



University Spending & Graduation Rates: Does Money Matter?

Eric S. Atchison

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Background

- K-12:
 - School resources had little or no effect on K-12 student achievement after accounting for student background characteristics (Coleman, et al., 1966)
 - No significant relationships between expenditures and exiting test scores (Rock, Baird, and Linn, 1972)
- Postsecondary:
 - Expenditures for student services were positively related to retention (Astin, 1993)
 - Expenditures for instruction and academic support were positively related to retention rates (Ryan, 2004)
 - Retention at private baccalaureate colleges was related to academic support, but negatively related to student services & institutional support (Gansemer-Topf & Schuh, 2006)

Understanding GASB

- “Colleges and universities’ patterns of expenditures represent a set of actions that can emphasize or deemphasize undergraduate education and student learning”
(Pike, et al., (2006)

GASB Category	Description
Instruction	General academic instruction...conducted by the teaching faculty for the institution’s students.
Research	Activities specifically organized to produce research outcomes.
Public Service	Activities established primarily to provide non-instructional services beneficial to groups external to the institution.
Academic Support	Include the support services that are an integral part of the institution’s primary mission of instruction, research, and public service.
Student Services	Admissions, registrar activities, and activities whose primary purpose is to contribute to students’ emotional and physical well-being and to their intellectual, cultural, and social development outside the context of the formal instructional program.
Institutional Support	General administrative services, executive direction and planning, legal and fiscal operations, public relations, and development.

National Center for Education Statistics (2014). IPEDS glossary. Retrieved from <http://nces.ed.gov/ipeds/glossary/>

Research Questions

- In what ways are institutional expenditures a predictor of graduation rates?
- Do the relationships between institutional expenditures and graduation rates differ for...
 - baccalaureate institutions?
 - master's institutions?
 - doctoral/research institutions?

Variables in the Model

- Data source: IPEDS Data Center
- Key Variables:
 - Six-year graduation rate (Fall 2006 full-time entering cohort)
 - Three-year (FY07-FY09) average expenditures per FTE
 - Instruction
 - Academic Support
 - Research
 - Student Services
 - Public Service
 - Institutional Support
 - Carnegie Classification Groups
 - Baccalaureate
 - Master's
 - Research / Doctoral

Selection Criteria

- U.S. only institutions
- Public, 4-year colleges
- Have first-time, full-time freshmen
- Not a state or federal military academy (-9)
- Utilized GASB financial reporting
 - (-29 / 27 from PA, 1 from DE, 1 from FL)
- Reported 6-year bachelor's degree graduation rate for fall 2006 cohort in 2012 (-9)
- Study population = 515

Population Characteristics

	Baccalaureate (n=91)		Master's (n=256)		Research/Doctoral (n=168)	
	M	SD	M	SD	M	SD
6-Year Graduation Rate	35.5%	15.5	44.3%	14.4	57.8%	16.5
Instruction	5,642	1,574.1	5,778	1,161.1	9,034	3,617.3
Research	344	816.5	555	3,137.8	5,105	4,481.6
Public Service	531	705.6	535	638.5	1,774	1,960.1
Academic Support	1,327	648.4	1,363	527.7	2,460	1,838.2
Student Services	1,448	635.4	1,284	526.4	1,241	545.0
Institutional Support	2,143	1,103.3	1,832	820.6	2,175	940.0

Outlier Labeling Rule

Research/Doctoral: Instruction

Q1	Q3	g	Lower	Upper
6511.8	10914.5	2.2	-3068.4	20527.8
		X		
Q3 - Q1		4369.7		
g' =		9613.3		

