Comparing Virginia's Public Research Institutions to Leading Private Research Institutions

A Comprehensive Evaluation Conducted for the Virginia Joint Legislative and Audit Review Commission by MPP Students with the Thomas Jefferson Program in Public Policy at the College of William & Mary

Andrew Beideman, Jordan Bowman, and Mackenzie Doss

Fall 2013

Executive Summary

This policy memo offers an overview of revenue and spending differences between Virginia's public research institutions and Carnegie Classification private not-for-profit High/Very High research institutions. The memo is organized into subsections that, in turn, discuss revenue, instructional spending, research spending, and administrative spending. Lastly, the memo offers three policy considerations based on findings from the revenue and spending analyses.

Revenue. Leading private research institutions have significantly higher annual revenue per full-time equivalent student than Virginia's public research institutions. Over the last decade, the revenue of Virginia's institutions has remained relatively flat because they depend heavily on funding from tuition and fees and state appropriations- sources which have limited growth due to fiscal and political pressures. Alternatively, private institutions receive more money from almost all revenue sources, but the bulk of their funding comes from returns on investments, private gifts, and federal research dollars. These sources, which are mostly untapped by public institutions, are the primary factors driving the disparity between Virginia's public and private institution's total revenue.

Instructional Spending. Virginia's public research institutions spend significantly less on the instruction of their students than leading private institutions. Salary spending dominates Virginia institutions' expenditures, whereas private counterparts devote more spending to operations and maintenance and other. A gap in instructional spending that existed at the beginning of the last decade has widened. This widening is the result of increases in all subcategories of instructional spending by private schools; however, salary is the dominant driver of the increase. While operations and maintenance, benefits, and other spending have leveled off in the second half of the decade, salary expenditures per student have continued to increase. When compared to peer institutions with similar graduation rates in the private group, Virginia's institutions under-spend their peers in every instance. Graduation rates over the last decade have closed an existing performance gap with private institutions.

Research Spending. Virginia's institutions spend significantly less on research than private institutions. Much of the separately-budgeted research spending by private institutions is on items other than faculty salaries. Research spending does not directly relate to the make-up of a university's student body (graduate v. undergraduate students) or to overall student body size. Research spending does directly relate to federal grants and contracts revenue, suggesting that institutions who receive revenue from this particular source are engaged in separately-budgeted research.

Administrative Spending. Virginia's institutions also spend significantly less on administrative expenditures than private institutions. Private institutions direct the majority of their administrative spending towards day-to-day operational support of the institution and management activities while Virginia's public institutions instead direct more spending towards academic support activities. Both public and private institutions spend about half of their total administrate spending on the salaries of their support staff.

Policy Conclusions. This analysis suggests three policy considerations. Because any change in policy depends, in part, on a subjective view of what Virginia's institutions should be doing, how they should be performing, and how they should funded, this paper provides "considerations" that could assist Virginia's institutions in becoming more cost-efficient, higher-performing, and competitive with their private counterparts.

Policy Consideration I: Explore a "Private Funding Model" for Virginia's Public Institutions. Virginia's institutions have significantly less revenue per student than their private counterparts. Their revenue portfolios are also less diverse than their private counterparts – they depend largely on state appropriations and tuition. Exploring an approach that would diversify revenue sources could result in increased revenue and financial stability for Virginia's institutions. Specifically, this paper recommends capital campaigns and other endowment-generating activity to increase interest generated by endowment, which is the largest category of revenue for the private Institutions analyzed in this study.

Policy Consideration II: Further strengthen the Research Ecosystem at Virginia's Public Institutions. On average, Virginia's institutions engage in much less separately-budgeted research than private Institutions. This difference in research activity is not a result of a difference in student-body composition or total university enrollment size. Rather, research activity directly corresponds to federal grants and contracts revenue. Institutions with higher federal grants and contracts revenue are also shown to be more likely to receive higher private gift revenues. We recommend that Virginia's institutions engage strengthen efforts to attract federal grants and contracts revenue and engage in research, and hypothesize that doing so would result in increased generation of gifts.

Policy Consideration III: Support Growth and Support Staff. Virginia's institutions employ far lower numbers of institutional support and administrative staff than private Institutions, and spend far less on administrative spending. However, these types of staff play a crucial role in to facilitating endowment growth and obtaining research funding. Private Institutions with higher levels of institutional support and administrative staff report higher revenue in these categories than Virginia's public institutions. In order to achieve financial growth and expansion of research activity, Virginia's institutions should consider increasing their spending on institutional support and administrative staff.

I. Introduction and Motivation

The Virginia General Assembly has directed the Joint Legislative and Audit Review Commission (JLARC) to "study the cost efficiency of the Commonwealth's institutions of higher education." In response, JLARC staff are conducting a series of reviews focused on Virginia's 15 public four-year higher education institutions. Topics include institutional spending on auxiliary enterprises, instruction, research, and various administrative functions. While conducting preliminary analyses of revenue and spending, JLARC staff noticed that many leading private research institutions (such as Harvard, Yale, University of Chicago, and Cal Tech) have substantially higher revenue and spending per full-time equivalent (FTE) student than Virginia's six research institutions (the University of Virginia, Virginia Tech, Virginia Commonwealth University, the College of William and Mary, George Mason University, and Old Dominion University).

This project explores development of comprehensive analysis of (1) the differences in revenue and spending between these public and private institutions and (2) what may explain these differences. Specifically, this project seeks to address the following questions:

(a) How does revenue at Virginia's public higher education research institutions compare to revenue at private not-for profit H/VH research institutions per FTE? What factors may explain differences in revenue sources and amounts?

(b) How does spending at Virginia's public higher education institutions compare to spending at private not-for profit H/VH research institutions per FTE? What factors may explain differences in instructional spending, such as faculty compensation, type of faculty, or number of faculty members? What factors may explain differences in administrative spending, such as compensation and the number of administrators or administrative faculty? What factors may explain differences in research spending?

(c) To what extent do the differences in revenue and spending between public and private institutions merit policy changes, and what could those policy changes be?

II. Data & Methodology

Source:

Data for this project came from two sources. First, the Delta Cost Project dataset provided baseline data for the 2000-2010 period for most study variables. Using annual survey results from the Integrated Postsecondary Education Data System (IPEDS), the Delta Cost Project compiles raw annual financial and demography survey results and presents these reports in a digestible and centralized database. Delta Cost also supplements raw, reported figures with complimentary datasets and independently generated summary statistics (e.g. computed categorical totals). In comparison to using raw IPEDS data, the Delta Cost Project dataset offers significant convenience and quality advantages in managing accounting and reporting differences across public and private university respondents, namely, that the Delta Cost Project team employs professional researchers to verify university-reported figures vis-à-vis variable definition standards for the Delta Cost Project dataset. On the other hand, the rigor of Delta Cost's quality control yields a somewhat-constrained dataset in terms of available variables, timeliness, and complete year-to-year listings.

Consequently, this project supplements baseline 2000-2010 Delta Cost data with the following IPEDS data:

(a) 2011 survey results not yet included in Delta Cost as of Fall 2013;
(b) Sub-category variables of analysis excluded from the master Delta Cost set;
(c) Missing datum for specific variables, institutions, and years as-needed.

After identifying data issues and merging sets from Delta Cost and raw IPEDS, variable names were standardized across the sets and generated additional indices and variables for analysis.

Important Data Notes:

All data are adjusted using U.S. Bureau of Labor Statistics Consumer Price Index deflators and are reported in this report in 2011 dollars. To improve comparison across analytical cohorts and compensate for differences in institution size, all spending and revenue figures were indexed over total full-time equivalent (FTE) student enrollment for a given year and are reported per FTE in this report. For example, if Institution X received $10,000 in 2010 state appropriations and had 2,500 full-time enrolled students that year, this paper would report 2010 state appropriations of $4 per FTE student.

For a full listing of the project's variables, including definitions, imputation notes, and sources, see **Appendix 1**.

Cohort Selection:

This project assesses revenue and spending disparity between Virginia's six public research institutions and the 60 private not-for-profit High/Very High research institutions (per the Carnegie Classification System. After observing extreme spending and revenue variation within the private cohort, the project team elected to bifurcate private institutions into two quantiles by comparing institutional total revenue to the mean of the entire cohort (i.e. Private I Institutions are those with total revenue that is less than the mean total revenue of the entire Private population; Private II Institutions are those with total revenue that is greater than the mean). Consequently, this report analyzes financial data across three cohorts, hereinafter referred to as "Private I Institutions", "Private II Institutions", and "Virginia Public Institutions." In some parts of the discussion, the term "private institutions" is used, this term collectively refers to Private I and Private II Institutions. The cohorts include the following institutions:

<u>Virginia Public Institutions (6)</u>.

- College of William and Mary
- George Mason University
- Old Dominion University
- University of Virginia-Main Campus
- Virginia Commonwealth University
- Virginia Polytechnic Institute

<u>Private I Institutions (39)</u>

- Baylor University
- Boston College
- Brandeis University
- Brigham Young University
- Brown University
- Carnegie Mellon University
- Case Western Reserve University
- Catholic University of America
- Claremont Graduate University
- Clark University
- Clarkson University
- Dartmouth College
- Drexel University
- Duquesne University
- Fordham University
- George Washington University
- Georgetown University
- Howard University
- Illinois Institute of Technology
- Lehigh University
- Loyola University Chicago
- Northeastern University

- Nova Southeastern University
- Polytechnic Institute of New York University
- Polytechnic University
- Rensselaer Polytechnic Institute
- Rice University
- Rockefeller University
- Saint Louis University-Main Campus
- Southern Methodist University
- Stevens Institute of Technology
- Syracuse University
- Tufts University
- Tulane University of Louisiana
- University of Dayton
- University of Denver
- University of Notre Dame
- Wake Forest University
- Yeshiva University

Private II Institutions (21)

- Boston University
- California Institute of Technology
- Columbia University in the City of New York
- Cornell University
- Duke University
- Emory University
- Harvard University
- Johns Hopkins University
- Massachusetts Institute of Technology
- New York University
- Northwestern University
- Princeton University
- Stanford University
- University of Chicago
- University of Miami
- University of Pennsylvania
- University of Rochester
- University of Southern California
- Vanderbilt University
- Washington University in St Louis
- Yale University

For a full listing of descriptive statistics for each cohort and ranking of each institution by annual revenue, see **Appendix II**.

