10		.10		.10	
Urbanization: medium city	.08		.08		.08	
Urbanization: small city	.12		.12		.12	
Urbanization: suburb	.18		.18		.18	
Urbanization: town or rural	.52		.52		.52	

Table 4.

Predicting Educational Expenditures among Baccalaureate Colleges (n=557)

	Educational Expenditures (log)			
	b	*SE*	*β*	*p*
Level 1 Intercept	5.84	.06		.000
Time 1	-.03	.00	-.08	.000
Time 2	-.01	.00	-.04	.000
Number of credentials conferred				
Associate's degrees (log)	-.01	.01	-.02	.546
Associate's degrees squared	.09	.01	.25	.000
Bachelor's degrees (log)	.70	.03	.76	.000
Master's degrees (log)	.01	.01	.03	.233
Master's degrees squared	.04	.01	.06	.004
Proportion of credentials conferred by discipline				
Biological sciences (sqrt)	.18	.06	.07	.002
Business (sqrt)	-.23	.03	-.13	.000
Computer sciences (log)	.02	.01	.03	.094
Computer sciences squared	-.08	.02	-.06	.000
Engineering (log)	-.02	.01	-.03	.035
Engineering squared	.04	.01	.07	.000
Foreign language (log)	.05	.02	.07	.002
Leisure studies (log)	-.03	.01	-.05	.002
Liberal arts (log)	-.05	.01	-.09	.000
Liberal arts squared	.03	.01	.05	.003
Natural resources (log)	.03	.02	.04	.045
Natural resources squared	-.04	.02	-.04	.024
Public administration (log)	.00	.01	-.01	.710

Public administration squared	-.06	.02	-.07	.000
Social sciences (log)	.04	.01	.08	.001
Theology (log)	-.04	.01	-.08	.000
Visual and performing arts (log)	.05	.01	.08	.000
Faculty Attributes				
Student-faculty ratio (log)	-.14	.02	-.06	.000
Proportion full-time faculty	.04	.01	.02	.017
Random effect estimate				
State-level intercept	.00	.00		.076
$\chi^2(26)$	1421.26			.000

Note. The chi-square difference test compares the deviance statistics for a full and intercepts-only model. The OLS adjusted r-square estimate for the full model is .88.

Table 5.

Predicting Educational Expenditures among Master's Universities (n=582)

	Educational Expenditures (log)			
	b	*SE*	*β*	*p*
Level 1 Intercept	7.53	.05		.000
Time 1	-.04	.00	-.12	.000
Time 2	-.02	.00	-.07	.000
Number of credentials conferred				
Associate's degrees (log)	.02	.01	.05	.001
Bachelor's degrees (log)	.55	.02	.66	.000
Bachelor's degrees squared	-.09	.02	-.09	.000
Master's degrees (log)	.21	.02	.25	.000
Master's degrees squared	.07	.02	.04	.003
Doctoral degrees (research) (log)	.08	.02	.11	.000
Doctoral degrees (research) squared	-.06	.02	-.07	.010
Doctoral degrees (professional) (log)	-.01	.01	-.02	.589
Doctoral degrees (professional) squared	.05	.01	.16	.000
Less-than-two-year certificates (log)	.03	.01	.04	.004
Post-baccalaureate certificates (log)	.01	.01	.03	.013
Proportion of credentials conferred by discipline				
Biological sciences (sqrt)	.30	.08	.07	.000
Business (sqrt)	-.14	.03	-.07	.000
Communication and journalism (sqrt)	.27	.05	.08	.000
Education (sqrt)	-.16	.03	-.09	.000
Education squared	.40	.11	.06	.000
Engineering (log)	.01	.00	.01	.240
Engineering squared	.02	.00	.05	.000

Physical sciences (log)	.05	.01	.09	.000
Psychology (sqrt)	-.17	.05	-.05	.001
Social sciences (log)	.15	.06	.05	.008
Visual and performing arts (log)	.06	.01	.11	.000
Visual and performing arts squared	.04	.01	.06	.000
Faculty Attributes				
Student-faculty ratio (log)	-.24	.05	-.13	.000
Student-faculty ratio squared	.08	.02	.09	.000
Proportion full-time faculty	.06	.01	.04	.000
Contextual Attributes				
Urbanization: large city	.02	.01	.08	.028
Random effect estimate				
State-level intercept	.00	.00		.072
$\chi^2(29)$	1749.04			.000

Note. The chi-square difference test compares the deviance statistics for a full and intercepts-only model. The OLS adjusted r-square estimate for the full model is .90.

