Defendable, Persuasive, and Insightful Budget Analysis Methods

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2015 Southeastern Library Assessment Conference

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AGENDA

- **Background**
- **The BIG Question and Another One**
- **Investigation (data and peers)**
- **Peer Analysis**
  - **Demand and Resource**
  - **Funding**
    1. **Percentage based**
   2. **Linear regression based**

BACKGROUND

- **The University of Florida (UF) is a major, public, comprehensive, land-grant, research university.**

- **It is one of only 17 public, land-grant universities that belong to the Association of American Universities, and is one of the largest universities in the nation, with more than 50,000 students.**

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- **The UF Libraries form the largest information resource system in the state. The UF Libraries consist of seven libraries; six are in the system known as the George A. Smathers Libraries. These include the Health Science Center Libraries (HSCL).**

- **The Smathers Libraries is an active member of the Association of Research Libraries (ARL).**

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Since July 1, 2009, the Smathers Libraries have experienced $2.4 million in recurring funding cuts and $700,000 in one time cuts.

	FY2009-2010	FY2010-2011	FY2011-2012	FY2012-2013
Recurring	$642,296	$277,522	$136,160	$1,387,951
Non-Recurring			$689,971	

Gap in Expenditures for Materials
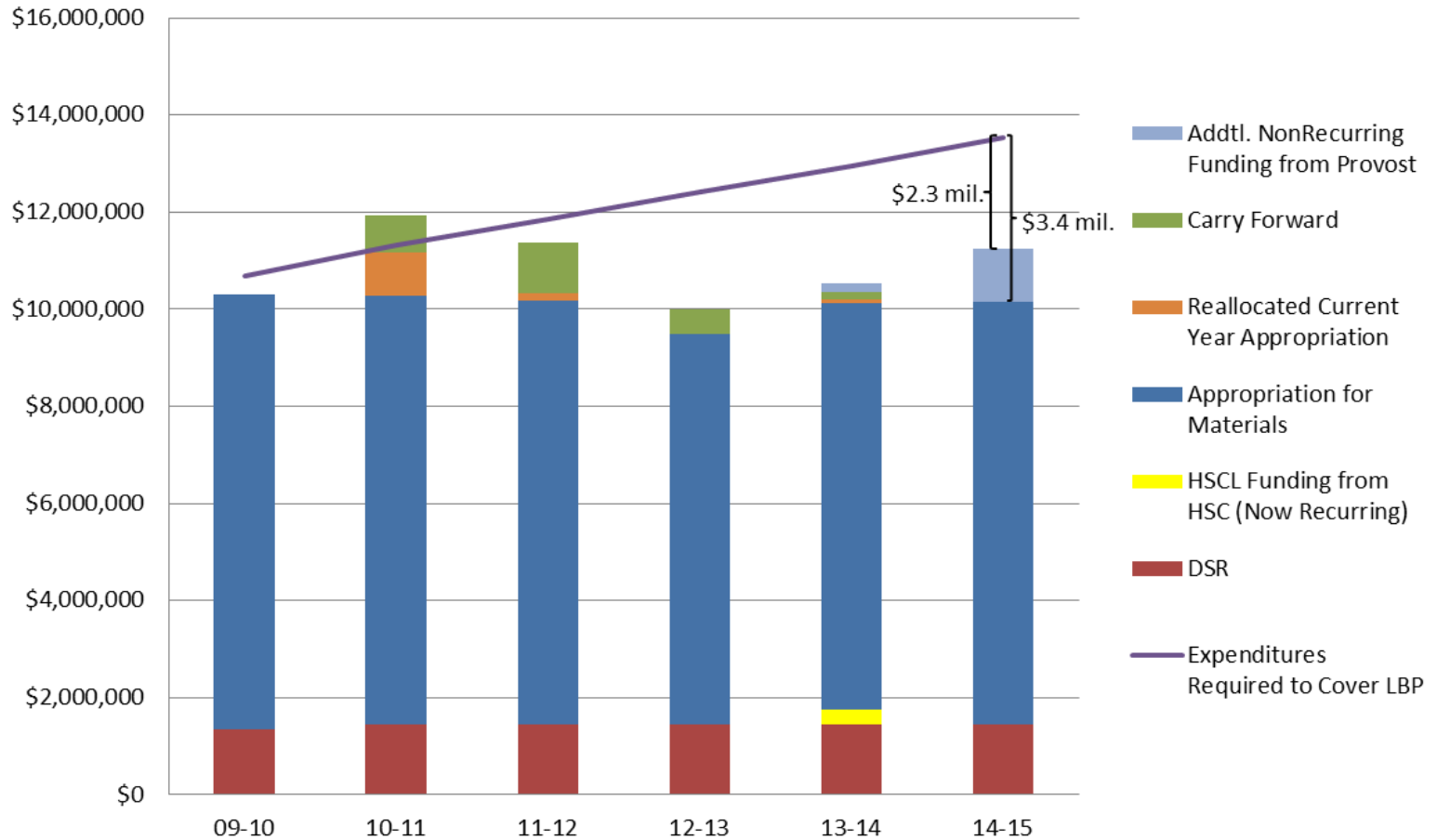
- **In 2011, UF adopted Responsibility Centered Management (RCM) for budgeting.**

- **Under RCM, the colleges became Responsibility Centers (revenue generators) and the Libraries became one of the numerous Support Units (non-revenue generating units primarily providing services to Responsibility Centers).**

- **The fundamental premise of RCM is to move decisions and resulting revenues to the colleges.**

- **RCM, along with decreased UF appropriations and lost purchasing power for library materials have increased pressure (internally and externally) to assess library funding and expenditures**

- **In 2014, UF launched *UF Rising* – a five-year initiative to elevate the University to among the nation's top public universities.**

- **W. Kent Fuchs became UF president on January 1, 2015 having previously served as Cornell provost.**

The QUESTION

- **What should the funding be for the Smathers Libraries?**

   (→UF Libraries)

- **Do the UF Libraries spend money eccentrically?**

INVESTIGATION

1. **Establish Peers**

AAU Public Universities
 – **Group A: 6 of Top 11 from US News (Aspirational Peers)**
 – **Group B: 10 of Top 25 from US News (Comprehensive Universities with Law & 2 or more Health Colleges)**

INVESTIGATION

2. **Assess available data:**

- **National Center for Education Statistics (NCES) data for university characteristics that correlate with** **DEMAND** **for library resources & services**

- **ARL data for characteristics that reflect library** **RESOURCES** **relating to materials and staff**

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PEER ANALYSIS

- **Demand v. Resources (2014)**

PEER ANALYSIS

UNIVERSITY Demand	Average Excluding UF
Total Faculty	4,204
Total Students	38,374
Undergraduates	27,561
Graduate Students	10,813
PhD's Awarded	1,191

PEER ANALYSIS

UNIVERSITY Demand	Average Excluding UF	UF as % of Non-UF Average
Total Faculty	4,204	132%
Total Students	38,374	130%
Undergraduates	27,561	120%
Graduate Students	10,813	155%
PhD's Awarded	1,191	165%

LIBRARY Resources	Average Excluding UF
Volumes Held	9,608,530
Librarians & Professional Staff	179
Other Staff	222
TOTAL Staff	401
$ for Materials	$17,570,516
TOTAL Library Expenditures	$47,089,336

LIBRARY Resources	Average Excluding UF	UF as % of Non-UF Average
Volumes Held	9,608,530	52%
Librarians & Professional Staff	179	49%
Other Staff	222	80%
TOTAL Staff	401	66%
$ for Materials	$17,570,516	73%
TOTAL Library Expenditures	$47,089,336	66%

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- **Findings:**

1. **UF is above average in all metrics reflecting demand for library services and/or resources**

2. **The UF Libraries are below average in all metrics reflecting the resources for the delivery of services and information**

	Per Undergraduate	
	UF	**AVG**
Volumes Held	147	352
Librarians and Professional Staff	0.0028	0.0066
Other Staff	0.0051	0.0082
TOTAL Staff	0.0080	0.0148
$ for Materials	$394	$643
Total Lib Expenditures	$911	$1,727

	Per Undergraduate		
	UF	AVG	Ratio
Volumes Held	147	352	1 : 2.4
Librarians and Professional Staff	0.0028	0.0066	1 : 2.3
Other Staff	0.0051	0.0082	1 : 1.6
TOTAL Staff	0.0080	0.0148	1 : 1.9
$ for Materials	$394	$643	1 : 1.6
Total Lib Expenditures	$911	$1,727	1 : 1.9

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	Per Graduate Student		
	UF	AVG	Ratio
Volumes Held	292	864	1 : 3
Librarians and Professional Staff	0.0056	0.0172	1 : 3.1
Other Staff	0.0102	0.0224	1 : 2.2
TOTAL Staff	0.0158	0.0396	1 : 2.5
$ for Materials	$782	$1,662	1 : 2.1
Total Lib Expenditures	$1,808	$4,422	1 : 2.5