Outliers & Truncation

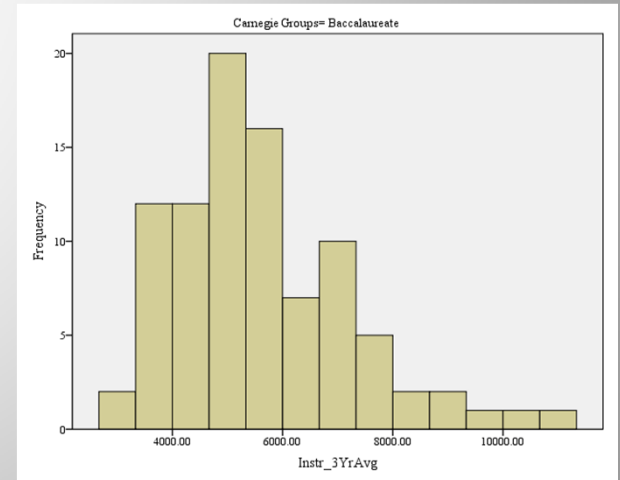
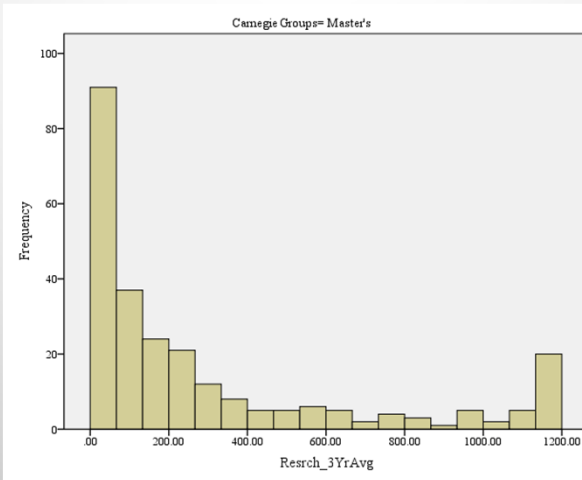
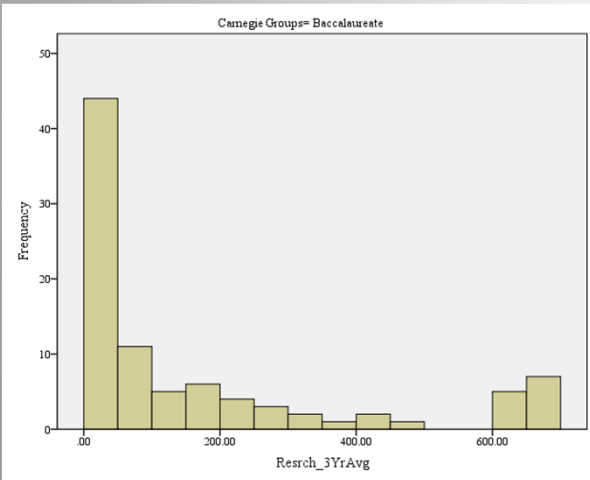
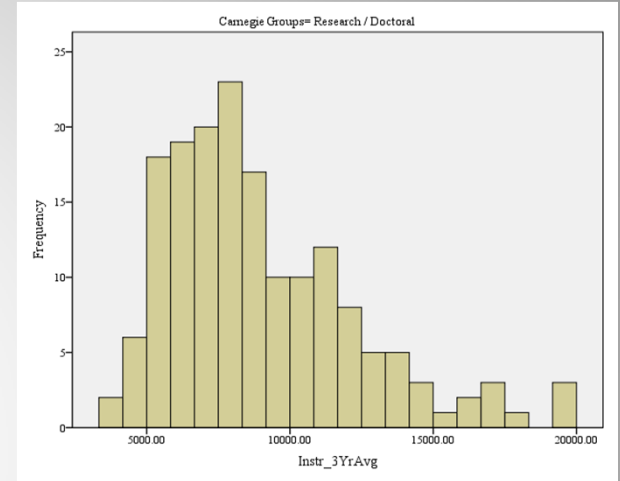
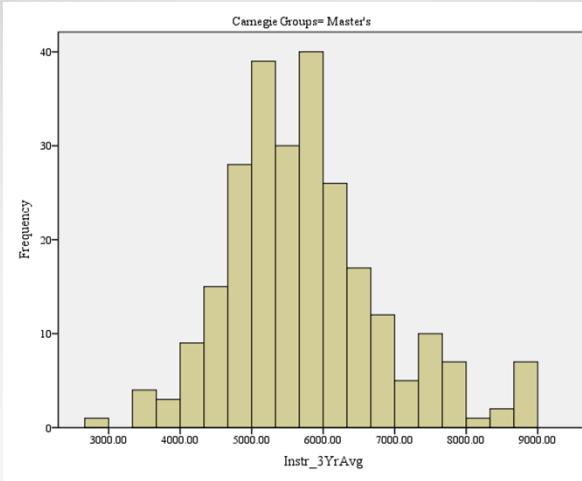
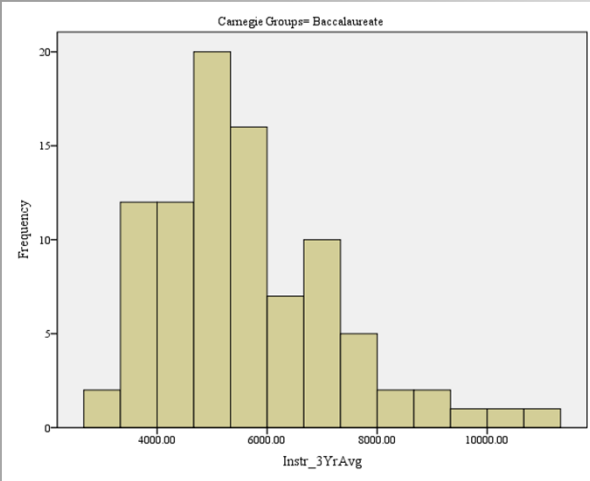
- 74 institutions (14.4%) / 92 items (2.9%)