III. Revenue Comparisons

This analysis begins by conducting an analysis of total revenue per full-time equivalent student across Virginia Public Institutions and leading private institutions to determine the magnitude of the difference in revenue. The financial data in IPEDS includes revenues reported by schools, by revenue source. To calculate Total Revenue, we include revenue from ten categories reported by the institutions: tuition and fees, education sales, local, state, and federal grants and contracts, return on investment (ROI), private gifts, and local, state, and federal appropriations. Further information on these variables can be found in Appendix I. It is critical to note that for the purposes of this study, we do not include an exhaustive list of available revenue sources in our calculation of "Total Revenue". We chose not to include a few select revenue variables that were not germane to this study or because they were not reported consistently across all institutions. For example, we did not to include revenue from auxiliary enterprises, such as residence halls or food services, which charge fees directly related to the cost of their service and are consequently often managed as self-supporting activities. Additionally, we did not include revenue generated from hospitals operated by the institutions since this is not a common source of revenue across our study population.

Table 1 provides a side-by-side comparison of the selected revenue sources and amounts at Virginia Public and Private I and Private II Institutions. In total, we find that Private I and Private II Institutions have significantly higher annual revenue than Virginia Public Institutions. Total average annual revenue for Virginia Public Institutions is $31,017 per FTE student. Total average annual revenue for Private I and Private II Institutions is $81,877 and $158,557, respectively. The magnitude of disparity between revenue

for Virginia Public and private institutions is great: Private I Institutions have annual earnings that are over 2.5 times greater than the Virginia cohort while revenue at Private I Institutions is over 5 times the size of revenue at Virginia Public.

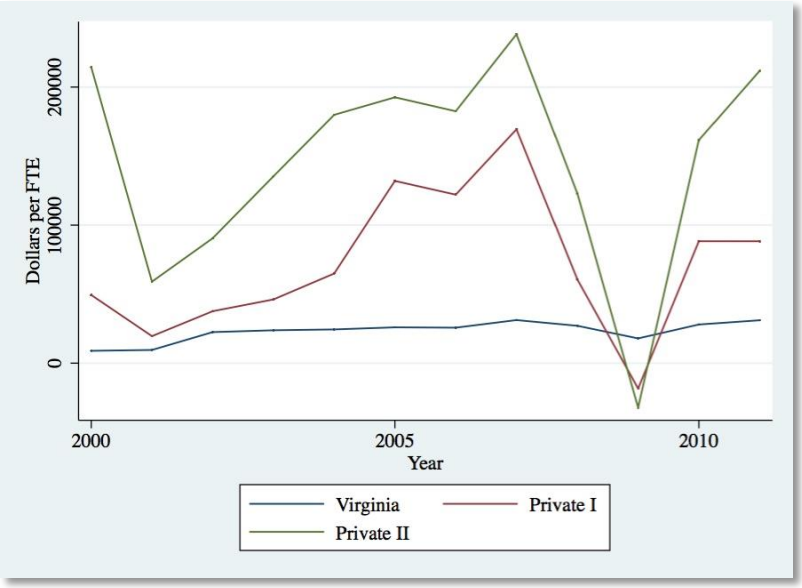
Table 1: Average Annual Revenue per Full-Time Enrolled Student, 2000-2011

	Virginia Institutions		Private I		Private II	
Source Category	**Average**	**%**	**Average**	**%**	**Average**	**%**
Tuition & Fees	$10,133.08	33%	$22,190.19	27%	$24,679.18	16%
Education Sales	$573.98	2%	$3,996.04	5%	$10,936.69	7%
State Grants	$557.64	2%	$1,003.30	1%	$1,024.32	1%
Local Grants	$1,073.55	3%	$403.04	0%	$667.20	0%
Federal Grants	$5,737.50	18%	16,401.93	20%	40,788.64	26%
ROI	$2,764.25	9%	19,806.21	24%	$49,919.66	31%
Private Gifts	$2,139.40	7%	$17,045.54	21%	$28,900.54	18%
Local Approps.	$0.00	0%	$0.00	0%	$3.63	0%
State Approps.	$8,021.70	26%	$263.27	0%	$1,578.02	1%
Federal Approps.	$16.64	0%	$767.66	1%	$59.94	0%
TOTAL	**$31,017.73**		**$81,877.18**		**$158,557.82**	

Private institutions have had consistently higher total revenue than Virginia's public institutions over the last decade. This can be seen in Figure 1, which illustrates trends in total revenue from 2000 to 2011 for Virginia Public and private institutions. It is perhaps most interesting to note that, on average, total revenue for Virginia Public Institutions has remained relatively flat since 2000, while private institutions experienced extreme volatility over the same period. Additionally, while there is a marked difference in the amount of revenue earned by Private I and Private II Institutions, both private cohorts exhibit similar patterns in volatility in their revenue stream. The extreme volatility in revenue for private institutions compared to the flat trend for Virginia Public indicates that public and private institutions depend upon different revenue sources and that private institutions depend upon sources that tend to be susceptible to fluctuations in the market.

While we can see in Figure 1 that revenue at private institutions has far exceeded revenue at public institutions, there is one year in our study during which Private Institutional revenue fell dramatically below Virginia Public. In 2009 during the economic recession, both Private cohorts reported a net total loss in revenue. Reviewing the data, we determined that this is largely the result of the significant losses that most institutions suffered on their investments. While Virginia Public Institutions also reported losses in revenue during this period, the losses were attenuated by the volume of non-market-based revenue streams at most of these institutions.

Figure 1: Total Average Revenue per FTE Student, 2000-2010



Next, this analysis evaluated which revenue sources were primarily responsible for the disparity in total revenue between public and private institutions. Figure 2 compares average annual revenue by source for Virginia Public and private institutions. First, it is evident that revenue collected from tuition and fees provides a substantial portion of the total annual revenue for both public and private institutions, but that Private institutions earn substantially more from tuition than public institutions. The average gross tuition revenue earned by Virginia Public Institutions is $10,133 per FTE student annually. At both private cohorts, tuition revenue is more than double, at approximately $22,190 and $24,679 per FTE student respectively.

Virginia Public Institutions rely on tuition revenue significantly more than private institutions. Figure 3 illustrates the percent contribution of each revenue source to total revenue for public and private institutions. Tuition and fees make up about 33 percent of Virginia's total annual revenue. Private I Institutions are more comparable to Virginia public schools in their dependence on revenue from tuition and fees, with 27 percent of their total revenue coming from tuition. The proportion of total annual revenue for Private II institutions contributed by tuition and fees presents a different story: revenue from tuition and fees provide up only 16% of total annual average revenues for these schools. Thus, it is evident that those private institutions with greater revenues are earning a large portion of their revenue elsewhere.

Figure 2: Average Annual Revenue by Source per FTE Student

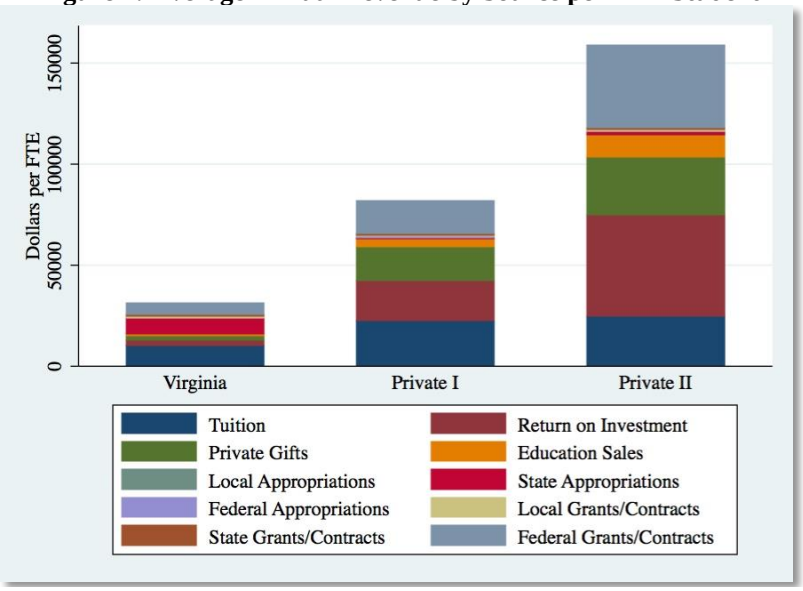
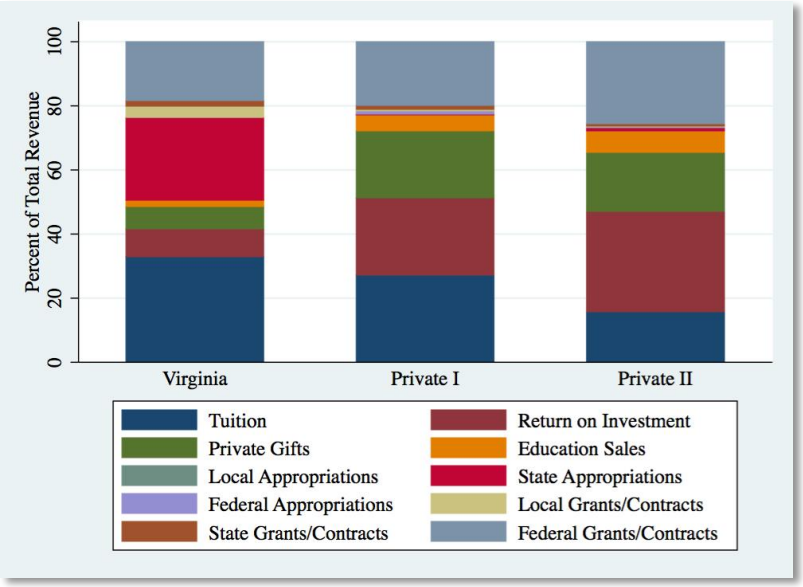


Figure 3: Percent Contribution of Revenue Sources to Total Revenue



In addition to tuition revenue, both Virginia Public and private institutions rely on support from funding through federal grants and contracts. Proportionally speaking, Virginia Public Institutions and Private I Institutions again appear similar: revenue from federal grants and contracts contributes to 18% of Virginia Public Institution's total annual revenue and 20% of Private I Institutions' total annual revenue. However, private schools receive substantially more revenue from this source. Federal grants and contracts is the second largest source of revenue for Private II Institutions which receive $40,788 annually from this source. In comparison, Virginia's Public Institutions receive only $5,737 annually. This amounts to a difference of approximately $35,000 between Private II and Virginia Public Institutions in revenue from the federal grants and contracts. While Private I Institutions do not receive as much funding from federal grants as Private II Institutions, they still receive over $10,000 more than public institutions annually.