	Per PhD Awarded		
	UF	AVG	Ratio
Volumes Held	2,482	7,872	1 : 3.2
Librarians and Professional Staff	0.0479	0.1525	1 : 3.2
Other Staff	0.0866	0.1979	1 : 2.3
TOTAL Staff	0.1344	0.3505	1 : 2.6
$ for Materials	$6,657	$14,897	1 : 2.2
Total Lib Expenditures	$15,383	$39,508	1 : 2.6

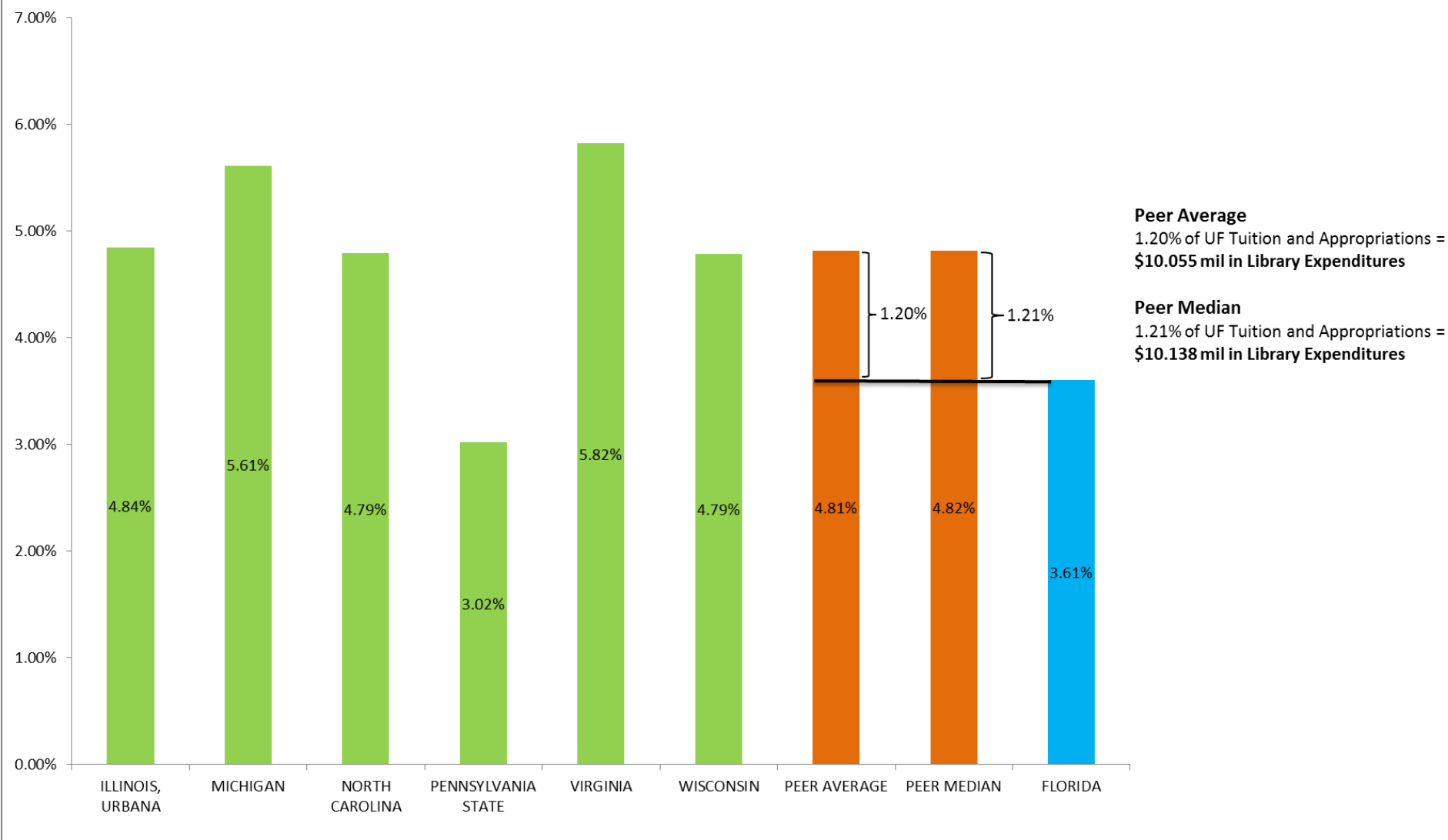|	Per Faculty		
	UF	AVG	Ratio
Volumes Held	880	2,557	1 : 2.9
Librarians and Professional Staff	0.0170	0.0497	1 : 2.9
Other Staff	0.0307	0.0545	1 : 1.8
TOTAL Staff	0.0477	0.1042	1 : 2.2
$ for Materials	$2,361	$4,376	1 : 1.9
Total Lib Expenditures	$5,454	$11,957	1 : 2.2

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PEER ANALYSIS

- **Funding – Percentage based (2013)**

FY 2013 Library Expenditures as a % of University Tuition & Approropriations

ILLINOIS, URBANA	4.84%
MICHIGAN	5.61%
NORTH CAROLINA	4.79%
PENNSYLVANIA STATE	3.02%
VIRGINIA	5.82%
WISCONSIN	4.79%
PEER AVERAGE	4.81%
PEER MEDIAN	4.82%
FLORIDA	3.61%

1.20% 1.21%

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2013 Library Expenditures as a % of University Tuition & Appropriations

Peer Average
1.20% of UF Tuition and Appropriations =
$10.055 mil in Library Expenditures

Peer Median
1.21% of UF Tuition and Appropriations =
$10.138 mil in Library Expenditures

Chart values:
- ILLINOIS, URBANA: 4.84%
- MICHIGAN: 5.61%
- NORTH CAROLINA: 4.79%
- PENNSYLVANIA STATE: 3.02%
- VIRGINIA: 5.82%
- WISCONSIN: 4.79%
- PEER AVERAGE: 4.81% (1.20%)
- PEER MEDIAN: 4.82% (1.21%)
- FLORIDA: 3.61%

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FY 2013 Materials Expenditures as a % of University Tuition & Appropriations

ILLINOIS, URBANA	2.03%
MICHIGAN	2.06%
NORTH CAROLINA	2.10%
PENNSYLVANIA STATE	1.18%
VIRGINIA	1.95%
WISCONSIN	1.57%
PEER AVERAGE	1.82%
PEER MEDIAN	1.99%
FLORIDA	1.56%

.26%

.43%

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FY 2013 Materials Expenditures as a % of University Tuition & Appropriations

Peer Average
.26% of UF Tuition and Appropriations
= $2.2 mil in Materials Expenditures

Peer Median
.43% of UF Tuition and Appropriations
= $3.6 mil in Materials Expenditures

Bar chart values:
- ILLINOIS, URBANA: 2.03%
- MICHIGAN: 2.06%
- NORTH CAROLINA: 2.10%
- PENNSYLVANIA STATE: 1.18%
- VIRGINIA: 1.95%
- WISCONSIN: 1.57%
- PEER AVERAGE: 1.82%
- PEER MEDIAN: 1.99%
- FLORIDA: 1.56%

.26%
.43%

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FY 2013 Library Expenditures as a % of University Tuition & Appropriations