Table 6.

Predicting Educational Expenditures among Research Universities (n=248)

	Educational Expenditures (log)			
	b	*SE*	*β*	*p*
Level 1 Intercept	7.73	.14		.000
Time 1	-.04	.00	-.09	.000
Time 2	-.02	.00	-.05	.000
Number of credentials conferred				
Bachelor's degrees (log)	.23	.05	.20	.000
Bachelor's degrees squared	-.18	.05	-.08	.000
Master's degrees (log)	.30	.03	.25	.000
Doctoral degrees (research) (log)	.19	.03	.22	.000
Doctoral degrees (research) squared	.07	.02	.05	.004
Doctoral degrees (professional) (log)	.11	.01	.28	.000
Doctoral degrees (professional) squared	.04	.01	.10	.000
Less-than-two-year certificates conferred (log)	.04	.01	.05	.003
Proportion of credentials conferred by discipline				
Biological sciences (sqrt)	.60	.13	.11	.000
Education (sqrt)	-.21	.07	-.07	.003
Engineering (log)	.02	.01	.04	.054
Physical sciences (log)	.11	.03	.10	.001
Physical sciences squared	.07	.03	.06	.006
Psychology (sqrt)	-.39	.14	-.06	.006
Social sciences (sqrt)	.39	.11	.09	.000
Social sciences squared	-1.69	.60	-.06	.005
Theology (log)	.03	.01	.06	.009
Visual and performing arts (log)	.43	.11	.08	.000

Faculty Attributes				
Student-faculty ratio (log)	-.17	.04	-.07	.000
Proportion full-time faculty (reflected sqrt)	-.11	.02	-.05	.000
Random effect estimate				
State-level intercept	.00	.00		.075
$\chi^2(22)$	383.29			.000

Note. The chi-square difference test compares the deviance statistics for a full and intercepts-only model. The OLS adjusted r-square estimate for the full model is .93. The coefficient for theology is positive due to a suppressor effect.

Table 7.

Predicting Educational Expenditures among Public Two-Year Colleges Data (n=880)

	Educational Expenditures (log)			
	b	*SE*	*β*	*p*
Level 1 Intercept	5.33	.07	-.01	.000
Time 1	-.04	.00	-.10	.000
Time 2	-.05	.00	-.15	.000
FTE student enrollment	.60	.02	.67	.000
Number of credentials conferred				
Associate's degrees (log)	.19	.02	.22	.000
Associate's degrees squared	.07	.01	.06	.000
Less-than-one-year certificates conferred (log)	.01	.00	.02	.033
Transfer students (log)	.04	.01	.05	.000
Transfer students squared	.01	.01	.02	.031
Proportion of credentials conferred by discipline				
Health professions (sqrt)	.06	.02	.03	.001
Mechanic and repair (log)	.01	.00	.02	.006
Personal and culinary services (log)	.01	.00	.02	.023
Visual and performing arts (log)	.01	.00	.03	.000
Faculty Attributes				
Student-faculty ratio (log)	-.12	.02	-.05	.000
Proportion full-time faculty	.13	.02	.05	.000
Contextual Attributes				
Urbanization: large city	.09	.01	.26	.000
Urbanization: medium city	.06	.01	.17	.000
Urbanization: small city	.03	.01	.10	.001
Urbanization: suburb	.05	.01	.14	.000

Random effect estimate			
State-level intercept	.01	.00	.000
$\chi^2(18)$	2159.21		.000

Note. The chi-square difference test compares the deviance statistics for a full and intercepts-only model. The OLS adjusted r-square estimate for the full model is .90.

Table 8.