There are two significant funding sources that most public schools may be underutilizing and that largely drive the disparity between public and private school revenue. Private institutions are receiving a substantial amount annually from Returns on Investment, which includes revenues derived from the institution's investments and endowment earnings. Revenue from ROI is the single largest source of annual income per FTE for Private II Institutions, which earn an annual average of $49,919 from ROI. Private I Institutions earn $19,801. The amount of revenue from ROI earned by the highest earning private institutions is 1.5 times the size of *total* annual revenue for Virginia Public Institutions. On average, Virginia Public Institutions earn only $2,764 annually per FTE in ROI. However, it is critical to note that there is also a large disparity among Virginia Public Institutions in ROI. Table 2 illustrates that the University of Virginia is comparable to some of the highest earning Private Institutions, with annual revenue from ROI close to $40,000 per FTE student. With the exception of The College of William and Mary, the remaining Virginia Public institutions receive under $500 annually in ROI.

Private institutions also receive far more revenue from private gifts and donations than Virginia Public Institutions. Private I Institutions earn an average of $17,045 in private gifts annually, while Private II Institutions earn close to $28,900 in gifts. In comparison, Virginia's Public Institutions make only $2,139 annually from private gifts. One consideration however is that Virginia Public Institutions reported revenue from Private Gifts infrequently and thus their calculated annual average may not be an accurate reflection of their true earnings from this category.

Table 2: 2011 Revenue from ROI by Virginia's Institutions per Full-time Enrolled Student

School	2011 ROI Revenue
College of William and Mary	$1,449.25
George Mason University	$63.50
Old Dominion University	$196.39
University of Virginia	$39,372.92
Virginia Commonwealth University	$501.27
Virginia Polytechnic Institute	$321.24

These results suggest that Virginia Public Institutions rely most heavily upon revenue from tuition and fees and state appropriations. These sources of revenue make up well over half of Virginia Public Institutions' total annual revenue. As stated previously, tuition revenue is the single largest source of average annual income for VA public institutions. Virginia Public Institutions depend almost equally as much on revenue from state appropriations, earning $8,021 in state appropriation funds annually.

IV. Spending Comparison

Instructional Spending

Next, this analysis explored instructional spending disparity across the cohorts. Instructional spending is spending by a university related to general academic instruction, such as spending by all instructional divisions of a university (e.g. School of Business). Instructional spending also includes departmental research and public service expenses that are not separately budgeted, as well as information technology

expenses when those expenses are budgeted separately by the instructional divisions (see definition in Appendix I).

Total instructional spending is reported by each institution. In addition, institutions report instructional spending for several sub-categories: salaries, benefits, depreciation, operations and maintenance, and other. The other category is a residual category, calculated by subtracting the sum of the four subcategories from each institution's reported total instructional spending. For the purposes of our analysis, depreciation was omitted due to the limited availability of data. Consequently, our totals, as displayed in Table 3, are about 2 to 5 percent less than the total reported instructional spending by institutions in each group, which is included in our dataset.

Spending for Virginia Public Institutions and Private I and PrivateII Institutions is shown in Tables 3 and 4. Table 3 provides average spending by institutions in each category, as well as the percent of total instructional spending that each category comprises. Virginia Public Institutions spend $11,921 each year on instruction per student. In 2011, this ranged from $17,836 by the University of Virginia to $9,093 at Old Dominion University. The majority of Virginia Public Institutions' instructional spending is on salaries (70%), with spending in other categories such as benefits (16%) and other (12%) dropping off sharply. Instructional spending among Private I and Private II is significantly greater per full-time student Private I Institutions spent $18,768.00 per student, whereas institutions in Private II spent $50,102.83 per student. This latter is also marked by extremely high instructional spending, and ranged in 2011 from Yale University ($103,987 per student) to Cornell ($20,617). Six institutions spent more than $75,000 per student: California Institute of Technology, Columbia, Johns Hopkins, University of Chicago, Washington University in Saint Louis, and Yale.

Although spending per student is greater in all categories for Private I and Private II Institutions, the proportion of instructional spending devoted to salaries is less among private institutions (61% in Group I and 56% in Group II) than it is among Virginia Public Institutions (70%). Conversely, the Operations and Maintenance and Other categories make up a larger proportion of private institutions' instructional spending. This is particularly noticeable for Private I Institutions, which spend as much on spending in the Other category per student than Virginia Public Institutions do in total.

Table 3: Average Annual Instructional Spending per Full-Time Enrolled Student, 2000-2011

	Virginia Institutions		Private I		Private II	
Category	**Average**	**%**	**Average**	**%**	**Average**	**%**
Salary	**$8,358.73**	**70%**	**$11,479.16**	**61%**	**$27,966.97**	**56%**
Benefits	**$1,959.93**	**16%**	**$2,711.39**	**14%**	**$7,034.48**	**14%**
Operations and Maintenance	**$205.33**	**2%**	**$1,540.17**	**8%**	**$3,285.28**	**7%**
Other	**$1,397.12**	**12%**	**$3,037.29**	**16%**	**$11,816.10**	**24%**
TOTAL	**$11,921.12**		**$18,768.00**		**$50,102.83**	

As can be seen by the standard deviations in Table 4, Virginia's institutions were more homogenous in their spending in all categories than private institutions in Groups I and II. Particularly in Group II, large standard deviations in spending indicate that there is greater spread among institutions in this category.

For example, in 2011 Yale University spent more than any other university per student on instructional salaries ($58,087), followed by Washington University in Saint Louis ($51,588), University of Chicago

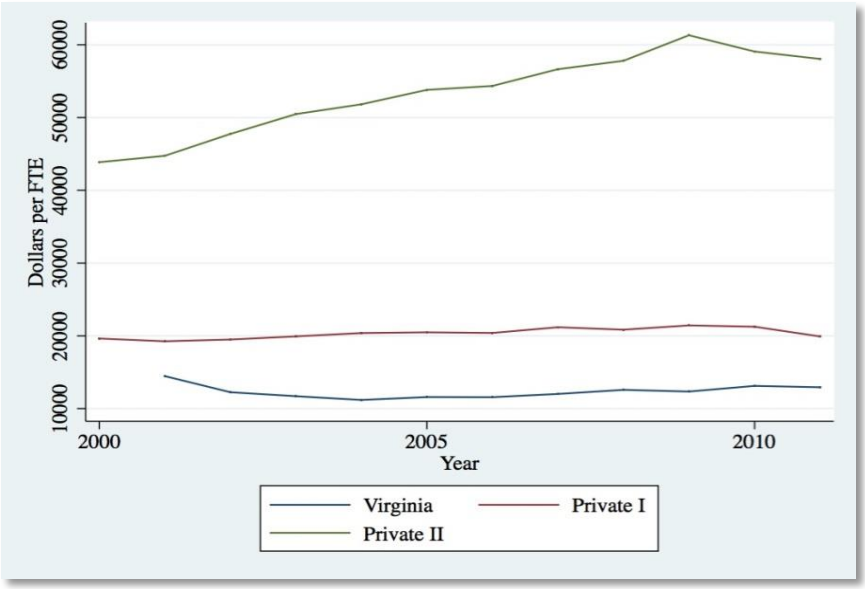
($46,390), and Columbia University ($45,100). However, other Private II Institutions spent far less, the lowest being Cornell University which spent $13,906 on instructional salaries per student in 2011. For comparison, University of Virginia spent the most out of Virginia Public Institutions ($10,776) on instructional salaries in 2011, and Old Dominion University spent the least ($5,501).

Table 4: Average Annual Instructional Spending per Full-Time Enrolled Student, 2000-2011

	Virginia Institutions		Private I		Private II	
Category	**Average**	**Std. Deviation**	**Average**	**Std. Deviation**	**Average**	**Std. Deviation**
Salary	**$8,358.73**	**$1,633.90**	**$11,479.16**	**$4,469.91**	**$27,966.97**	**$12,603.25**
Benefits	**$1,959.93**	**$440.94**	**$2,711.39**	**$1,455.07**	**$7,034.48**	**$3,945.13**
Operations and Maintenance	**$205.33**	**$420.90**	**$1,540.17**	**$1,056.44**	**$3,285.28**	**$3,163.16**
Other	**$1,397.12**	**$665.09**	**$3,037.29**	**$2,224.51**	**$11,816.10**	**$8,475.30**

Among Private II Institutions, instructional spending over time has sharply increased since 2000, whereas Private I Institutions and Virginia Public Institutions have not experienced a similar increase. Figure 4 shows total instructional spending per full-time enrolled student for each group from 2000 to 2011. These data suggest that, since 2000, an existing gap in instructional spending has widened between Virginia's Public Institutions and Private II Institutions. Spending among Private I Institutions also did appear to grow commensurately with Private II. Although Private II spending dropped slightly in 2010 and 2011, the current gap between Private II and Private I/ Virginia Public Institutions remains about $15,000 per student greater than in 2001, the first year for which data is available for Virginia Public Institutions (See Figure 4).

Figure 4: Total Instructional Spending per FTE Student, 2000-2011



This growing gap in instructional spending has been driven by increases in spending among all instructional categories from Private II Institutions. In particular, increased spending on instructional

salaries has caused spending among Private II Institutions to skyrocket. This category has increased steadily among Private II Institutions since the year 2000, and it is by far the largest category of instructional spending. Data on other instructional categories is only available from 2002 to 2011 due to the shift among public institutions that year to GASB. From 2002 to 2003, the spending in Other, Operations and Maintenance, and Benefits increased sharply. Since 2003, these other categories of instructional spending have exhibited less overall change, increasing steadily from 2003 to 2007, but slightly declining from 2008 to 2011.

Figure 5 shows the change in spending on instructional salaries over time among the three cohorts. Virginia's spending on instructional salaries has declined slightly since 2002, salaries among Private I Institutions have remained constant, and – as discussed above – salaries among Private II Institutions has dramatically increased, driving the change in total instructional spending. Since 2009, spending on instruction salaries among Private II Institutions has slightly decreased, likely because of a decrease in the revenue streams of those institutions. Still, Private II institutions, on average, spend three times more on instructional salaries than Virginia Public Institutions.