FY 2013 Materials Expenditures as a % of University Tuition & Appropriations
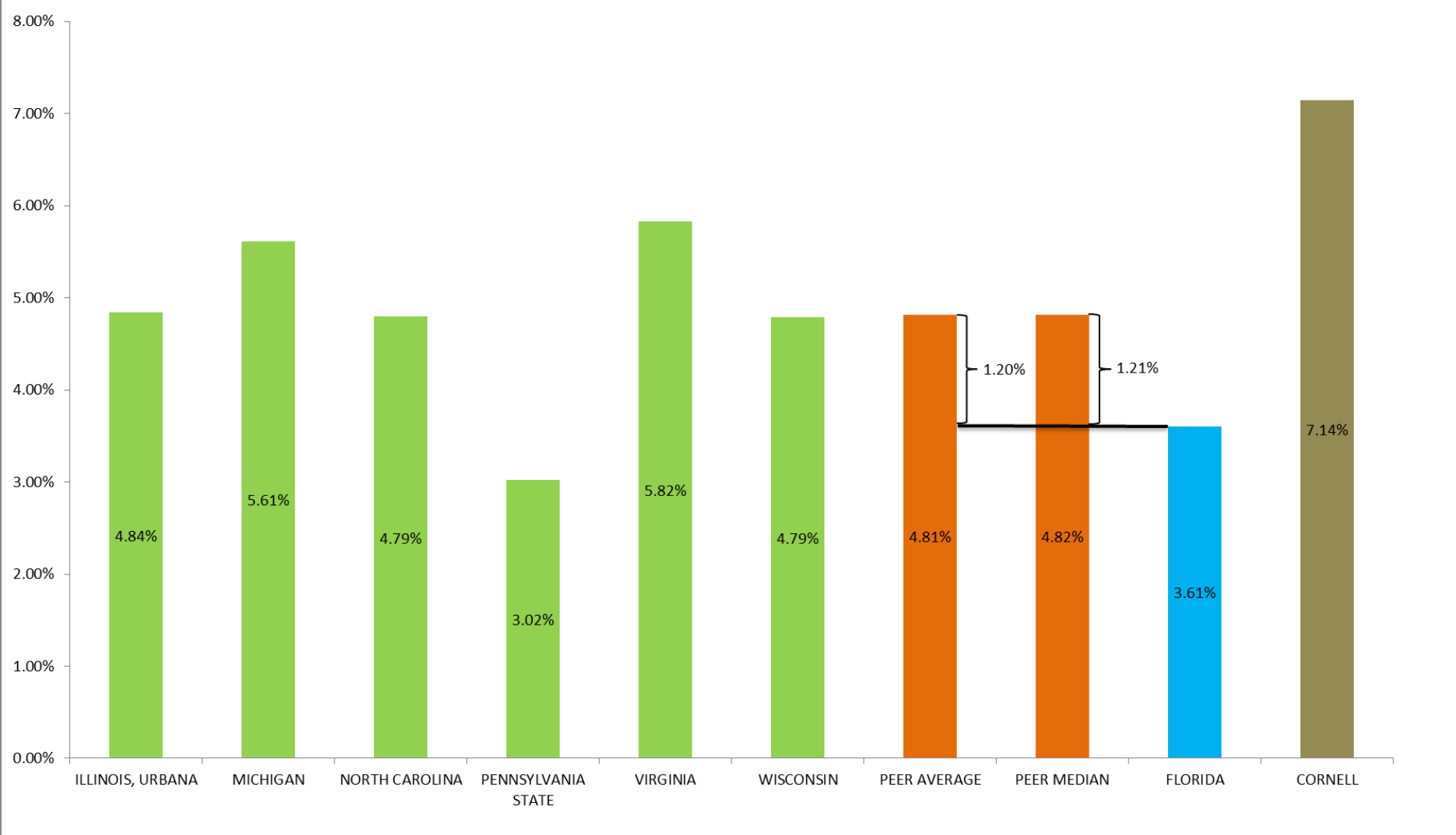
ILLINOIS, URBANA	2.03%
MICHIGAN	2.06%
NORTH CAROLINA	2.10%
PENNSYLVANIA STATE	1.18%
VIRGINIA	1.95%
WISCONSIN	1.57%
PEER AVERAGE	1.82%
PEER MEDIAN	1.99%
FLORIDA	1.56%
CORNELL	2.77%

.26%

.43%

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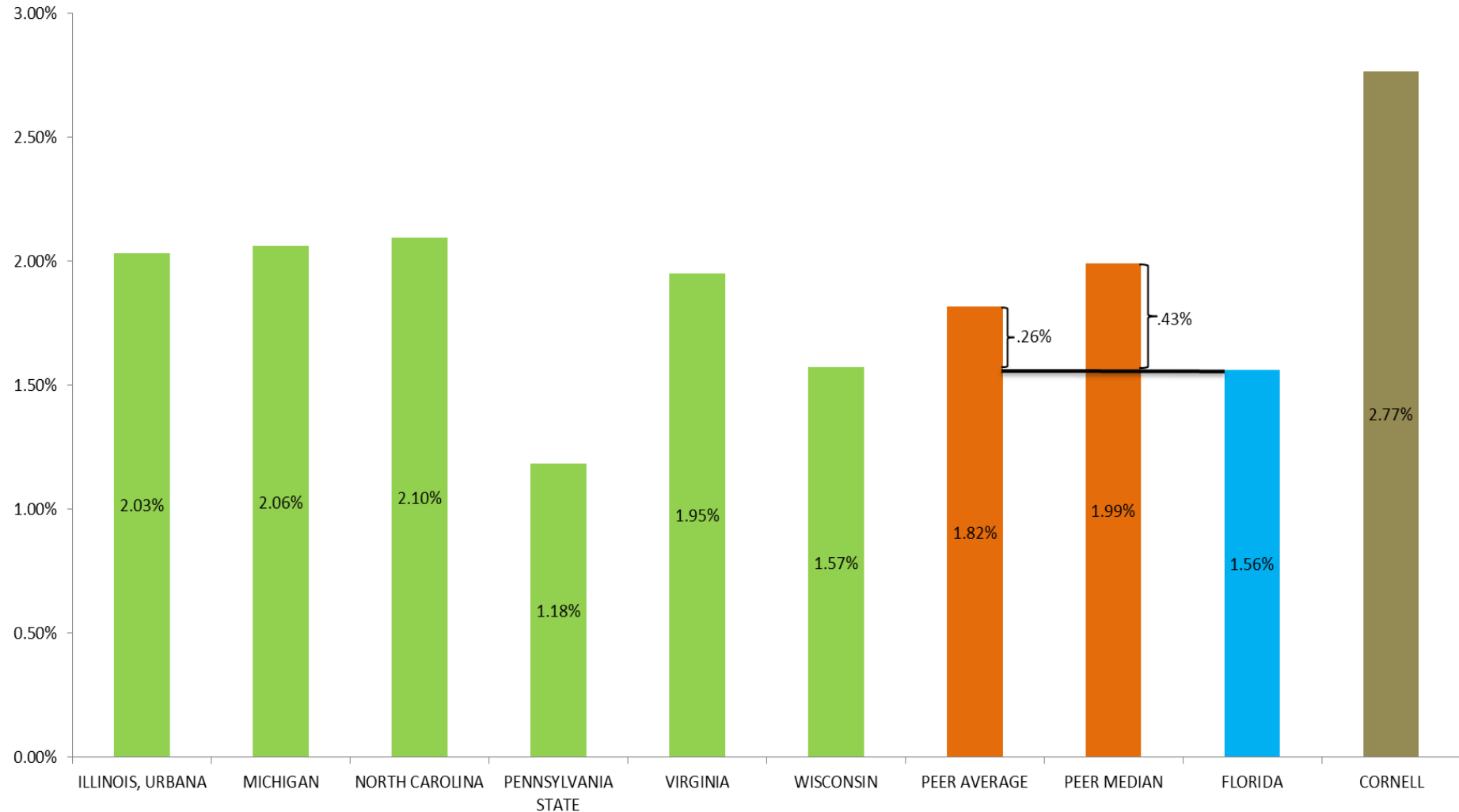
PEER ANALYSIS

- **Funding – Linear regression based (2013)**

PEER ANALYSIS

- ## Funding – Linear regression based (2013)

REFERENCE:
https://www.clemson.edu/ces/phoenix/tutorials/excel/regression.html

PEER ANALYSIS

- **Compared UF to Four Groups of AAU Public Universities**
  - **Group A: 6 of Top 11 from US News (Aspirational Peers)**
  - **Group B: 10 of Top 25 from US News (Comprehensive Universities with Law & 2 or more Health Colleges)**
  - **Group C: UF Identified Peers**
  - **Group D – Business Journal Top 20**

PEER ANALYSIS

Top US Public University Peers	Top 25 Public University Peers	UF Identified Peers	Business Journal Top 20
ILLINOIS, URBANA	MICHIGAN	CALIFORNIA, BERKELEY	CALIFORNIA, BERKELEY
MICHIGAN	MINNESOTA	ILLINOIS, URBANA	CALIFORNIA, LOS ANGELES
NORTH CAROLINA	NORTH CAROLINA	INDIANA	CALIFORNIA, SAN DIEGO
PENNSYLVANIA STATE	OHIO STATE	MICHIGAN	GEORGIA
VIRGINIA	PENNSYLVANIA STATE	NORTH CAROLINA	ILLINOIS, URBANA
WISCONSIN	PITTSBURGH	OHIO STATE	INDIANA
	TEXAS	PENNSYLVANIA STATE	MARYLAND
	VIRGINIA	TEXAS	MICHIGAN
	WASHINGTON	TEXAS A&M	MINNESOTA
	WISCONSIN	VIRGINIA	NORTH CAROLINA
		WISCONSIN	OHIO STATE
			PENNSYLVANIA STATE
			TEXAS
			TEXAS A&M
			VIRGINIA
			WASHINGTON
			WISCONSIN

LINEAR REGRESSION

- **A model of the relationship between two variables:**

    1. Independent variable

    (e.g. a university budget)

    2. Dependent variable

    (e.g. a library's budget)