	Baccalaureate	Master's	Research/Doctoral
Instruction		Delaware State (\$10,854)	UCLA (\$26,773)
Research	Montana Tech. (\$5,365)	New Mexico IMT (\$49,692)	Georgia Tech (\$21,068)
Public Service	Vermont Tech. (\$4,773)	Auburn Univ. (M) (\$4,271)	Univ. of Utah (\$15,201)
Academic Support	Central St. Univ. (\$3,630)	MUW (\$3,386)	Univ. of Alabama (\$20,461)
Student Services		Delaware State (\$4,881)	Univ. of Alaska (\$3,179)
Institutional Support	New College (FL) (\$6,666)	Cheney Univ. (\$7,215)	Texas So. Univ. (\$6,600)

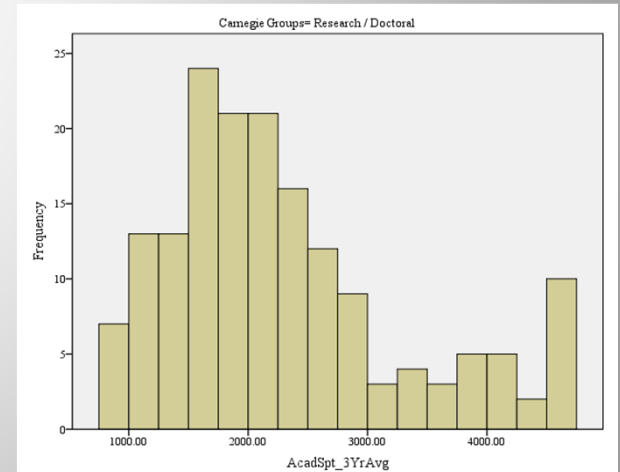
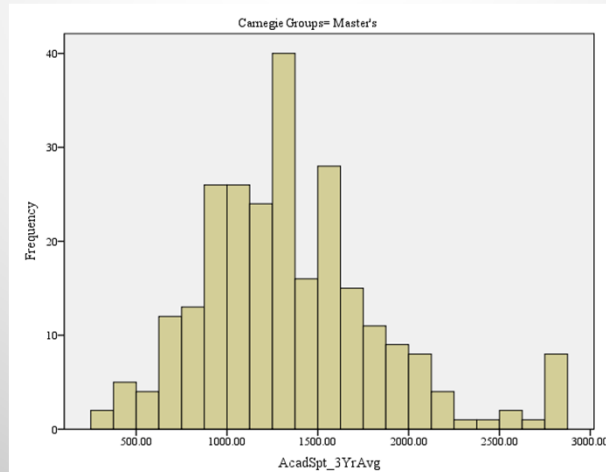
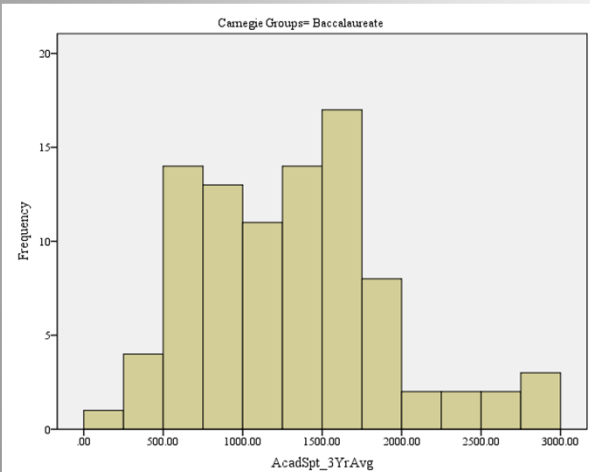
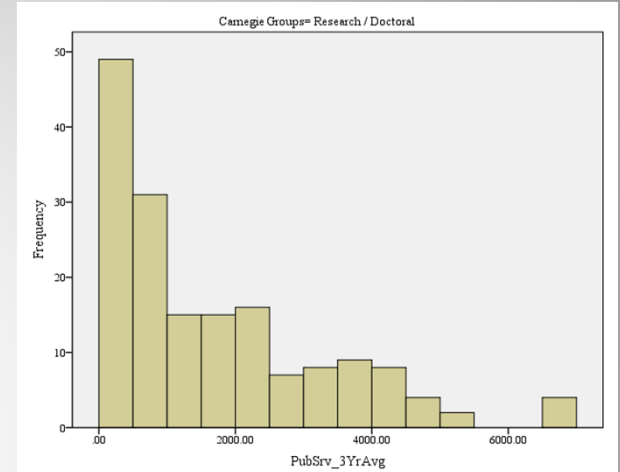
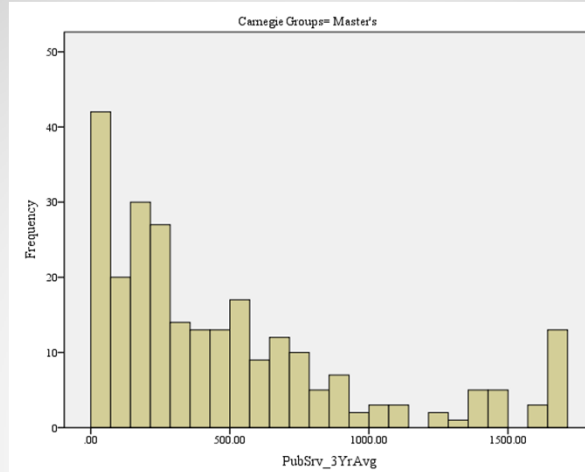
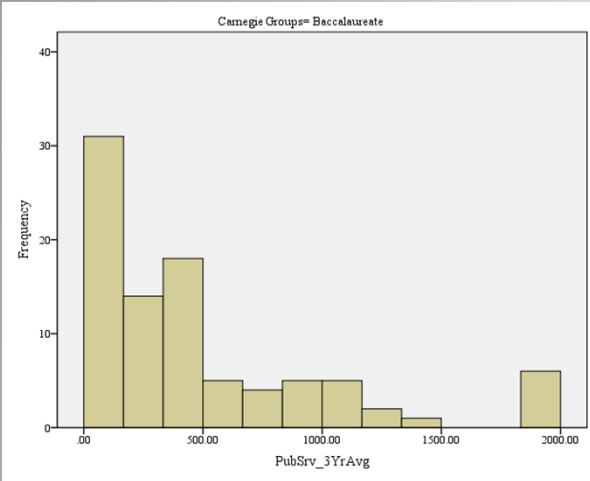
Adjusted Population Characteristics