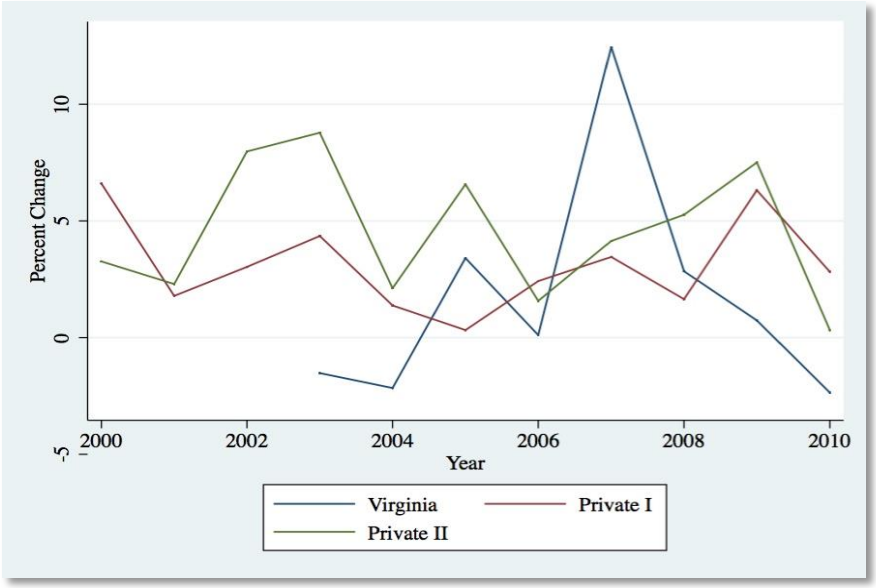
This analysis suggests two distinct causes for this disparity in instructional salary. First, the full-time faculty at Private II Institutions have an average salary of about $120,000. Full-time faculty at Virginia Public Institutions have an average salary of about $85,000. Thus, some of this disparity is driven by simple difference in average faculty pay. Second, instructional spending disparity is also the result high faculty to student ratios. Comparing full-time faculty levels (combined instructional and research faculty) to the number of full-time students, most Private II Institutions ranged between two to 10 students per faculty member. For example, Yale and MIT both reported a ratio of two students per faculty member. Virginia's Institutions ranged between University of Virginia (ten students per faculty member) and William and Mary (11 students per faculty member) to Old Dominion University (21 students per faculty member).

Figure 5: Instructional Salaries per FTE Student, 2000-2011

Figure 6 shows the percent change in instructional salary spending for each group from 2000 to 2011 (data is only available for Virginia Public Institutions since 2003). Virginia Public Institutions experienced positive change of greater than 5 percent in only one year (2007) and change of about zero percent in five years. Private II Institutions experienced change of about five percent or greater in six years. All cohorts declined in 2010. . In 2007, Virginia Public Institutions reported an increase in

instructional spending per FTE driven by the College of William and Mary, which reported $7,685 in 2006 and $9,411 in 2007 (22%), and Virginia Commonwealth University, reporting $8,389 in 2006 and $9,495 in 2007 (13%). The same variation was not seen the other Virginia Public Institutions.

Figure 6: Percent Change in Instructional Salaries, 2000-2011



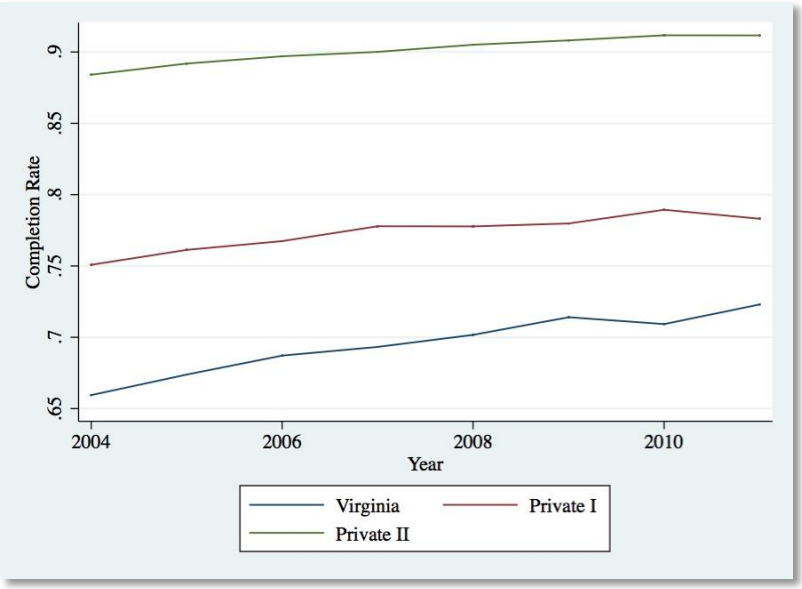
In addition to assessing instructional spending disparity, this analysis explored measurements of outcomes to assess how spending differences might influence performance. Availability of outcome data is limited to six-year graduation rates for all institutions from 2002 to 2011, which measures the percent of students from a cohort that have graduated within six years of their entry. For example, the 2002 six-year graduation rate would be the percent of students that entered school in the fall of 1996 that have graduated by May 2002.

Virginia Public Institutions have diverse outcomes, as shown in Table 5. Additionally, for some of the Virginia Public Institutions, outcomes have significantly changed since 2002, whereas the outcomes of others in the Public and Private cohorts have not. For example, the six-year graduation rate of William and Mary has increased 0.1 percentage points, compared to George Mason University (increase of 14.9 percentage points) and Virginia Commonwealth University (increased of 13.4 percentage points).

Table 5: 2011 and 2002 Six-Year Graduation Rates for Virginia's Institutions

School	2011 Six-Year Graduation Rate	2002 Six-Year Graduation Rate
College of William and Mary	90.7%	90.6%
George Mason University	64.4%	49.5%
Old Dominion University	50.0%	41.3%
University of Virginia	93.9%	91.8%
Virginia Commonwealth University	53.1%	39.7%
Virginia Polytechnic Institute	81.6%	74.5%

Figure 7: Six-Year Graduation Rates



On average, the six-year graduation rates at Virginia Public Institutions have experienced more of an increase since 2002 than those of Private I and Private II. However, as shown in Table 4, the majority of this increase is driven by historically low-performing Institutions improving over the last decade. Schools with high graduation rates improved much less.

Figure 7 shows the average six-year graduation rate over time for each cohort. Private II experienced an improvement of about 4 percentage points over the last decade. Private I Institutions improved about 5 percentage points over the same period. Virginia Public Institutions improved almost 8 percentage points, narrowing the gap in outcomes, particularly when compared to Private I. This suggests that instructional spending disparity does not directly correspond to performance.

To further elucidate potential linkages between instructional spending and graduation outcomes, Table 6 presents a comparison of instructional spending levels at University of Virginia compared to institutions with similar graduation rates from the private cohort. For this outcome metric, these results suggest that the University of Virginia graduates students at as high a rate as other private schools for significantly less instructional spending.

Table 6: University of Virginia – Instructional Spending of Private Institutions with Comparable Graduation Rates

School	2011 Total Instructional Spending	2011 Six-year Graduation Rate
University of Virginia	$17,836.97	93.9%
Georgetown University	$27,098.36	93.7%
Northwestern University	$34,991.16	93.6%
Washington University in Saint Louis	$99,315.32	93.4%

Table 7 offers the same comparison for Virginia Commonwealth University and Old Dominion University, which have substantially lower six-year graduation rates that University of Virginia, and consequently have different peers within the private cohorts.

Table 7: ODU and VCU – Instructional Spending of Private Institutions with Comparable Graduation Rates

School	2011 Total Instructional Spending	2011 Six-year Graduation Rate
Old Dominion University	$9,093.50	50.0%
Virginia Commonwealth University	$13,550.67	53.1%
Polytechnic Institute of New York University	$14,784.49	53.6%
Saint Louis University – Main Campus	$20,586.37	60.8%
Nova Southeastern University	$20,811.26	42.9%
Howard University	$22,439.61	62.6%

Although they have the lowest six-year graduation rates of Virginia Public Institutions, Old Dominion University and Virginia Commonwealth University also spend substantially less than their peers with similar six-year graduation rates in the private cohort.

The above comparisons suggest that, although instructional spending among Virginia's Institutions is less per student than both Private I and Private II cohorts, spending deficiencies at Virginia Public Institutions do not necessarily produce subpar graduation rates. The Private II cohort, in which many Institutions have graduation rates between 90 percent and 95 percent, spends far more than the Private I cohort and Virginia Public Institutions. However, Virginia does have two institutions (College of William & Mary and University of Virginia) with comparable graduation rates. Likewise, Virginia's Institutions with six-year graduation rates between 50 percent and 60 percent (ODU and VCU) spend less than their similarly-performing peers.

Research Spending

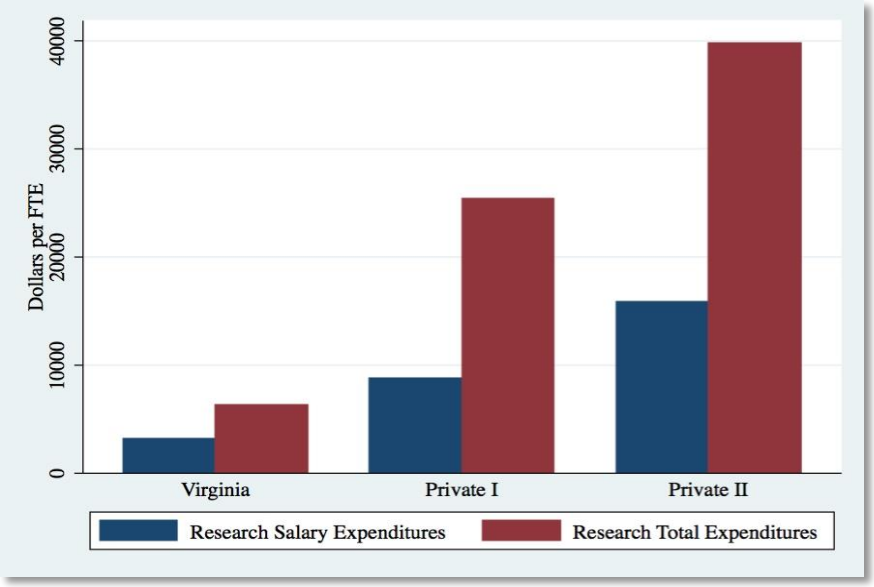
In addition to instructional spending, that analysis explored research spending disparities between public and private cohorts. Virginia Public Institutions are diverse in their spending on research, ranging from University of Virginia, which spent $16,886.94 per student in 2011, to Old Dominion University, which spent $421.10 per student in 2011. Table 7 shows Virginia Public Institutions' spending on research per full-time enrolled student in 2011.

Not surprisingly, private institutions spend, on average, significantly more on research than Virginia Public Institutions. However, The University of Virginia and Virginia Polytechnic Institute are comparable to many of the private research institutions, even some of those from Private II. For example, New York University spent $16,539 in 2011 and Cornell University spent $18,376. However, Private II schools such as Johns Hopkins ($92,988 in 2011) and Massachusetts Institute of Technology ($115,759 in 2011) far outspent most institutions both in their own group and in the Virginia Public group. Figure 7 shows the average spending on total research and research salaries by institutions in each group. Virginia Public Institutions spent an average of $6,986.35 per full-time enrolled student, whereas Private II Institutions spent almost $40,000. Although salary spending is also higher among private institutions, those expenditures were less than 50% of total research spending for each of the three groups. Due to a lack of available data for research subcategory spending (such as other, operations and maintenance, etc.), it is unclear exactly where this spending is being apportioned. However, it is evident that the make-up of research spending is fundamentally different from that of instructional spending, which is dominated by salary expenditures among all three groups.