- **MAY serve to predict a variable if the other variable is known**
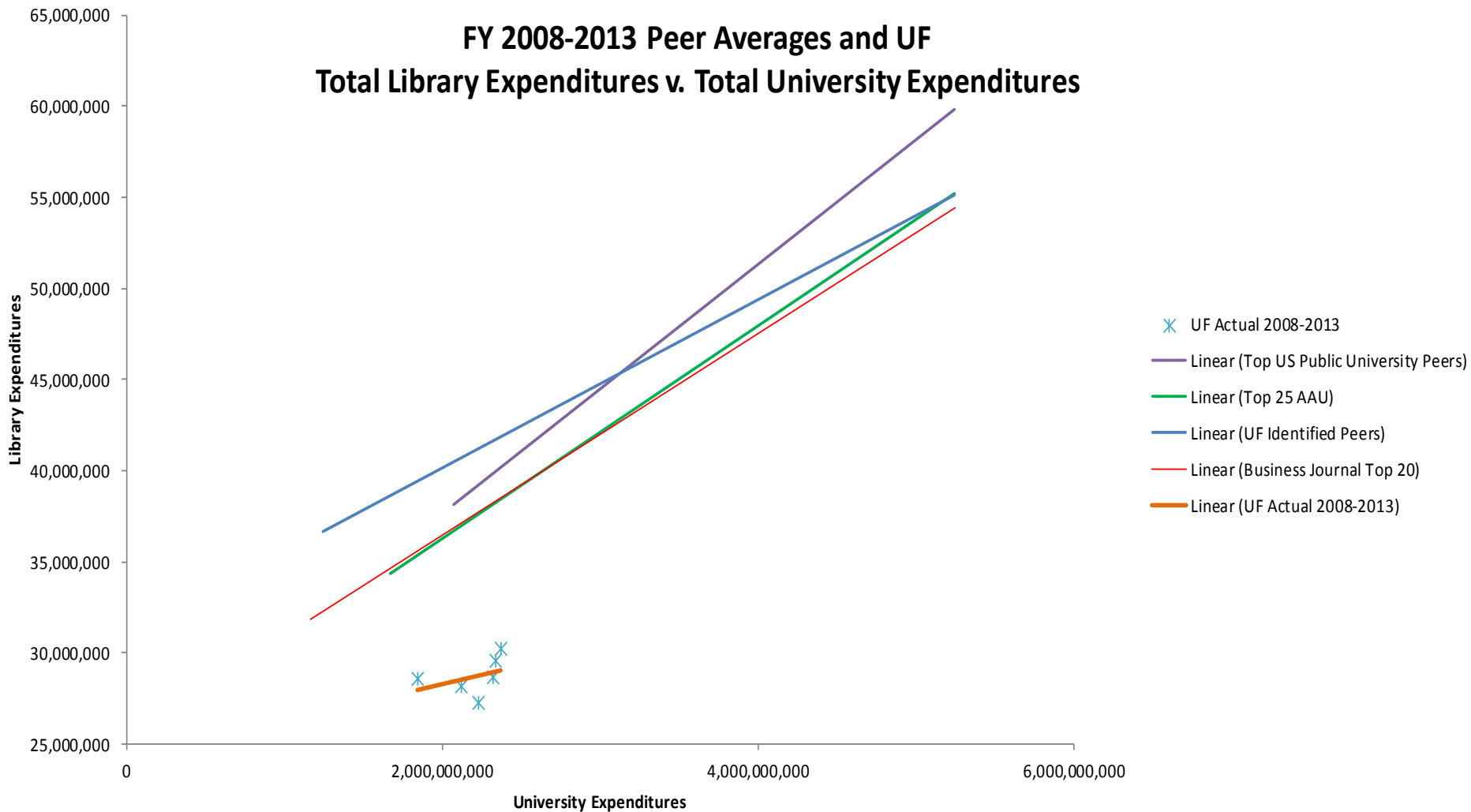
LINEAR REGRESSION

- **R-squared or Coefficient of Determination**

  Indicates the proportion of the change in one variable that is predictable from another
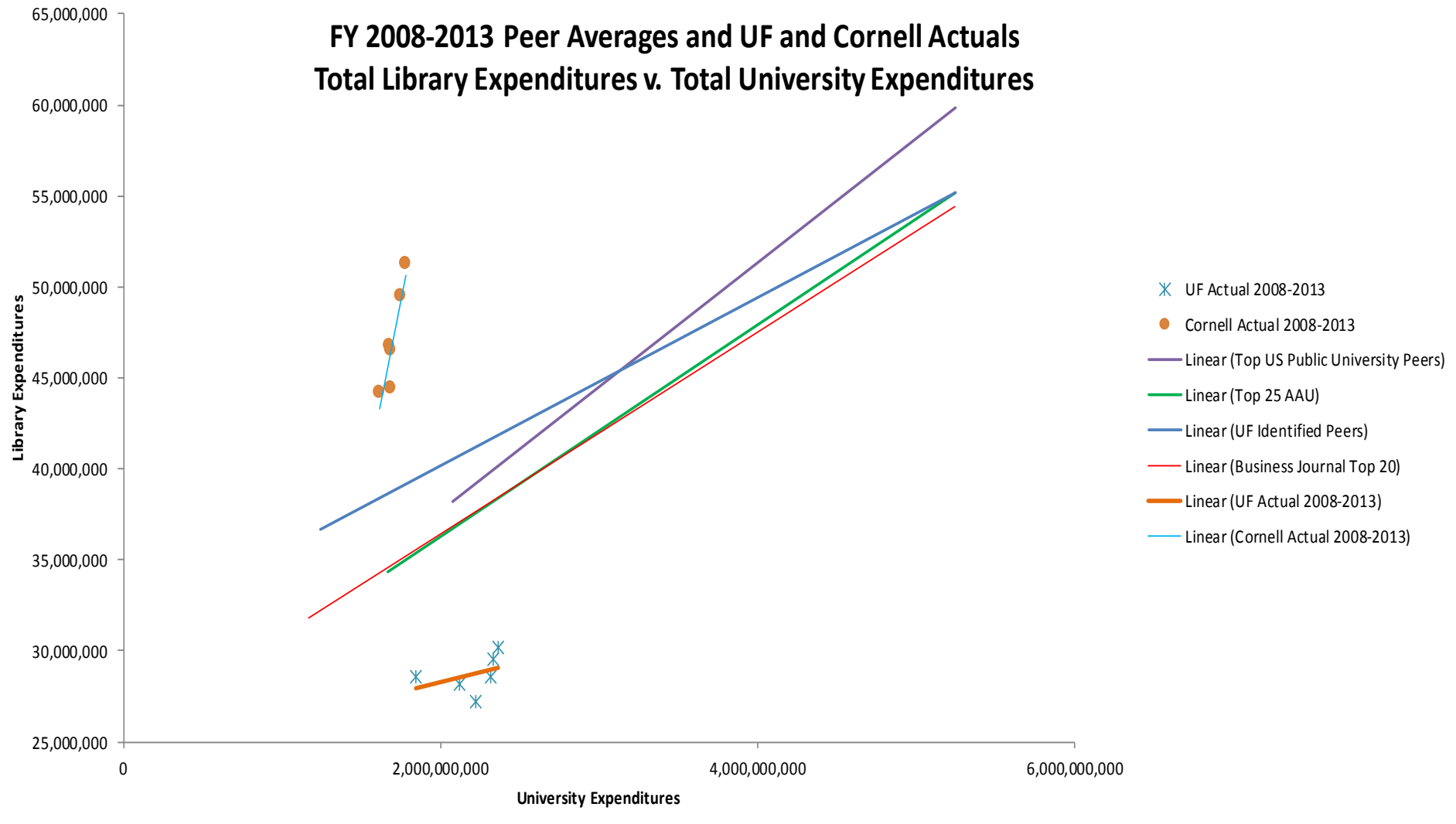
  $$0 \leq r^2 \geq 1$$

  Represents the percent of variation in a variable that can be explained by the relationship between the two