	Baccalaureate (n=91)		Master's (n=256)		Research/Doctoral (n=168)	
	M	SD	M	SD	M	SD
6-Year Graduation Rate	35.5%	15.5	44.3%	14.4	57.8%	16.5
Instruction	5,642	1,574.1	5,760	1,098.7	8,959	3,314.7
Research	163	219.8	296	364.1	5,089	4,424.4
Public Service	483	511.9	486	467.3	1,697	1,600.4
Academic Support	1,312	603.5	1,355	500.7	2,297	991.5
Student Services	1,448	635.4	1,275	484.3	1,36	529.1
Institutional Support	2,129	1,049.9	1,805	708.2	2,152	857.0

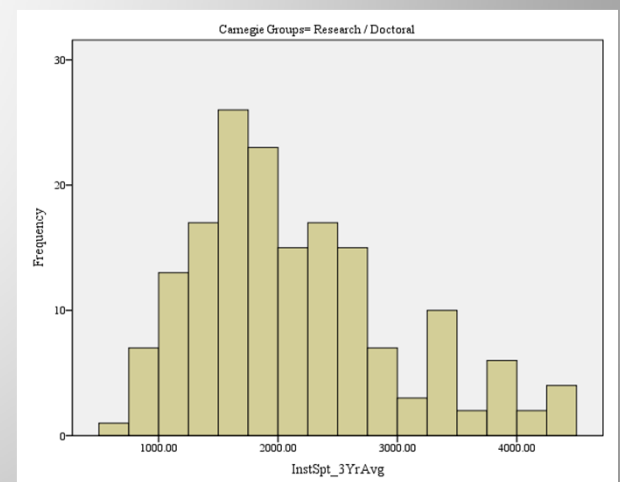
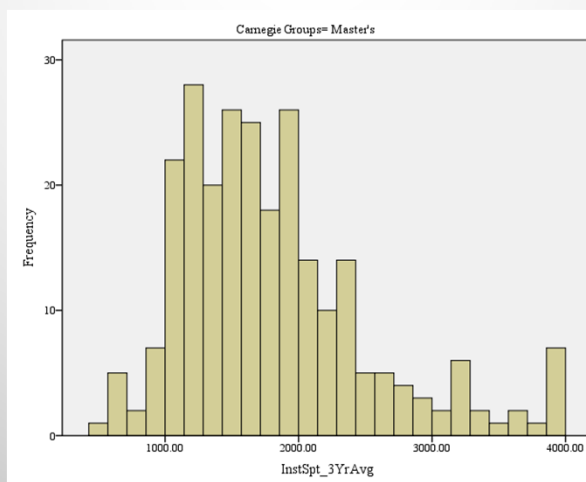
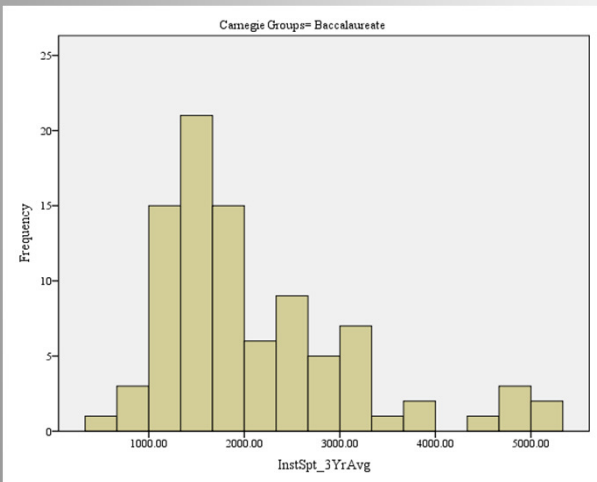
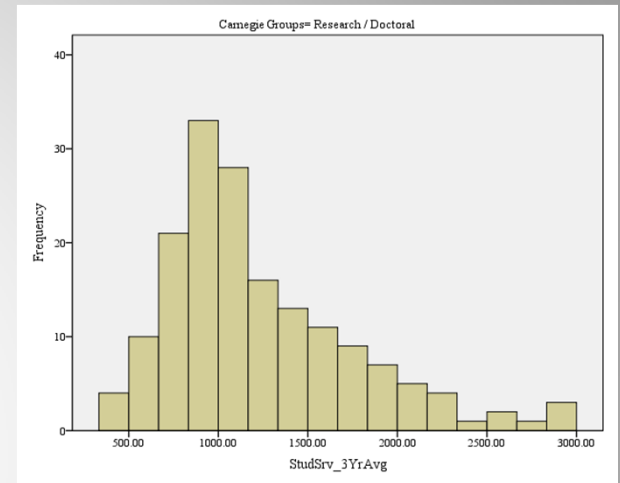
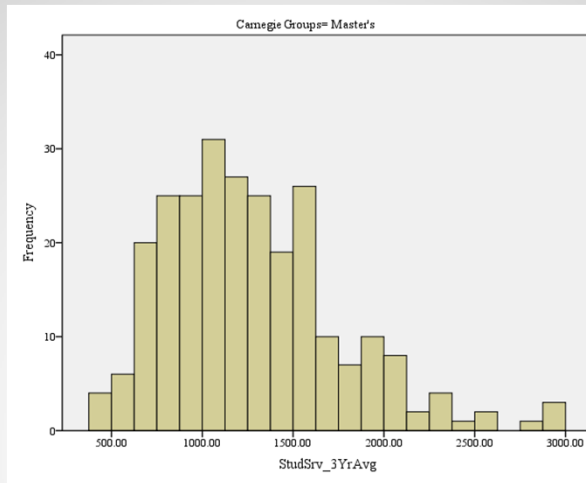
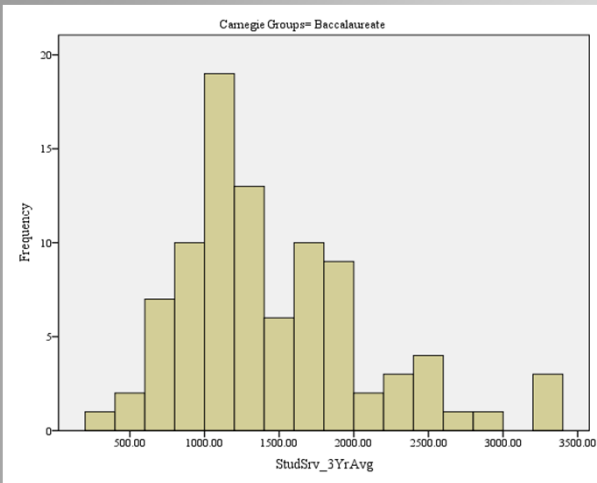
Frequency Distributions: Instruction & Research