Table 7: 2011 Research Spending by Virginia's Institutions per Full-time Enrolled Student

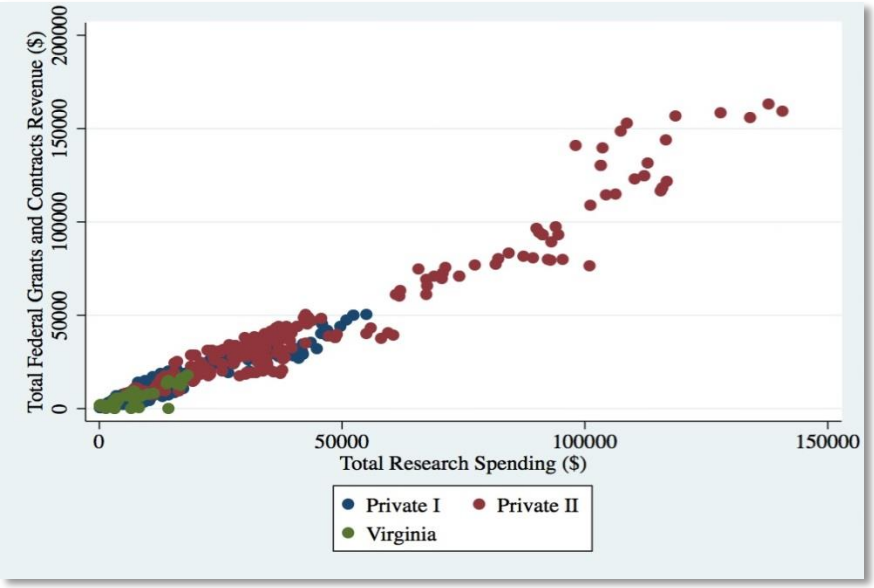
School	2011 Research Spending
College of William and Mary	$3,232.53
George Mason University	$3,714.42
Old Dominion University	$421.10
University of Virginia	$16,886.94
Virginia Commonwealth University	$6,472.46
Virginia Polytechnic Institute	$11,190.65

Figure 8: Research Total and Salary Expenditures



Next this analysis investigated potential drivers of this research spending disparity. Several approaches were used. First, this study developed an index of graduate students to undergraduate students for each university, hypothesizing that institutions with a larger graduate student cohorts were engaged in more research. Thus, student body composition would largely correlate with spending. This was not the case. Some institutions with largely undergraduate populations spent as much on research as others with student populations dominated by graduate students. One variable that did relate directly to research spending was federal grants and contracts revenue. A scatterplot of federal grants and contracts revenue and research spending per full-time equivalent student is shown in Figure 8. The relationship between this revenue source and spending was nearly 1 to 1. That is, for most institutions, each dollar of federal grants and contracts revenue corresponded to a dollar of total research spending.

Figure 9: Federal Grants and Contracts Revenue and Research Spending



The relationship seen between federal grants and contracts revenue and research spending is likely due to how research spending is defined by FASB and GASB. Research spending is spending that is "specifically organized to produce research outcomes and commissioned by an agency either external to the institution or separately budgeted by an organizational unit within the institution." Federal grants and contracts is a revenue source that is external to the institution per this definition. The linear relationship between federal grants and contracts revenue leads us to conclude that little university-funded research is reported as research spending, even though it would fit the definition were is separately budgeted. This means that if institutions fund research in addition to that funded by grants and contracts revenue, they likely do so through department instructional spending rather explicit research budgets.

Administrative Spending

Next, this analysis explores spending disparity on administrative functions between Virginia Public Institutions and private institutions. Due to inconsistencies across Virginia Public and private institutions reporting measures, this study includes two measures of administrative spending: Academic Support and Institutional Support. Academic support expenditures include spending on activities and services that support the institution's primary missions of instruction, research, and public service. Institutional support expenditures include spending on day-to-day operational support of the institution such as general administrative services and management. For more information on these variables, see Appendix I.

Consistent with other findings in this study, private institutions spend more on administrative functions than Virginia Public Institutions. Private I and Private II institutions spend $19,780 and $26,561 per FTE student respectively on academic and institutional support combined. In comparison, Virginia Public Institutions spend a total of $6,420 annually on the combined administrative categories. Table 8 presents a side-by-side comparison of administrative spending between Virginia Public and private institutions.

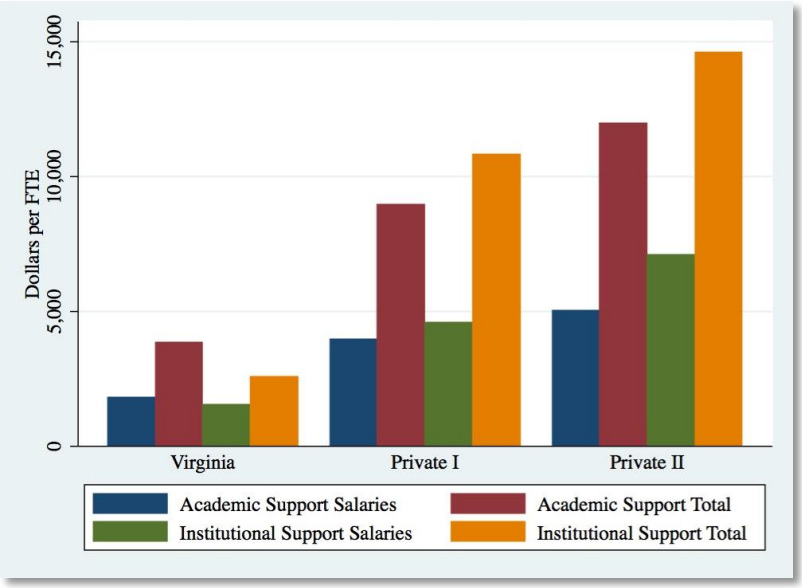
Table 8: Average Annual Admin. Spending per Full-Time Enrolled Student, 2000-2011

	Virginia Institutions		Private I		Private II	
Category	**Average**	**%**	**Average**	**%**	**Average**	**%**
Academic Support Salaries	**$1,795.56**		**$3,955.62**		**$5,025.30**	
Academic Total	**$3,855.21**	**60%**	**$8,967.58**	**45%**	**$11,961.45**	**45%**
Institutional Support Salaries	**$1,557.17**		**$4,594.87**		**$7,090.50**	
Institutional Total	**$2,564.80**	**40%**	**$10,813.18**	**55%**	**$14,599.97**	**55%**
TOTAL	**$6,420.01**		**$19,780.76**		**$26,561.42**	

It is interesting to note that private institutions devote more of their administrative spending to institutional support: Both Private I and Private II Institutions spend 55 percent of total administrative spending on institutional support and 45 percent on academic support. On the other hand, Virginia Public Institutions spend proportionally more of their resources on academic support, devoting 60 percent of their total administrative spending towards academic support and 40 percent towards institutional. This suggests that private institutions spend more gross administrative functions than on "core" university functions. Virginia Public Institutions spend a greater portion of their minimal administrative spending on the activities that support the institutions' academic mission.

Figure 10 illustrates average annual spending on academic support/institutional support salaries and total academic and institutional support by public and private institutions. Private institutions spend more Virginia Public Institutions on salaries for academic and institutional support staff. While private schools spend substantially less on total administrative functions, close to half of the total academic and institutional spending for both public and private schools goes to salaries of the institutions' support staff.

Figure 10: Average Annual Spending on Administrative Functions per FTE Student



V. Policy Considerations and Conclusions

These findings, not surprisingly, demonstrate significant spending and revenue disparities between Virginia Public Institutions and the private institutions. These results also suggest material differences between and within each cohort related to institutional student body compositions, outcomes, administrative structures, and research activity levels. While these results may explain some revenue and spending differences this analysis observed, they also underscore the institution-to-institution variation inherent to public universities.

Consequently, translating these quantitative findings in to credible policy directives will require administrators first consider four key, broad policy considerations as they relate to the future of the Virginia public university system. First, these results demonstrate significant heterogeneity both between public and private cohorts, and especially within the Virginia Public Institution cohort. As a result, any action based on these data should first repeat this analysis to further elucidate differences between individual Virginia Public Institutions and comparable high-performance public and private institutions. Without a fuller picture of the comparative performance of each individual Virginia public schools (rather than the system as a whole), administrators will a face a significant challenge prescribing system-wide corrective measures that adequately address institution-to-institution variation.

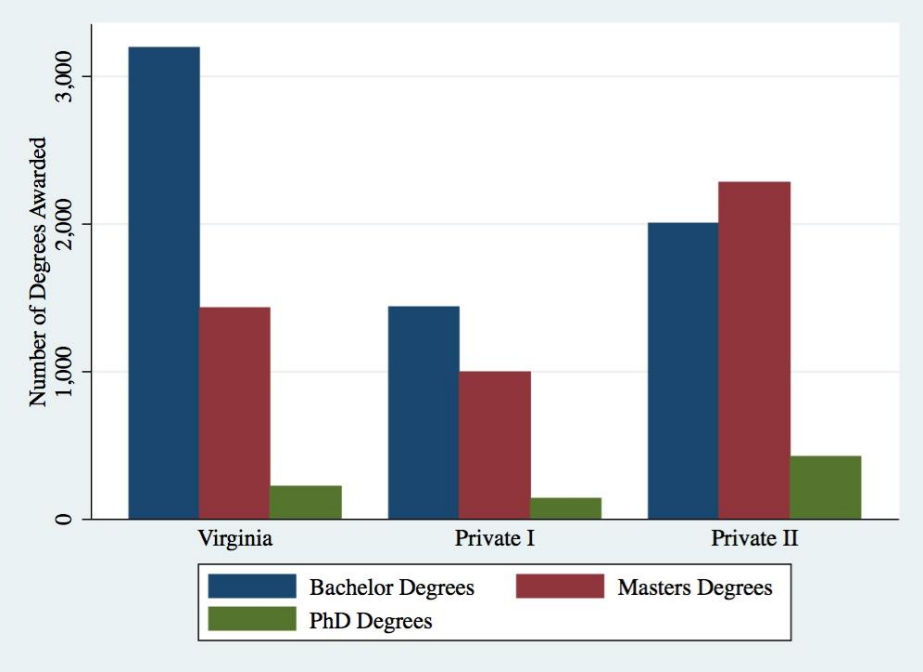
Second, interpretation of these results must address decisions regarding the appropriate level of funding for Virginia Public Institutions. On one hand, these results demonstrate budgetary efficiency in the Virginia public system. Virginia Public Institutions deliver comparable graduation metrics to leading private institutions, despite significantly leaner revenue and instructional spending. On the other hand,

these results suggest that Virginia's budgets are far more devoted to faculty salaries than those of their counterparts, which may limit their potential to compete with private institutions in the long-term. Additionally, the dominance of instructional salaries in Virginia Public Institution budgets suggests that any further budget cuts will likely require further reducing salaries or staff, both areas in which Virginia already falls short of private counterparts and where cuts threaten the long-term financial sustainability of the institution.