FY 2008-2013 Peer Averages and UF
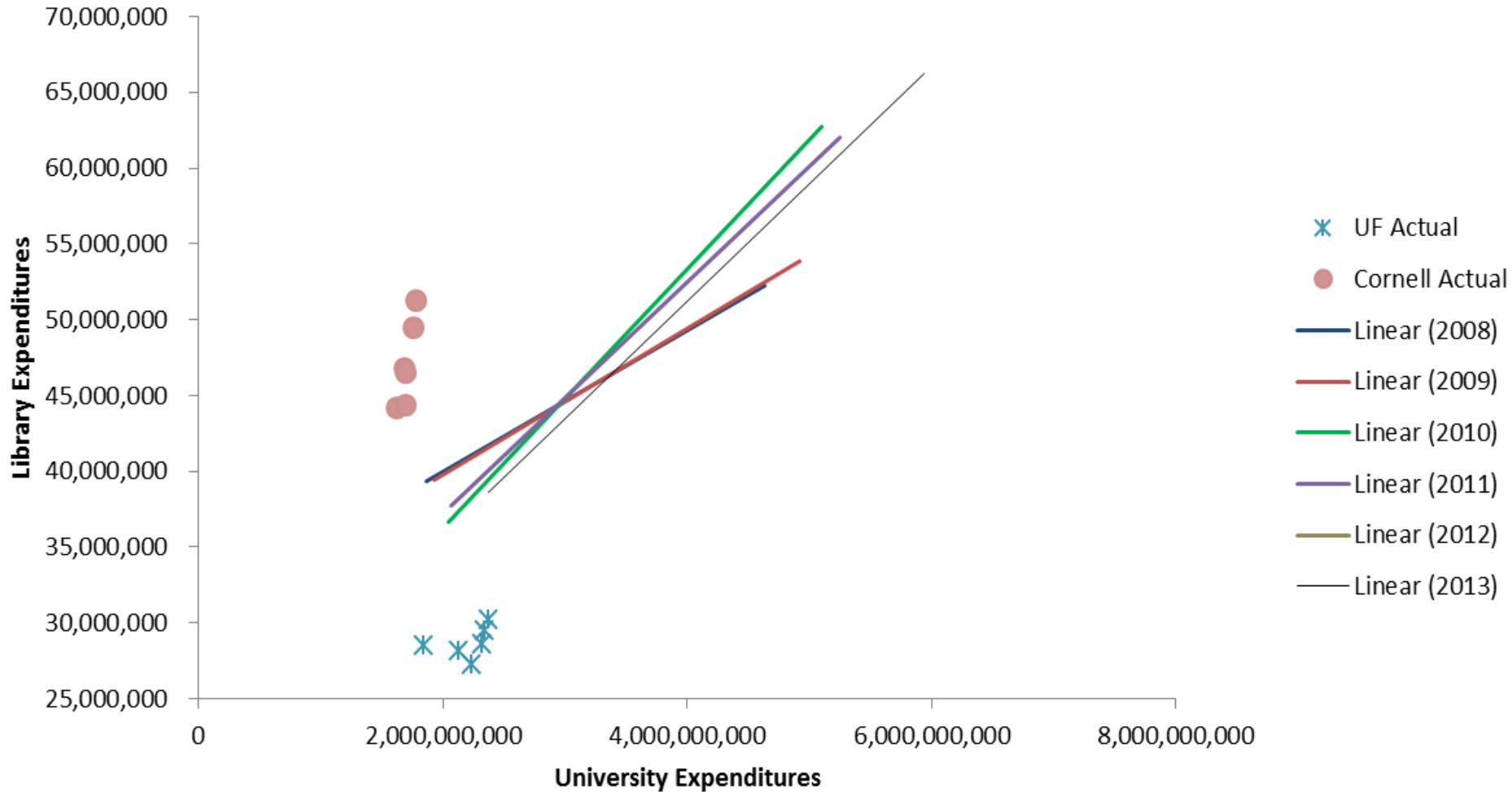## Total Library Expenditures v. Total University Expenditures

Legend:
- ✕ UF Actual 2008-2013
- Linear (Top US Public University Peers)
- Linear (Top 25 AAU)
- Linear (UF Identified Peers)
- Linear (Business Journal Top 20)
- Linear (UF Actual 2008-2013)

Y-axis: Library Expenditures
X-axis: University Expenditures

Top US Public University Peers	Top 25 Public University Peers	UF Identified Peers	Business Journal Top 20	UF Actual
$R^2 = 0.8675$	$R^2 = 0.6674$	$R^2 = 0.4854$	$R^2 = 0.4841$	$R^2 = 0.1537$

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FY 2008-2013 Peer Averages and UF and Cornell Actuals
Total Library Expenditures v. Total University Expenditures

Legend:
- ✳ UF Actual 2008-2013
- ● Cornell Actual 2008-2013
- Linear (Top US Public University Peers)
- Linear (Top 25 AAU)
- Linear (UF Identified Peers)
- Linear (Business Journal Top 20)
- Linear (UF Actual 2008-2013)
- Linear (Cornell Actual 2008-2013)

Top US Public University Peers	Top 25 Public University Peers	UF Identified Peers	Business Journal Top 20	UF Actual	Cornell Actual
$R^2 = 0.8675$	$R^2 = 0.6674$	$R^2 = 0.4854$	$R^2 = 0.4841$	$R^2 = 0.1537$	$R^2 = 0.8409$

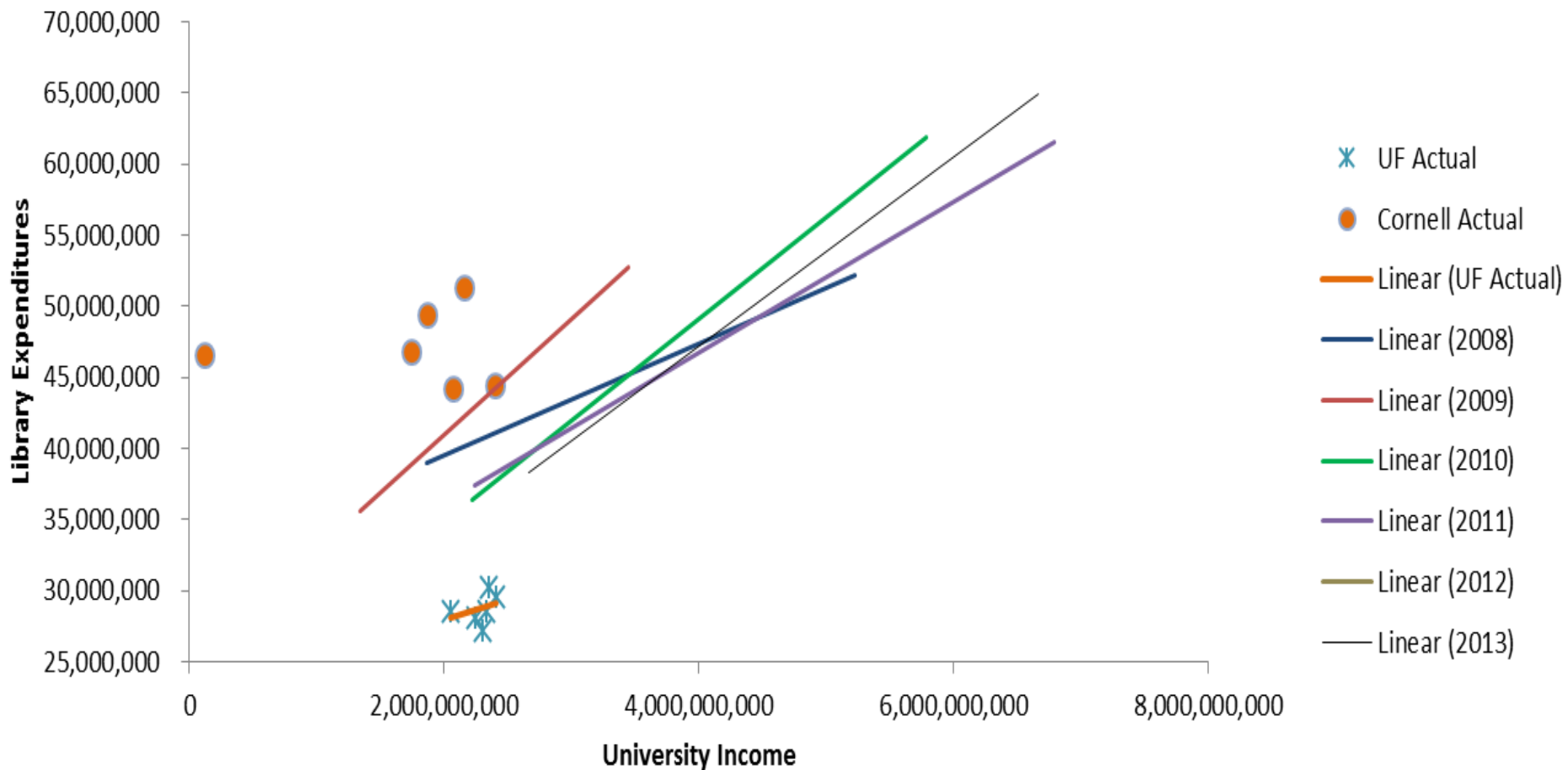**UF | George A. Smathers Libraries | UNIVERSITY of FLORIDA**