Frequency Distributions: Public Service & Academic Support

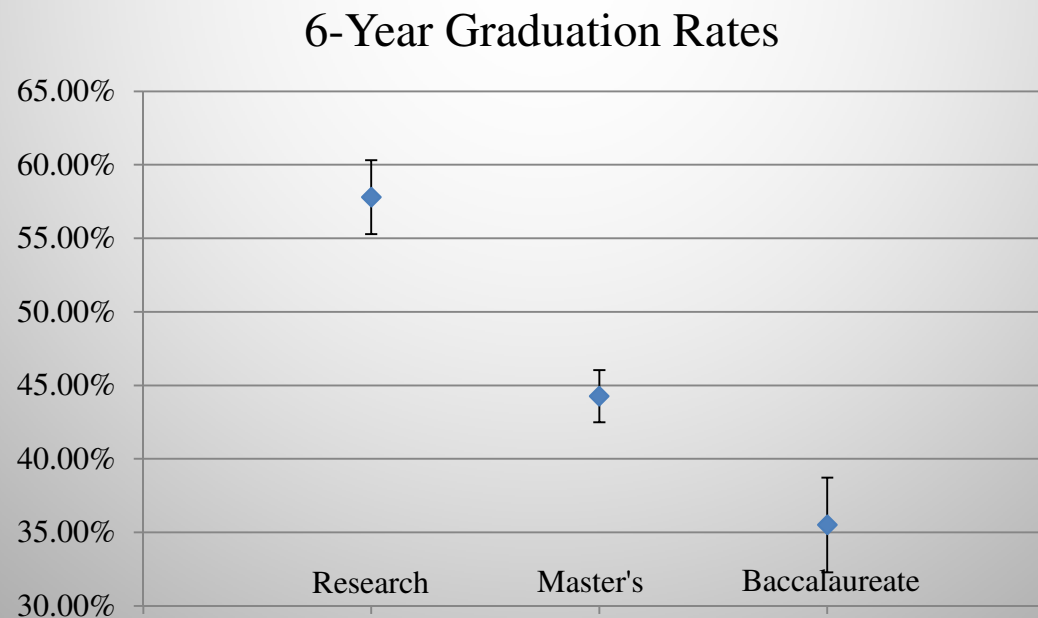


Frequency Distributions: Student Services & Institutional Support



Comparison of Carnegie Groups

- One-way ANOVA
- The one-way, between-subjects ANOVA revealed a reliable effect of Carnegie group on 6-year graduation rate
- $F(2, 512) = 71.53, p < .001$



Regression Model Specifications

- Outcome: Six-year graduation rate
- Predictors: Average expenditures per FTE categories
- Forced entry
 - Statistics: Collinearity diagnostics (Tolerance)
 - Plots: Partial plots, histogram, and standardized predicted and residual scores
 - Save: Unstandardized & studentized residuals, and standardized DfFit
- $\hat{Y} = b_0 + b_1(x_1) + b_2(x_2) + b_3(x_3) + \dots + b_k(x_k)$

Evaluation of the Model

- F test
- B weights
- Standardized Beta weights (β)
- Semi-partial correlation coefficients
- Estimates of explained variance (R^2)
- Tolerance for multicollinearity

Regression Model: Baccalaureate

	B	β	<i>t</i>	Semi-partial Correlations	Tolerance
(Constant)	12.35		2.14*		
Instruction / FTE	2.76×10^{-3}	.281	2.19*	.213	.575
Research / FTE	0.09×10^{-3}	.001	0.11	.001	.772
Public Service / FTE	-4.89×10^{-3}	-.162	-1.50	-.146	.809
Academic Support / FTE	5.91×10^{-3}	.231	1.97	.191	.686
Student Services / FTE	1.96×10^{-3}	.080	0.65	.063	.610
Institutional Support / FTE	0.32×10^{-3}	-.021	-0.18	-.018	.671

*.001 < *p* < .050; ***p* < .001

$$F(6,90) = 3.64^* \quad R^2 = .206$$

$$\hat{Y} = 12.35 + 2.76 \times 10^{-3}x_1 + 0.09 \times 10^{-3}x_2 - 4.89 \times 10^{-3}x_3 + 5.91 \times 10^{-3}x_4 + 1.96 \times 10^{-3}x_5 - 0.32 \times 10^{-3}x_6$$