Interpretation of these results should address subjective views about proper public education funding mechanisms, ideal performance, and optimum activity blend. This analysis approaches policy recommendations from the perspective that Virginia Public Institutions should be financially stable, operate cost-efficiently, educate students as effectively as possible, and remain as competitive with leading private institutions as possible given their resources.

Finally, assessing the policy implications of these results must also consider the fundamental issue of institutional mission. As illustrated below in Figure 11, Virginia Public Institutions serve a different student cohort than private research institutions—a quantitative reality that neatly expresses the qualitative mission difference between public institutions (with an interest in promoting access) versus private research institutions (focusing more on scholarship and selectivity). While these goals should not be mutually exclusive, policy implications derived from this analysis must acknowledge that public and private cohorts serve fundamentally different purposes that may require fundamentally different financial structures.

Figure 11: Average Annual Degree Awarded Composition



Despite these questions, this project has identified three broad policy implications for JLARC's consideration that address avenues through which Virginia Public Institutions could pursue revenue and spending portfolios more comparable to those of the private cohort.

Policy Consideration I: Explore a "Private Funding Model" for Virginia's Public Institutions

As shown above in Figures 2 and 3, the revenues of Virginia Public Institutions and private institutions differ significantly in both composition and magnitude. Return on investments provides the largest revenue stream for Private Institutions, while Virginia Public Institutions rely primarily on tuition and state appropriations and earn relatively negligible returns on their endowments. Similarly, Private Institutions appear to enjoy far higher revenues from private gifts and grants, federal grants and contracts, and, to a lesser extent, for-profit educational sales, while also consistently charging higher baseline tuition.

As the revenue of private institutions increases and Virginia's state budget tightens or remains static, Virginia Public Institutions should consider developing more-diversified revenue streams, similar to those of private research institutions. Expanding endowment investments through capital campaigns and gifts, and collecting return on those investments, offers significant opportunities to allow state institutions to be more competitive without requiring a large increase in tuition or state appropriations. Such a move would be a step toward building the type of self-sufficiency enjoyed by private institutions.

Enhanced reliance on endowment return would also provide Virginia Public Institutions with the budgetary independence to explore other structural and mission-based changes such as those discussed below. For example, growing private gift revenues would provide a cash infusion for structural and staffing investments that could, in turn, draw more federal grants and contracts for research. It should be noted that, as seen by private institutions over the last decade, reliance on endowment returns as primary revenue generation mechanisms exposes university budgets to increased risk as markets fluctuate. Thus, a diversified revenue portfolio that includes endowment returns but also maintains tuition and state appropriations will provide Virginia's institutions with the most stable financial environment in which to grow.

To achieve revenue diversity at Virginia's public institutions, policy-makers should keep in mind three important considerations:

1. How Should Private Revenue Generation in the Virginia Public University System Function?

A change in the current structure of revenue-generation at Virginia's universities should also address the impact of fundamental institutional differences within the Virginia public system on each institution's ability to draw public grants, private gifts, and contracts. For example, well-established, highly-esteemed public research institutions like the University of Virginia and the Virginia Polytechnic Institute will certainly have access to a larger alumni, research, and donor networks than newer institutions, such as George Mason University and Old Dominion University. Consequently, structural reform must address whether the Virginia public university framework will operate as a network of independent institutions (much like the similar approach) or as an integrated, cohesive system.

Should the state proceed with the current system of loosely affiliated, independent organizations, a change in revenue generation must enable each constituent organization to pursue financial approaches best-suited to their unique missions and populations. For example, Virginia's premier research schools may consider adopting aggressive fundraising campaigns, tuition rates closer to those of private research institutions, or recruit a higher proportion of out-of-state students (at the expense of resident access), while less competitive research institutions could their focus efforts on expanding access and enrollment to capitalize on economies of scale and grow future alumni pools.

If, on the other hand, Virginia pursues a "system" approach, the state may consider the pooling of system-wide resources as an approach to normalize revenue streams across the system, e.g. establish a state-wide

capital campaign, rather than institution-specific programs. Under this model, newer schools in the system will benefit from the significant donor resources and prestige of more-established public schools.

2. A Baseline for State Appropriations

The ability of Virginia Public Institutions to implement effective capital campaigns will depend on the Virginia's ability to provide a firm financial commitment to its universities. In the absence of such a commitment, donors may be reticent to give if they perceive their investments are providing a 'stop gap' rather than a foundation for university improvement, or if they believe that a dollar of funding given by them results in a dollar being taken away from state appropriations. The implementation of a base-line level of state appropriations for Virginia Public Institutions, below which the legislature cannot drop, would encourage private donations to institutions and help to ensure the success of effective capital campaigns.

3. Increase Funding for Key Administrative Positions

Lastly, Virginia Public Institutions should consider investing in "back office" administrative capacity in order to facilitate the type of revenue growth discussed here. An effective capital campaign requires administrative staff to network with alumni, identify potential willing donors, convince those donors to give, and show them that their money was well-spent. As highlighted in Figure 10, Virginia's public institutions significantly under-spend relative to private research institutions in institutional support functions. These results suggest that these non-core expenses, i.e. outside the classroom, correlate to higher revenue through grant and gift revenue streams. Under the assumption that tomorrow's returns will depend on today's investments, Virginia's institutions would be well-served in building an expanded cadre of dedicated stuff for fundraising. This analysis will discuss the related issue of academic support staffing for research activity in more detail in Policy Consideration III.

Policy Consideration II: Further Strengthen the Research Ecosystem at Virginia's Public Institutions

Despite the varied financial disparities between Virginia Public Institutions and private research institutions, close evaluation suggests that the volume of research activity at each institution strongly corresponds to higher revenues and higher spending levels. Relationships between research spending per full-time student and student body composition or university size were indeterminate. As discussed previously, federal grants and contracts comprise a large portion of private research university budgets. These monies are spent largely on research activity; however, there is evidence that private Institutions gain an additional benefit as a result of this activity.

We observe strong positive correlation (.88) between federal research grant levels and private gift volume, suggesting that growth in research capacity also corresponds to growth in private gift-giving. From a practical perspective, these results makes sense—research activities significantly contribute to the prestige and reputation of an institution, attributes that may, in turn, encourage generosity among donor and alumni communities. Private institutions can then avail these funds to further expand research capacity, increase instructional spending, or invest in the university's endowment.

From Virginia's perspective, these results suggest that expanding research activities could afford access to many previously untapped or underutilized resources. While Virginia Public Institutions and private institutions currently receive approximately equal shares of revenue from federal grants and contracts, the sheer magnitude of funding received by private institutions suggests that, with improved competitiveness and capacity, Virginia Public Institutions could expand their revenue stream with more federal grant

dollars. Accomplishing this task would require concerted investment in Virginia's research capacity and research support staffing in order to apply for and be awarded research grants and contracts. This may require politically challenging short-run expenditures; however, once Virginia's research Institutions have the infrastructure and staffing to engage in high-dollar research activity, they could realize long-run potential returns in federal grants and contracts, as well as the gifts that correlate with research activity.

Fortunately, the unique student body composition of Virginia Public Institutions may offer significant opportunities to compete with private research institutions for federal grant dollars. As shown in Figure 9, Virginia Public Institutions have a much larger undergraduate population than both private cohorts, and comparable masters student levels to the average private institutions. Given the important role of graduate students in participating in and providing labor for research activities, the relative strength of Virginia's graduate cohort suggests that Virginia could likely utilize graduate student resources to efficiently provide labor for more research activity. Graduate students could also play a vital role in propelling research activities at Virginia Public Institutions by participating in grant proposal and report writing in the absense of extensive professional research or administrative cadres like those at private instituions.

Policy Consideration III: Support Growth and Support Staff

This assessment also demonstrated that Virginia Public Institutions perform well compared to private high/very high research institutions in graduating students, despite considerably constrained budgets, divergent missions, and lean administrative structures. In the light of these results, this analysis next explores the types of direct structural and administrative investments that may further improve the competitiveness of Virginia Public Institutions with top-performing private research institutions. Broadly speaking, potential investments include expanding instructional support and expanding back-office capacity.

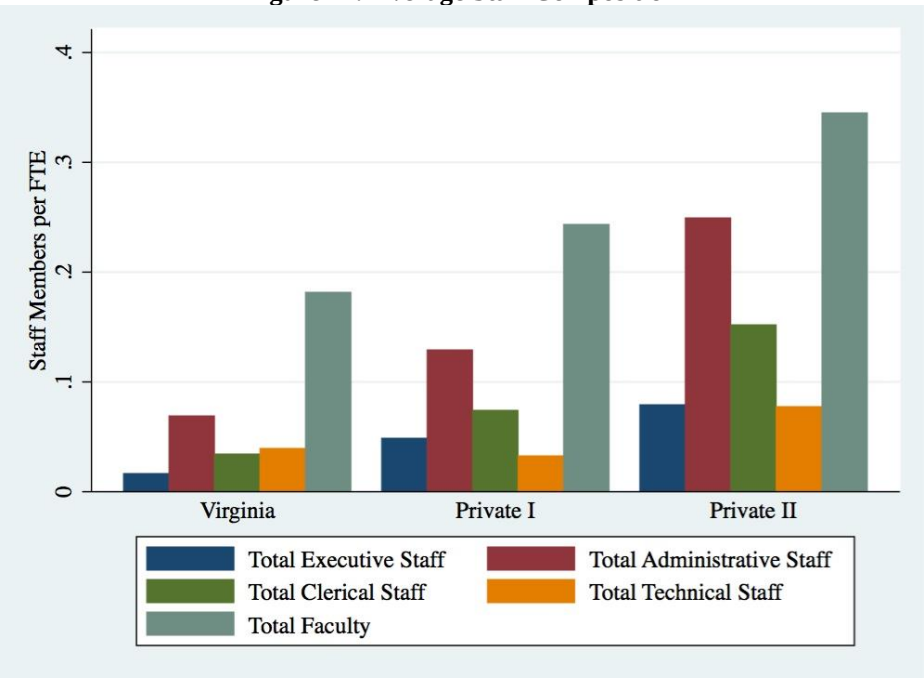
On the instructional side, these results suggest that public institutions maintain 'leaner' instructional budgets compared to the private cohorts, i.e. they spend significantly less on non-salary instructional activities *and* pay faculty considerably less. At the same time, Virginia faculty receive research salaries that are also considerably lower than their private counterparts and smaller non-salary research budgets. These results suggest a number of implications for public institutions, including potentially lower quality faculty (due to lower average salaries for both research and instruction), potentially lower quality instruction (driven by minimal non-salary instruction budgets) and potentially lower quality scholarship (driven by deficient non-salary research budgets).