FY 2008-2013 Total Library Expenditures v. Total University Expenditures
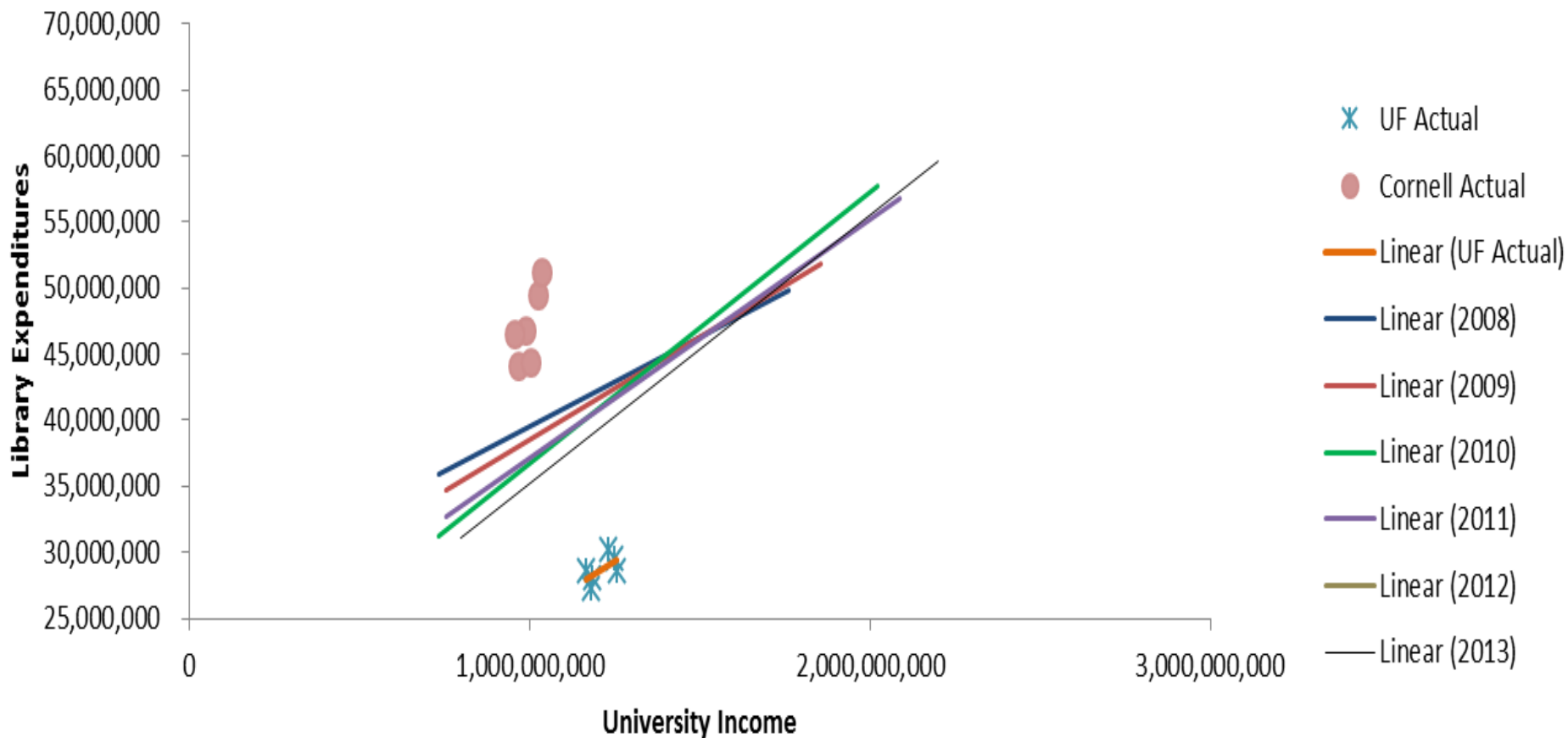Top US Public University Peers

2008-2013 Library Exp. v. Univ. Revenue - All Sources
Top US Public University Peers

2008-2013 Library Exp. v. Univ. Tuition, App. & Federal Grants
Top US Public University Peers

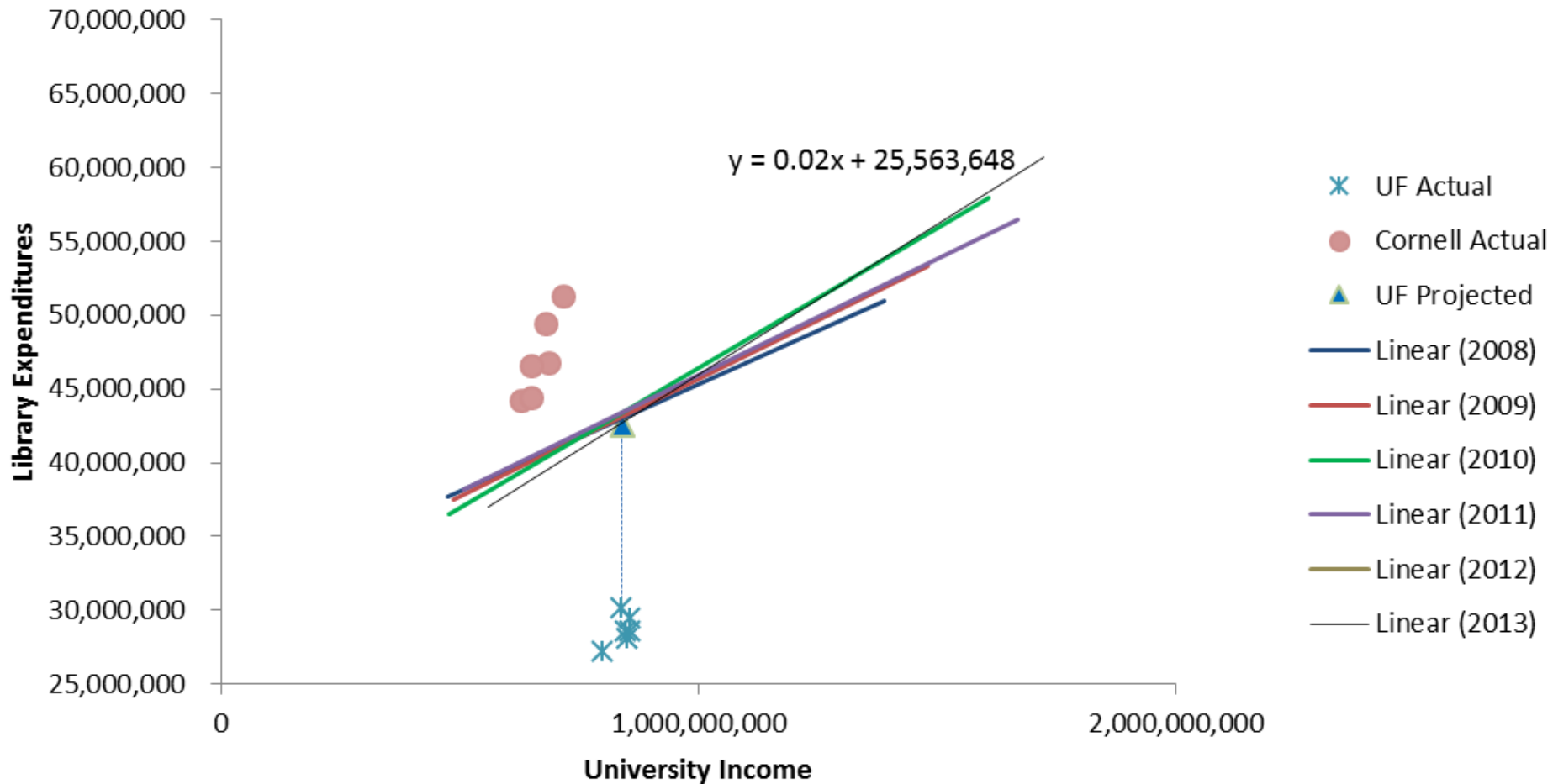FY 2008-2013 Total Library Expenditures v. University Tuition &
Appropriated Income
Top US Public University Peers

FY 2008-2013 Total Library Expenditures v. University Tuition & Appropriated Income
Top US Public University Peers