Regression Model: Master's

	B	β	<i>t</i>	Semi-partial Correlations	Tolerance
(Constant)	32.37		6.42**		
Instruction / FTE	4.03×10^{-3}	.306	4.45**	.264	.743
Research / FTE	-3.23×10^{-3}	-.081	-1.25	-.074	.837
Public Service / FTE	-5.60×10^{-3}	-.181	-2.94*	-.175	.927
Academic Support / FTE	1.62×10^{-3}	.056	0.88	.052	.861
Student Services / FTE	0.11×10^{-3}	.004	0.06	.003	.865
Institutional Support / FTE	-5.51×10^{-3}	-.270	-3.85**	-.228	.715

*.001 < *p* < .050; ***p* < .001

$$F(6,255) = 5.85^{**} \quad R^2 = .124$$

$$\hat{Y} = 32.37 + 4.03 \times 10^{-3}x_1 - 3.23 \times 10^{-3}x_2 - 5.60 \times 10^{-3}x_3 + 1.62 \times 10^{-3}x_4 + 0.11 \times 10^{-3}x_5 - 5.51 \times 10^{-3}x_6$$

Regression Model: Research/Doctoral

	B	β	<i>t</i>	Semi-partial Correlations	Tolerance
(Constant)	42.43		10.29**		
Instruction / FTE	2.17×10^{-3}	.436	4.04**	.263	.365
Research / FTE	1.19×10^{-3}	.319	3.13*	.204	.409
Public Service / FTE	-0.79×10^{-3}	-.077	-0.97	-.063	.674
Academic Support / FTE	-0.84×10^{-3}	-.051	-0.51	.033	.433
Student Services / FTE	-1.42×10^{-3}	-.046	-0.65	-.042	.867
Institutional Support / FTE	-2.36×10^{-3}	-.122	-1.57	-.102	.695

*.001 < *p* < .050; ***p* < .001

$$F(6,167) = 12.39^{**} \quad R^2 = .316$$

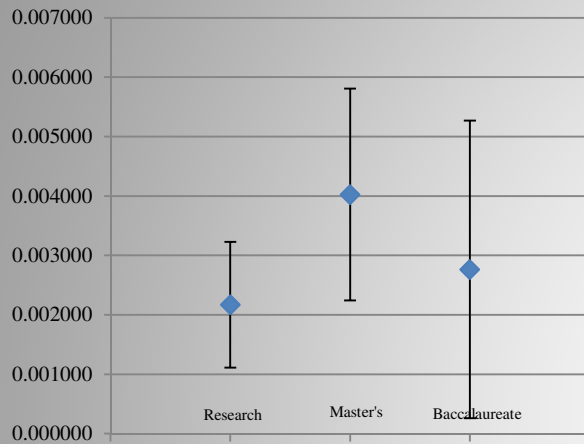
$$\hat{Y} = 42.43 + 2.17 \times 10^{-3}x_1 + 1.19 \times 10^{-3}x_2 - 0.79 \times 10^{-3}x_3 - 0.84 \times 10^{-3}x_4 - 1.42 \times 10^{-3}x_5 - 2.36 \times 10^{-3}x_6$$

Applying the Model

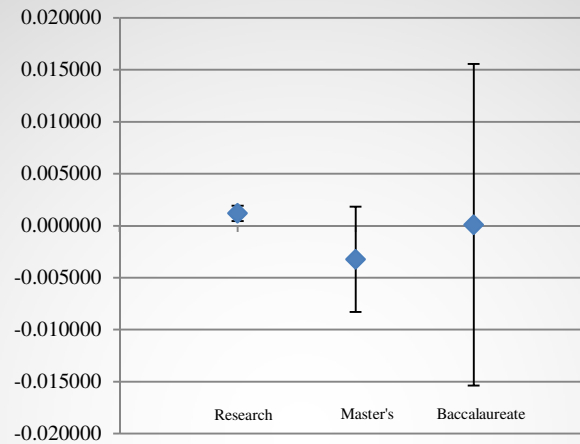
	ASU (M)	DSU (M)	JSU (R)	MSU (R)	MUW (M)	MVSU (M)	UM (R)	USM (R)
Instruction	6,072	5,594	5,812	6,084	5,214	5,535	7,570	6,771
Research	1,155	15.33	3,979	10,573	552	120	3,183	3,613
Public Service	1,462	1,420	233	5,282	224	1,312	294	1,506
Academic Support	1,353	1,385	1,511	1,866	2,799	1,266	1,801	1,122
Student Services	1,441	1,353	1,941	819	1,134	2,336	847	673
Institutional Support	3,240	1,580	3,852	2,627	1,881	2,590	1,584	1,991
Predicted Grad Rate	29.4%	40.6%	46.5%	55.1%	44.6%	35.0%	56.0%	53.6%
Actual Grad Rate	31.5%	37.0%	45.1%	57.8%	39.4%	22.3%	58.3%	49.5%
Difference	2.1%	-3.6%	-1.4%	2.7%	-5.2%	-12.7%	2.3%	-4.1%