Given the prominent role of research and instructor quality in driving enrollments, tuition, and a host of other university metrics, these results suggest that the Virginia public university system should consider exploring direct investments in faculty (via salary expenditures) and indirect non-salary instruction and research categories that might improve the academic experience and research capacity at Virginia public research institutions. These targeted investments should be guided by a fuller evaluation of Virginia's institution-by-institution instruction spending against comparable private or public institutions (rather than a cohort based approach). Given the significant material differences between institutions in the state's public university system, the volume and character of these investments will likely vary by school. This reality underscores the importance of initiating these investments through an initial state-wide priority assessment.

The data also suggest that Virginia Public Institutions significantly under-spend private research institutions in academic and institutional support functions. While, on one hand, keeping overhead low serves Virginia's goal of keeping ultimate student cost low and promoting access, our data also suggest that these types of investment strongly correlate to the higher revenues we observed at private institutions.

Revisiting the suggestion that today's investments will drive tomorrow's returns, these data suggest a strong relation between a university's investment in 'back office' institutional support functions and the ability of that university to elicit diverse and voluminous revenue streams. This proposition extends to Policy Consideration II, where the data suggest a strong correlation between research activity volume and a university's investments in research support staff. For a full breakdown of average staffing levels at each of the cohorts, see Figure 12.

Figure 12: Average Staff Composition



Consequently, Virginia's public institutions should also explore staffing augmentation to drive higher non-core revenue streams. These types of investments may take unique forms depending on the unique characteristics of each institution. For example, universities with established research facilities and competitive faculty may enjoy highest returns by expanding their cadres of proposal writing, grant administration, and technical research staff rather than investing in fundraising and executive steering staff—roles that may better suit Virginia's burgeoning public institutions. In light of need for institution-specific staffing, Virginia should consider pursuing a comprehensive personnel evaluation to identify future strategic staffing priorities on heels of recent broad staff cuts and hiring freezes.

While these types of targeted investments may prove difficult to justify under times of budget austerity, these data suggest that the vitality of Virginia's public research institutions tomorrow will depend, in large part, on strategic financial decisions made today.

Appendix I: Data Definitions

Revenue Variables

Variable Name	Definition
Tuition*	Total revenue from tuition and fees (including student aid applied to tuition and fees).
Return on Investment*	Investment income is revenues derived from the institution's investments, including investments of endowment funds. Such income may take the form of interest income, dividend income, rental income or royalty income and includes both realized and unrealized gains and losses at FASB institutions. Revenue from Endowment Earnings is reported in this category for FASB institutions.
Education Sales*	Revenues from the sales of goods or services that are incidental to the conduct of instruction, research or public service. Examples include film rentals, sales of scientific and literary publications, testing services, university presses, dairy products, machine shop products, data processing services, cosmetology services, and sales of handcrafts prepared in classes.
Private Gifts*	Revenues from private donors for which no legal consideration is involved and from private contracts for specific goods and services provided to the funder as stipulation for receipt of the funds. Includes only those gifts, grants, and contracts that are directly related to instruction, research, public service, or other institutional purposes. Includes monies received as a result of gifts, grants, or contracts from a foreign government. Also includes the estimated dollar amount of contributed services. Revenue from Endowment Earnings is reported in this category for GASB institutions.
Local Appropriations*	Revenues from appropriations by a governmental entity below the state level. Education district taxes include all tax revenues assessed directly by an institution or on behalf of an institution when the institution will receive the exact amount collected. These revenues also include similar revenues that result from actions of local governments or citizens (such as through a referendum) that result in receipt by the institution of revenues based on collections of other taxes or resources (sales taxes, gambling taxes, etc.).
State Appropriations*	Revenues received by the institution through acts of a state legislative body (except grants and contracts and capital appropriations). Funds reported in this category are for meeting current operating expenses, not for specific projects or programs
Federal Appropriations*	Revenue received by the institution through acts of a federal legislative body (except grants and contracts).
Local Grants & Contracts*	Revenues from local government agencies that are for training programs and similar activities for which amounts are received or expenditures are reimbursable under the terms of a local government grant or contract.
State Grants & Contracts*	Revenues from state government agencies that are for training programs and similar activities for which amounts are received or expenditures are reimbursable under the terms of a state or local government grant or contract.
Federal Grants & Contracts*	Revenues from federal governmental agencies that are for training programs, research, or public service activities for which expenditures are reimbursable under the terms of a government grant or contract. Includes Pell Grants for GASB institutions, and those FASB institutions that do not treat it as a pass-through to tuition revenues.
Total Revenue	Total net revenue calculated by summing Tuition, Return on Investment, Education Sales, Private Gifts, Local, State, and Federal Appropriations, and Local, State, and Federal Grants & Contracts.

Spending Variables

Variable Name	Definition
Instructional Salaries*	Instruction salaries and wages are amounts paid as compensation for services to all employees - faculty, staff, part time, full time, regular employees, and student employees of the colleges, schools, departments, and other instructional divisions of the institution, and for departmental research and public service that are not separately budgeted. It includes compensation for academic instruction, occupational and vocational instruction, community education, preparatory and adult basic education, and remedial and tutorial instruction conducted by the teaching faculty for the institution's students.
Instructional Fringe Benefits†	Instruction fringe benefits are payments made to an individual over and above that received in the form of a salary or wage, such as for insurance or retirement benefits, associated with the colleges, schools, departments, and other instructional divisions of the institution and for departmental research and public service that are not separately budgeted. This would include compensation for academic instruction, occupational and vocational instruction, community education, preparatory and adult basic education, and remedial and tutorial instruction conducted by the teaching faculty for the institution's students.
Instructional Operations & Maintenance Spending†	Operations and maintenance of plant expenses is the sum of all operating expenses associated with operations established to provide service and maintenance related to campus grounds and facilities used for educational and general purposes. Instruction operations and maintenance spending is the sum of all operating expenses associated with the colleges, schools, departments, and other instructional divisions of the institution and for departmental research and public service that are not separately budgeted. This would include compensation for academic instruction, occupational and vocational instruction, community education, preparatory and adult basic education, and remedial and tutorial instruction conducted by the teaching faculty for the institution's students.
Other Instructional Spending†	Other instructional spending is the sum of expenses not included in salaries and wages, benefits, or depreciation that are associated with the colleges, schools, departments, and other instructional divisions of the institution and for departmental research and public service that are not separately budgeted. This would include compensation for academic instruction, occupational and vocational instruction, community education, preparatory and adult basic education, and remedial and tutorial instruction conducted by the teaching faculty for the institution's students.
Instructional Total Spending*	A functional expense category that includes expenses of the colleges, schools, departments, and other instructional divisions of the institution and expenses for departmental research and public service that are not separately budgeted. Includes general academic instruction, occupational and vocational instruction, community education, preparatory and adult basic education, and regular, special, and extension sessions. Also includes expenses for both credit and non-credit activities. Excludes expenses for academic administration where the primary function is administration (e.g., academic deans). Information technology expenses related to instructional activities are included if the institution separately budgets and expenses information technology resources (otherwise these expenses are included in academic support). Operations and maintenance and interest amounts attributed to the instruction function have been subtracted from the total instructional expenditure amount at FASB reporting institutions. Operations and maintenance amounts (and interest in the 2009 aligned form) attributed to the instruction function have been subtracted from the total amount at public Aligned form reporting institutions.
Average Salary†	Average salary equated to 9-month contracts of full-time instructional faculty - all ranks were derived by summing the equated 9-month outlays for each rank and dividing by the total faculty on both 9/10 month and 11/12 month contracts.

Academic Support Salaries*	Academic support - salaries and wages are amounts paid as compensation for services to all employees - faculty, staff, part time, full time, regular employees, and student employees of activities and services that support the institution's primary missions of instruction, research, and public service.
Academic Support Total Spending*	A functional expense category that includes expenses of activities and services that support the institution's primary missions of instruction, research, and public service. It includes the retention, preservation, and display of educational materials (for example, libraries, museums, and galleries); organized activities that provide support services to the academic functions of the institution (such as a demonstration school associated with a college of education or veterinary and dental clinics if their primary purpose is to support the instructional program); media such as audiovisual services; academic administration (including academic deans but not department chairpersons); and formally organized and separately budgeted academic personnel development and course and curriculum development expenses. Also included are information technology expenses related to academic support activities; if an institution does not separately budget and expense information technology resources, the costs associated with the three primary programs will be applied to this function and the remainder to institutional support. Operations and maintenance and interest amounts attributed to the academic support function have been subtracted from the total academic support expenditure amount at FASB reporting institutions. Operations and maintenance amounts (and interest in the 2009 aligned form) attributed to the academic support function have been subtracted from the total academic support expenditure amount at public Aligned Form reporting institutions.
Institutional Support Salaries*	Amounts paid as compensation for services to all employees - faculty, staff, part time, full time, regular employees, and student employees of the day-to-day operational support of the institution. Includes expenses for general administrative services, central executive-level activities concerned with management and long range planning, legal and fiscal operations, space management, employee personnel and records, logistical services such as purchasing and printing, and public relations and development.
Institutional Support Total Spending*	A functional expense category that includes expenses for the day-to-day operational support of the institution. Includes expenses for general administrative services, central executive-level activities concerned with management and long range planning, legal and fiscal operations, space management, employee personnel and records, logistical services such as purchasing and printing, and public relations and development. Also includes information technology expenses related to institutional support activities. Operations and maintenance and interest amounts attributed to the institutional support function have been subtracted from the total institutional support expenditure amount at FASB reporting institutions. Operations and maintenance amounts (and interest in the 2009 aligned form) attributed to the institutional support function have been subtracted from the total institutional support expenditure amount at public Aligned Form reporting institutions.
Research Salaries*	Amounts paid as compensation for services to all employees - faculty, staff, part time, full time, regular employees, and student employees of activities specifically organized to produce research outcomes and commissioned by an agency either external to the institution or separately budgeted by an organizational unit within the institution. The category includes institutes and research centers and individual and project research. This function does not include non-research-sponsored programs (e.g., training programs).
Research Total Spending*	A functional expense category that includes expenses for activities specifically organized to produce research outcomes and commissioned by an agency either external to the institution or separately budgeted by an organizational unit within the institution. The category includes institutes and research centers, and individual and project research. This function does not include non-research-sponsored programs (e.g., training programs). Also included are information technology expenses related to research activities if the institution separately budgets and expenses information

	technology resources (otherwise these expenses are included in academic support.) Operations and maintenance and interest amounts attributed to the research function have been subtracted from the total research expenditure amount at FASB reporting institutions. Operations and maintenance amounts (and interest in the 2009 aligned form) attributed to the research function have been subtracted from the total research expenditure amount at public Aligned Form reporting institutions.