State-Level Expenditure Ratings for Four- and Two-Year Public Systems

	Public Four-Year Institutions			Public Two-Year Institutions		
	Raw credentials per expenditure z-score	Expenditures index z-score	Expenditures Rating	Raw credentials per expenditure z-score	Expenditures index z-score	Expenditures Rating
Alabama	-0.18	0.32	Moderate	-0.50	0.04	Moderate
Alaska	-0.97	2.57	Very High	n/a	n/a	n/a
Arizona	-0.02	-0.03	Moderate	0.39	0.02	Moderate
Arkansas	0.26	-0.61	Low	0.42	-0.09	Moderate
California	0.12	0.01	Moderate	-0.33	0.13	Moderate
Colorado	-0.10	-0.85	Low	0.40	-0.12	Moderate
Connecticut	-0.44	0.49	High	-0.68	-0.01	Moderate
Delaware	-1.25	1.59	Very High	-0.43	0.11	Moderate
Florida	0.56	-0.31	Low	0.54	-0.73	Low
Georgia	0.14	-0.30	Low	2.15	-0.12	Moderate
Hawaii	-0.85	-0.15	Moderate	-0.66	-0.02	Moderate
Idaho	-0.44	-0.19	Low	-0.48	0.04	Moderate
Illinois	-0.28	-0.10	Moderate	0.45	0.37	Moderate
Indiana	-0.55	0.56	High	-0.07	-0.22	Low
Iowa	-0.84	0.18	Moderate	-0.15	-0.04	Moderate
Kansas	-0.25	-0.11	Moderate	0.03	0.82	High
Kentucky	-0.53	0.44	High	1.22	-0.14	Moderate
Louisiana	-0.20	0.08	Moderate	0.26	0.39	Moderate
Maine	-0.61	0.12	Moderate	-0.23	0.04	Moderate
Maryland	0.44	-0.53	Low	-0.60	0.47	High
Massachusetts	-0.02	0.06	Moderate	-0.32	-0.11	Moderate

Michigan	-0.31	0.19	Moderate	-0.35	-0.06	Moderate
Minnesota	-0.52	0.18	Moderate	-0.04	0.00	Moderate
Mississippi	-0.31	0.10	Moderate	-0.41	0.01	Moderate
Missouri	-0.33	0.05	Moderate	-0.16	-0.01	Moderate
Montana	-0.40	-1.04	Very Low	-0.45	-0.10	Moderate
Nebraska	-0.35	0.06	Moderate	-0.22	-0.44	Low
Nevada	-0.61	0.55	High	-0.71	0.01	Moderate
New Hampshire	0.04	-0.08	Moderate	0.68	-0.75	Low
New Jersey	0.24	-0.23	Low	-0.17	0.02	Moderate
New Mexico	-0.53	-0.22	Low	-0.49	0.33	Moderate
New York	0.55	-0.45	Low	-0.4	0.30	Moderate
North Carolina	-0.53	0.22	Moderate	-0.23	-0.06	Moderate
North Dakota	-0.55	-0.26	Low	-0.10	0.62	High
Ohio	-0.73	0.54	High	-0.37	0.62	High
Oklahoma	-0.06	-0.32	Low	-0.28	0.48	High
Oregon	0.13	-0.08	Moderate	-0.84	0.93	High
Pennsylvania	-0.59	0.02	Moderate	-0.49	0.31	Moderate
Rhode Island	-0.34	-0.11	Moderate	-0.62	0.01	Moderate
South Carolina	-0.51	-0.02	Moderate	-0.23	0.12	Moderate
South Dakota	-0.49	-0.06	Moderate	0.56	-0.58	Low
Tennessee	-0.64	0.45	High	-0.73	0.01	Moderate
Texas	0.43	-0.24	Low	-0.39	0.13	Moderate
Utah	0.66	-0.01	Moderate	0.15	0.06	Moderate
Vermont	-0.53	0.30	Moderate	-0.21	0.01	Moderate
Virginia	-0.02	-0.55	Low	-0.21	-0.02	Moderate
Washington	-0.24	0.16	Moderate	0.01	0.02	Moderate
West Virginia	-0.31	-0.41	Low	-0.06	0.12	Moderate
Wisconsin	-0.58	0.35	Moderate	-0.17	0.29	Moderate

Wyoming	-0.94	0.00	Moderate	-0.59	0.38	Moderate