Comparison of B Weights

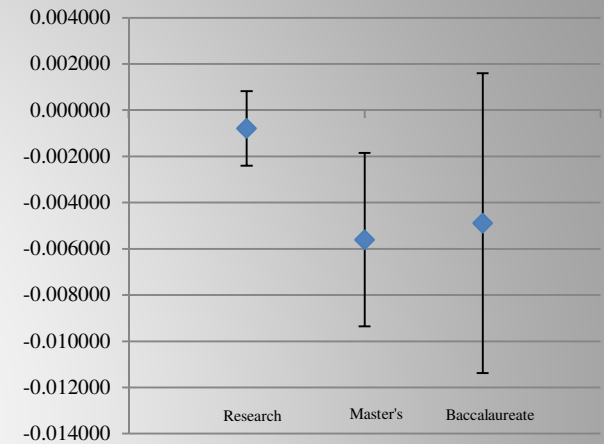
Instruction / FTE



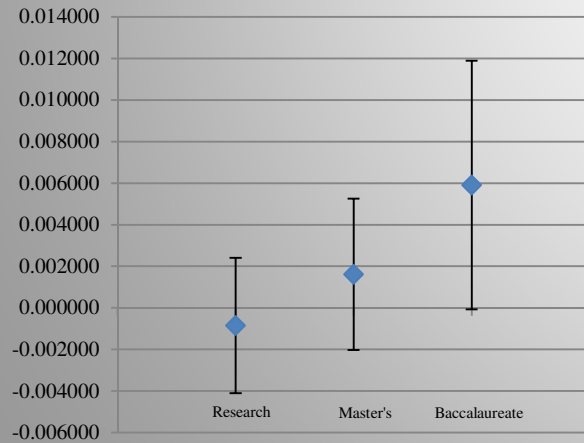
Research / FTE



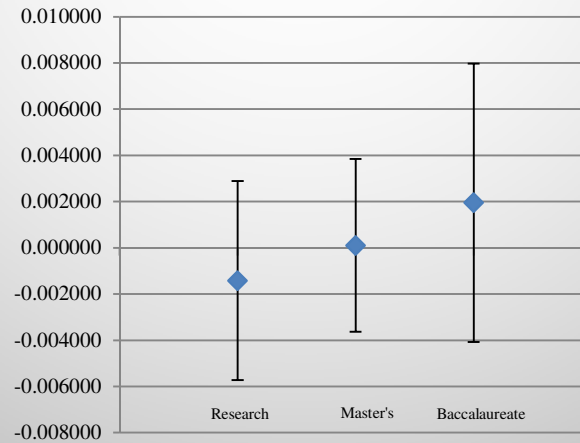
Public Service / FTE



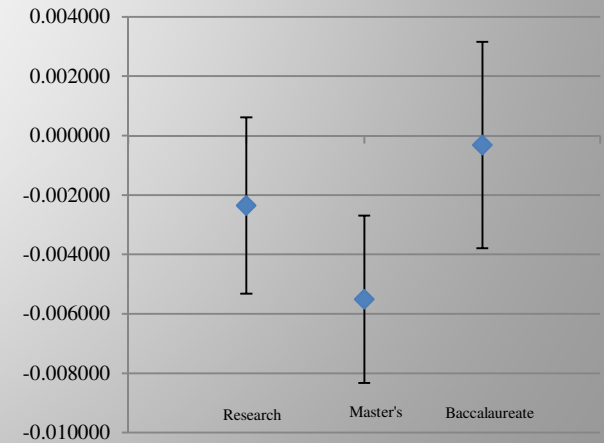
Academic Support / FTE



Student Services / FTE



Institutional Support / FTE



Conclusions

- In what ways are institutional expenditures a predictor of graduation rates?
- Do the relationships between institutional expenditures and graduation rates differ for...
 - baccalaureate institutions?
 - master's institutions?
 - doctoral/research institutions?

Expenditures	Baccalaureate	Master's	Research/Doctoral
Instruction	(+)	(+)	(+)
Research			(+)
Public Service		(-)	
Academic Support			
Student Services			
Institutional Support		(-)	

Limitations

- One moment in time
- Predictor variables are limited
- Skewness in certain categories

Next Steps

- Adjust expenditures to reflect undergraduate education
- Further investigate the individual expenditure categories
- Consider other institutional characteristics of institutions
- Investigate a similar model for community & junior colleges
- Dataset, syntax, and output are available

References

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