Quantitative Variables

Variable Name	Definition
Six Year Graduation Rate†	The number of students from the adjusted bachelor's degree-seeking cohort, who completed a bachelor's degree within 150 percent of normal time (6-years) divided by the adjusted cohort. Note: Adjusted Cohort is the revised cohort minus exclusions as reported by the institution as of 150 percent of normal time. (6-years).
Number of Degrees Awarded*	*Associate Degrees:* Total number of associate degrees conferred that normally require at least 2 but less than 4 years of full-time equivalent college work.
	Bachelor Degrees: Total number of awards conferred (baccalaureate or equivalent degree, as determined by the Secretary, U.S. Department of Education) that normally require at least 4 but not more than 5 years of full-time equivalent college-level work. This includes all bachelor's degrees conferred in a 5-year cooperative (work-study) program. A cooperative plan provides for alternate class attendance and employment in business, industry, or government; thus, it allows students to combine actual work experience with their college studies. Also includes bachelor's degrees in which the normal 4 years of work are completed in 3 years.
	Master Degrees: The total number of awards granted that require the successful completion of a program of study of at least the full-time equivalent of 1 but not more than 2 academic years of work beyond the bachelor's degree.
	Doctoral Degrees: The total number of doctoral degrees conferred. A doctoral degree is the highest award a student can earn for graduate study. The doctor's degree classification includes such degrees as Doctor of Education, Doctor of Juridical Science, Doctor of Public Health, and the Doctor of Philosophy degree in any field such as agronomy, food technology, education, engineering, public administration, ophthalmology, or radiology.
Staff Counts*	*Executive:* A primary function or occupational activity category used to classify persons whose assignments require management of the institution, or a customarily recognized department or subdivision thereof. Assignments require the performance of work directly related to management policies or general business operations of the institution, department or subdivision. Assignments in this category customarily and regularly require the incumbent to exercise discretion and independent judgment.
	Other Professionals: A primary function or occupational activity category used to classify persons employed for the primary purpose of performing academic support, student service, and institutional support, whose assignments would require either a baccalaureate degree or higher or experience of such kind and amount as to provide a comparable background.
	Clerical/Secretary: A primary function or occupational activity category used to classify persons whose assignments typically are associated with clerical activities or are specifically of a secretarial nature. Includes personnel who are responsible for internal and external communications, recording and retrieval of data (other than computer programmer) and/or information and other paperwork required in an office.
	Technical & Paraprofessional: A primary function or occupational activity category used to classify persons whose assignments require specialized knowledge or skills which may be acquired through experience, apprenticeship, on-the-job-training, or academic work in occupationally specific programs that result in a 2-year degree or other certificate or diploma. Includes persons who perform some of the duties of a professional in a supportive role, which usually requires less formal training and/or

	experience than normally required for professional status.
	Faculty: Persons identified by the institution as such and typically those whose initial assignments are made for the purpose of conducting instruction, research or public service as a principal activity (or activities). They may hold academic rank titles of professor, associate professor, assistant professor, instructor, lecturer or the equivalent of any of those academic ranks. Faculty may also include the chancellor/president, provost, vice provosts, deans, directors or the equivalent, as well as associate deans, assistant deans and executive officers of academic departments (chairpersons, heads or the equivalent) if their principal activity is instruction combined with research and/or public service. The designation as "faculty" is separate from the activities to which they may be currently assigned. For example, a newly appointed president of an institution may also be appointed as a faculty member. Graduate, instruction, and research assistants are not included in this category.

Source Notes:
* Delta Cost 2000-2010 Master Set + 2011 IPEDS Supplement
† IPEDS Raw Survey Data 2000-2011

All figures reported in 2011 dollars, adjusted per FTE.

Appendix II: Cohort Summary Statistics

Cohort Summary Statistics (2000-2011)

Category	Total Annual Enrollment		Annual Total Revenue* (1000s)		Annual Total Spending* (1000s)	
	Average	Std. Deviation	Average	Std. Deviation	Average	Std. Deviation
Virginia	23,266	7,778	$830,700,000	$708,000,000	$789,700,000	$614,000,000
Private I	10,892	7,114	$544,700,000	$377,400,000	$476,200,000	$267,600,000
Private II	17,619	9,145	$2,942,000,000	$1,904,000,000	$2,413,000,000	$924,800,000

**As reported by each institution. Includes additional revenue and spending categories otherwise excluded in this analysis such auxiliary enterprises, athletics, interest/depreciation, etc.*

Virginia Public Institution Summary Statistics (2000-2011)

Rank		Total Annual Enrollment	Mean Annual Total Revenue*	Annual Total Spending*
1	University of Virginia	23,642	$2,233,000,000	$2,038,000,000
2	Virginia Polytechnic Institute	28,902	$954,800,000	$932,400,000
3	Virginia Commonwealth University	28,800	$742,200,000	$717,500,000
4	George Mason University	28,988	$506,900,000	$498,400,000
5	Old Dominion University	21,541	$292,300,000	$289,400,000
6	College of William and Mary	7,720	$255,300,000	$263,000,000

**As reported by each institution. Includes additional revenue and spending categories otherwise excluded in this analysis such auxiliary enterprises, athletics, interest/depreciation, etc.*

Private I Institution Summary Statistics (2000-2011)

Rank		Total Annual Enrollment	Mean Annual Total Revenue*	Annual Total Spending*
1	University of Notre Dame	11,418	$1,222,000,000	$723,900,000
2	Wake Forest University	6,626	$1,014,000,000	$971,400,000
3	Brigham Young University	33,599	$993,600,000	$878,100,000
4	George Washington University	23,602	$970,100,000	$867,300,000
5	Dartmouth College	5,719	$908,700,000	$684,300,000
6	Georgetown University	14,009	$895,700,000	$841,800,000
7	Howard University	10,473	$857,900,000	$861,800,000
8	Carnegie Mellon University	9,889	$835,500,000	$788,100,000
9	Case Western Reserve University	9,466	$790,400,000	$770,500,000
10	Brown University	8,116	$768,000,000	$585,200,000
11	Tulane University of Louisiana	11,600	$741,600,000	$698,000,000
12	Tufts University	9,700	$721,900,000	$590,900,000
13	Syracuse University	18,904	$717,700,000	$666,300,000
14	Boston College	14,637	$714,800,000	$575,700,000
15	Drexel University	18,158	$671,600,000	$624,500,000
16	Northeastern University	24,115	$659,500,000	$604,500,000
17	Saint Louis University	15,000	$628,400,000	$598,100,000
18	Rice University	4,975	$618,400,000	$415,500,000
19	Yeshiva University	6,134	$615,900,000	$573,300,000
20	Nova Southeastern University	24,474	$476,900,000	$443,300,000
21	Loyola University Chicago	14,398	$447,100,000	$401,000,000
22	Fordham University	15,118	$443,300,000	$383,600,000
23	Baylor University	14,117	$420,600,000	$356,800,000
24	Southern Methodist University	10,817	$419,300,000	$361,400,000
25	Lehigh University	6,740	$362,500,000	$300,600,000
26	University of Dayton	10,508	$358,100,000	$327,400,000
27	University of Denver	10,303	$356,200,000	$300,100,000
28	Rensselaer Polytechnic Institute	7,065	$352,900,000	$356,400,000
29	Brandeis University	5,144	$310,300,000	$257,900,000
30	Rockefeller University	186	$249,800,000	$200,800,000
31	Duquesne University	9,881	$236,300,000	$218,500,000
32	Illinois Institute of Technology	6,675	$214,000,000	$212,400,000
33	Catholic University of America	6,082	$200,800,000	$181,600,000
34	Stevens Institute of Technology	4,781	$140,200,000	$139,900,000
35	Clark University	3,141	$108,800,000	$87,343,015
36	Clarkson University	3,064	$104,100,000	$94,163,870
37	Polytechnic Institute of New York	4,328	$98,321,478	$108,700,000
38	Polytechnic University	2,991	$91,453,470	$98,115,136
39	Claremont Graduate University	2,076	$60,225,707	$52,789,582

**As reported by each institution. Includes additional revenue and spending categories otherwise excluded in this analysis such auxiliary enterprises, athletics, interest/depreciation, etc.*

Private II Institution Summary Statistics (2000-2011)

Rank		Total Annual Enrollment	Mean Annual Total Revenue*	Annual Total Spending*
1	Harvard University	25,421	$5,468,000,000	$3,277,000,000
2	University of Pennsylvania	23,386	$5,218,000,000	$4,662,000,000
3	Duke University	13,259	$4,143,000,000	$3,551,000,000
4	Stanford University	18,621	$3,994,000,000	$2,961,000,000
5	Yale University	11,311	$3,638,000,000	$2,152,000,000
6	Johns Hopkins University	19,063	$3,595,000,000	$3,357,000,000
7	Columbia University	26,666	$3,514,000,000	$2,892,000,000
8	Massachusetts Institute of Techno	10,284	$2,991,000,000	$2,239,000,000
9	New York University	39,944	$2,924,000,000	$2,677,000,000
10	Emory University	12,148	$2,892,000,000	$2,753,000,000
11	Vanderbilt University	11,338	$2,829,000,000	$2,583,000,000
12	University of Chicago	13,871	$2,561,000,000	$2,251,000,000
13	California Institute of Technology	2,109	$2,437,000,000	$2,378,000,000
14	University of Southern California	32,405	$2,377,000,000	$2,035,000,000
15	University of Rochester	8,825	$2,320,000,000	$2,213,000,000
16	Princeton University	6,948	$2,040,000,000	$1,012,000,000
17	Washington University in St Louis	13,055	$2,034,000,000	$1,762,000,000
18	Northwestern University	18,278	$1,812,000,000	$1,386,000,000
19	University of Miami	15,159	$1,746,000,000	$1,654,000,000
20	Cornell University	17,613	$1,742,000,000	$1,494,000,000
21	Boston University	30,300	$1,499,000,000	$1,385,000,000