$y = 0.02x + 25,563,648$
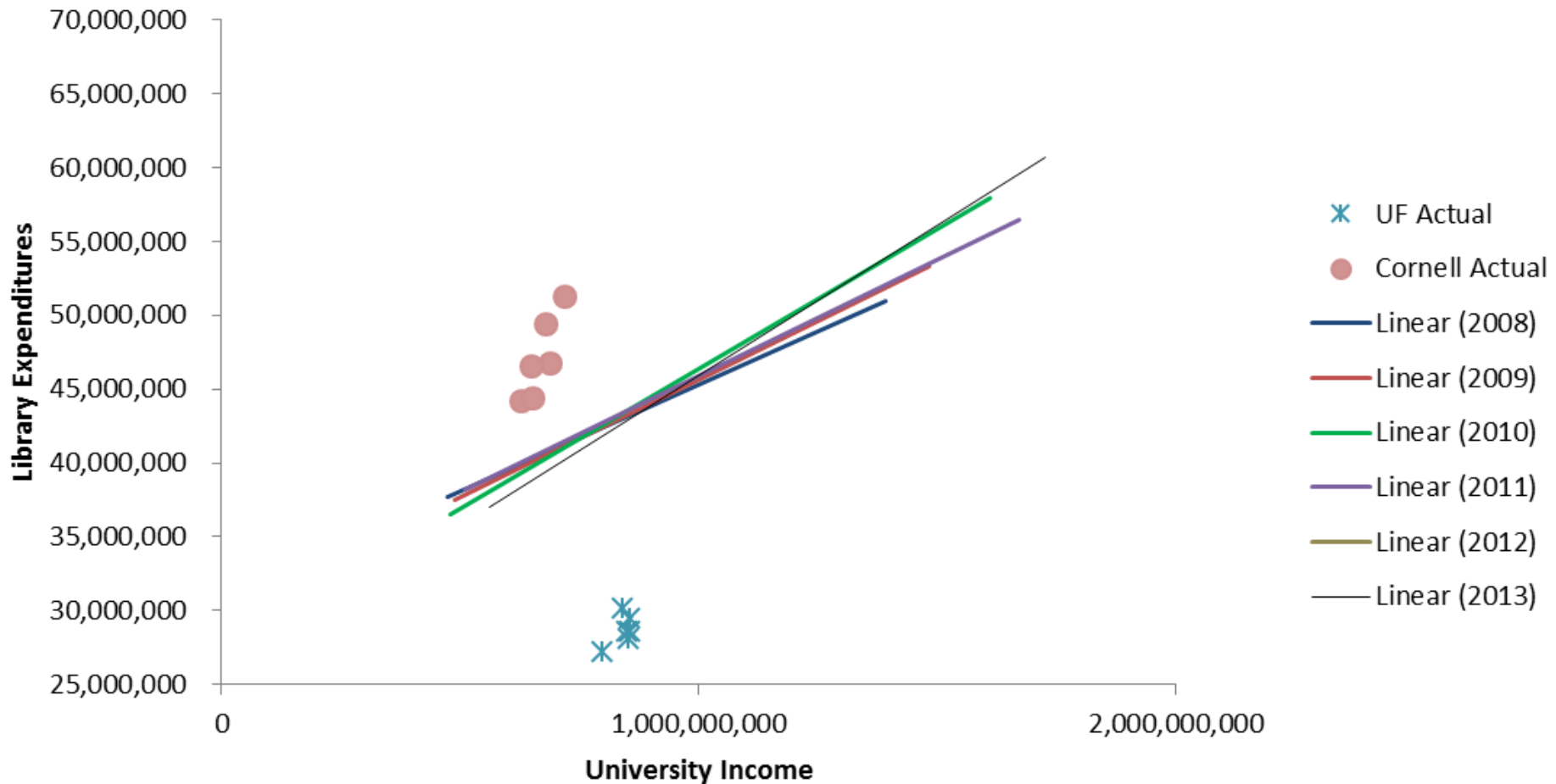
LINEAR REGRESSION

Linear regression line formula

The model identified by the linear regression analysis of university revenue from tuition and appropriation at peer universities (independent variable) and total library expenditures at those institutions (dependent variable) for each year can be expressed in a regression line with a formula of

$$Y = a + bX$$

LINEAR REGRESSION

Linear regression line formula

$$Y = a + bX$$

In this formula:

Y = the dependent variable (library)

X = the independent variable (university)

b = the slope of the regression line

a = the intercept point of the regression line

and the y axis.

PEER ANALYSIS

Application of Linear Regression Formulas to Estimate Appropriate Funding for UF Libraries

	UF Tuition & Appropriations
2008	$855,300,000
2009	$849,955,000
2010	$797,569,000
2011	$855,234,000
2012	$848,376,000
2013	$837,923,000

PEER ANALYSIS

Application of Linear Regression Formulas to Estimate Appropriate Funding for UF Libraries

	Linear Regression for Peers: Total Library Expenditures & University Tuition and Appropriations
2008	y = 0.01x + 30,868,025
2009	y = 0.02x + 29,693,057
2010	y = 0.02x + 27,401,814
2011	y = 0.02x + 30,223,057
2012	y = 0.02x + 26,651,035
2013	y = 0.02x + 25,563,648

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PEER ANALYSIS

Application of Linear Regression Formulas to Estimate Appropriate Funding for UF Libraries

	UF Tuition & Appropriations	Line Formula	UF Libraries Projected
2008	$855,300,000	y = 0.01x + 30,868,025	$43,231,307
2009	$849,955,000	y = 0.02x + 29,693,057	$43,249,625
2010	$797,569,000	y = 0.02x + 27,401,814	$42,536,788
2011	$855,234,000	y = 0.02x + 30,223,057	$43,650,863
2012	$848,376,000	y = 0.02x + 26,651,035	$42,701,203
2013	$837,923,000	y = 0.02x + 25,563,648	$42,607,215

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PEER ANALYSIS

Application of Linear Regression Formulas to Estimate Appropriate Funding for UF Libraries

	UF Libraries Projected	UF Libraries Actual Expenditures	Difference
2008	$43,231,307	$28,573,302	($14,658,005)
2009	$43,249,625	$28,147,202	($15,102,423)
2010	$42,536,788	$27,242,279	($15,294,509)
2011	$43,650,863	$29,537,452	($14,113,411)
2012	$42,701,203	$28,581,160	($14,120,043)
2013	$42,607,215	$30,211,764	($12,395,451)

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FY 2008-2013 Total Library Expenditures v. University Tuition & Appropriated Income
Top US Public University Peers

$y = 0.02x + 25,563,648$

$42,607,215$

Legend:
- ✳ UF Actual
- ● Cornell Actual
- ▲ UF Projected
- ── Linear (2008)
- ── Linear (2009)
- ── Linear (2010)
- ── Linear (2011)
- ── Linear (2012)
- ── Linear (2013)

Y-axis: Library Expenditures (25,000,000 to 70,000,000)
X-axis: University Income (0 to 2,000,000,000)

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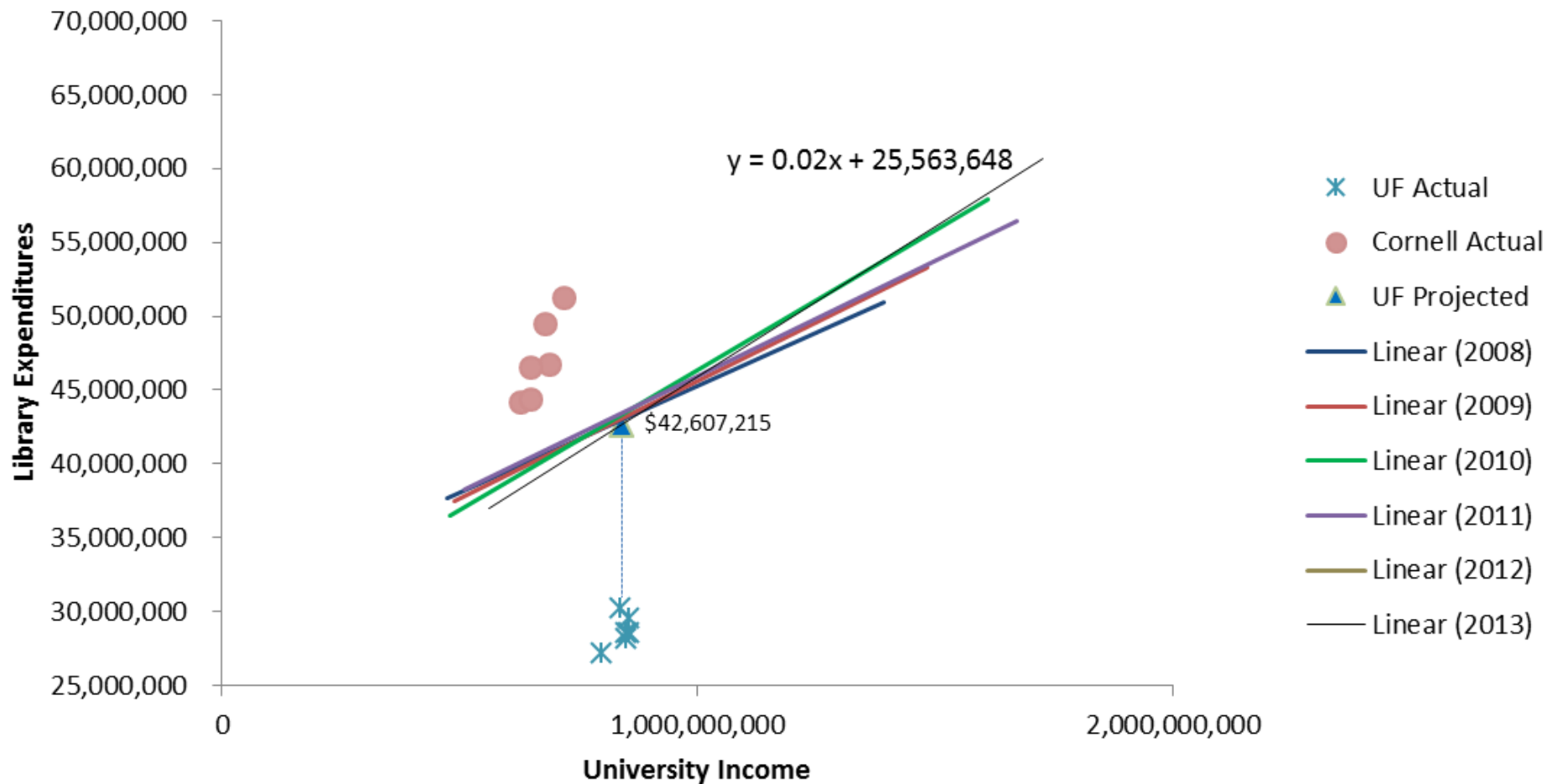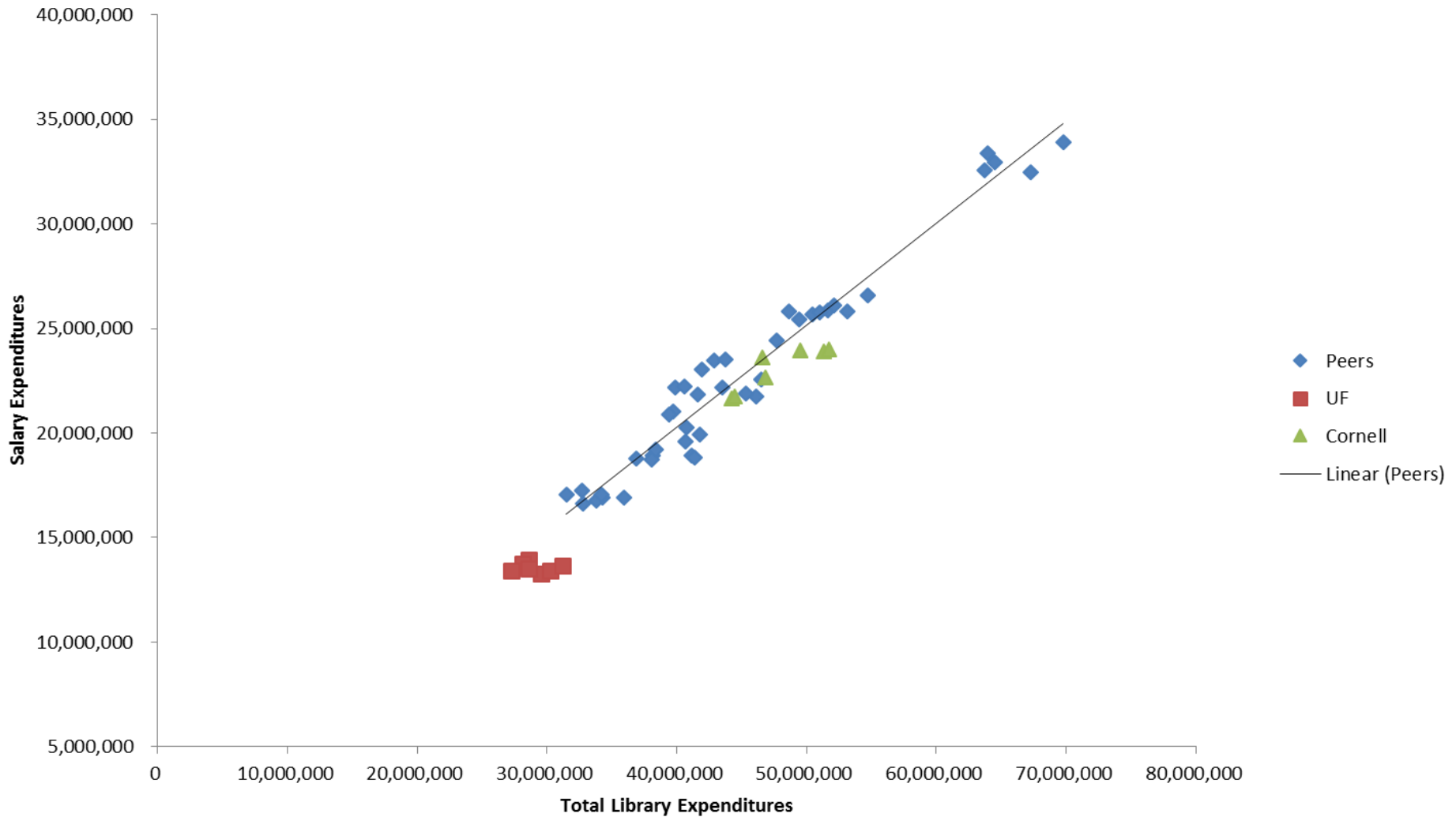
PEER ANALYSIS

- **Spending within libraries**

PEER ANALYSIS

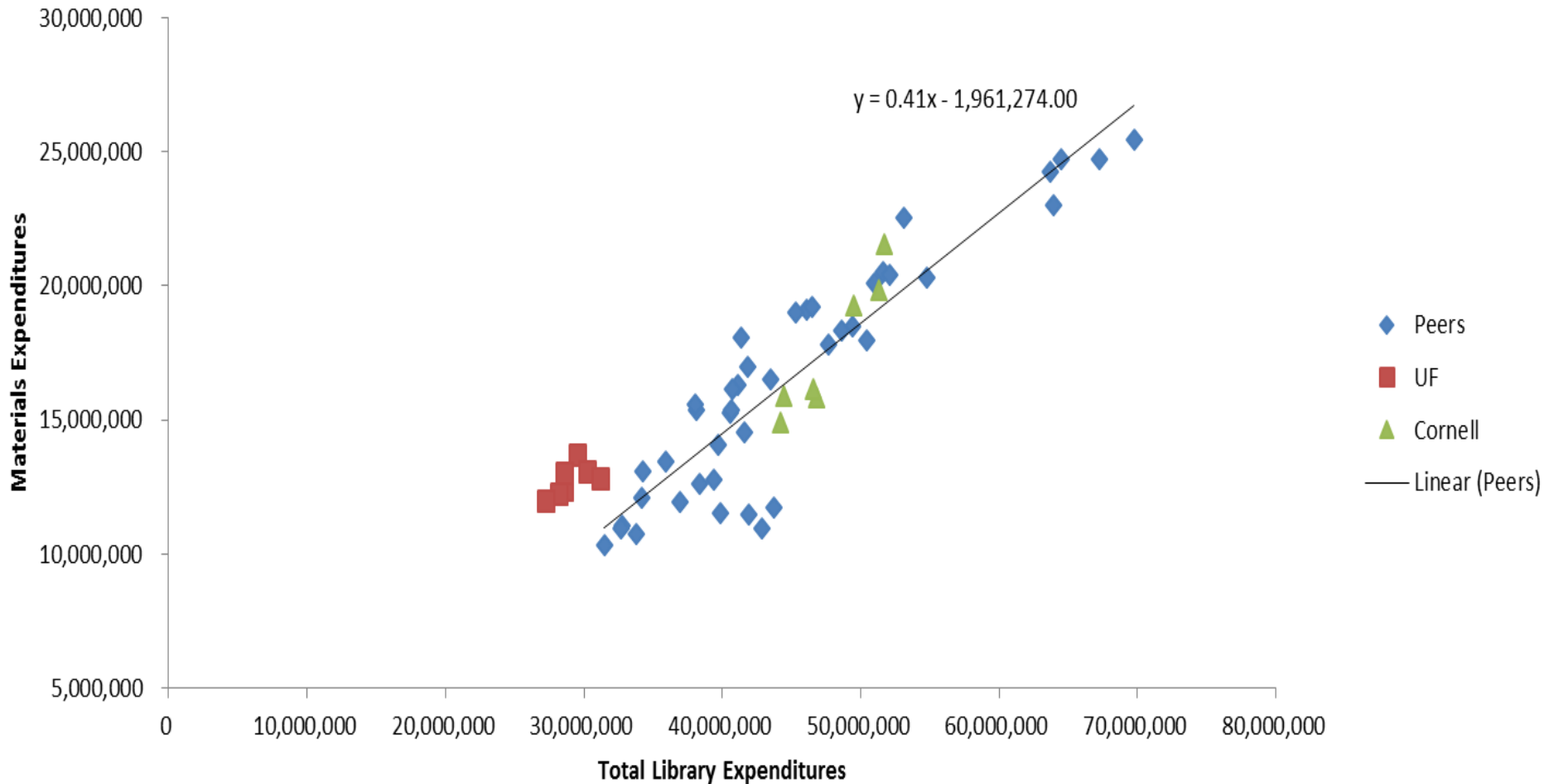| PROPORTION OF LIBRARY EXPENDITURES	Materials	Staffing	Operations
Median for Peers	37%	49%	14%
Average for Peers	37%	50%	13%
UF	41%	44%	15%

FY 2008-2014 Salary Expenditures v. Total Library Expenditures
Top US Public University Peers

FY 2008-2014 Material Expenditures v. Total Library Expenditures
Top US Public University Peers

FY 2008-2014 Material Expenditures v. Total Library Expenditures
Top US Public University Peers

$y = 0.41x - 1,961,274.00$

Legend:
- ◆ Peers
- ■ UF
- ▲ Cornell
- —— Linear (Peers)
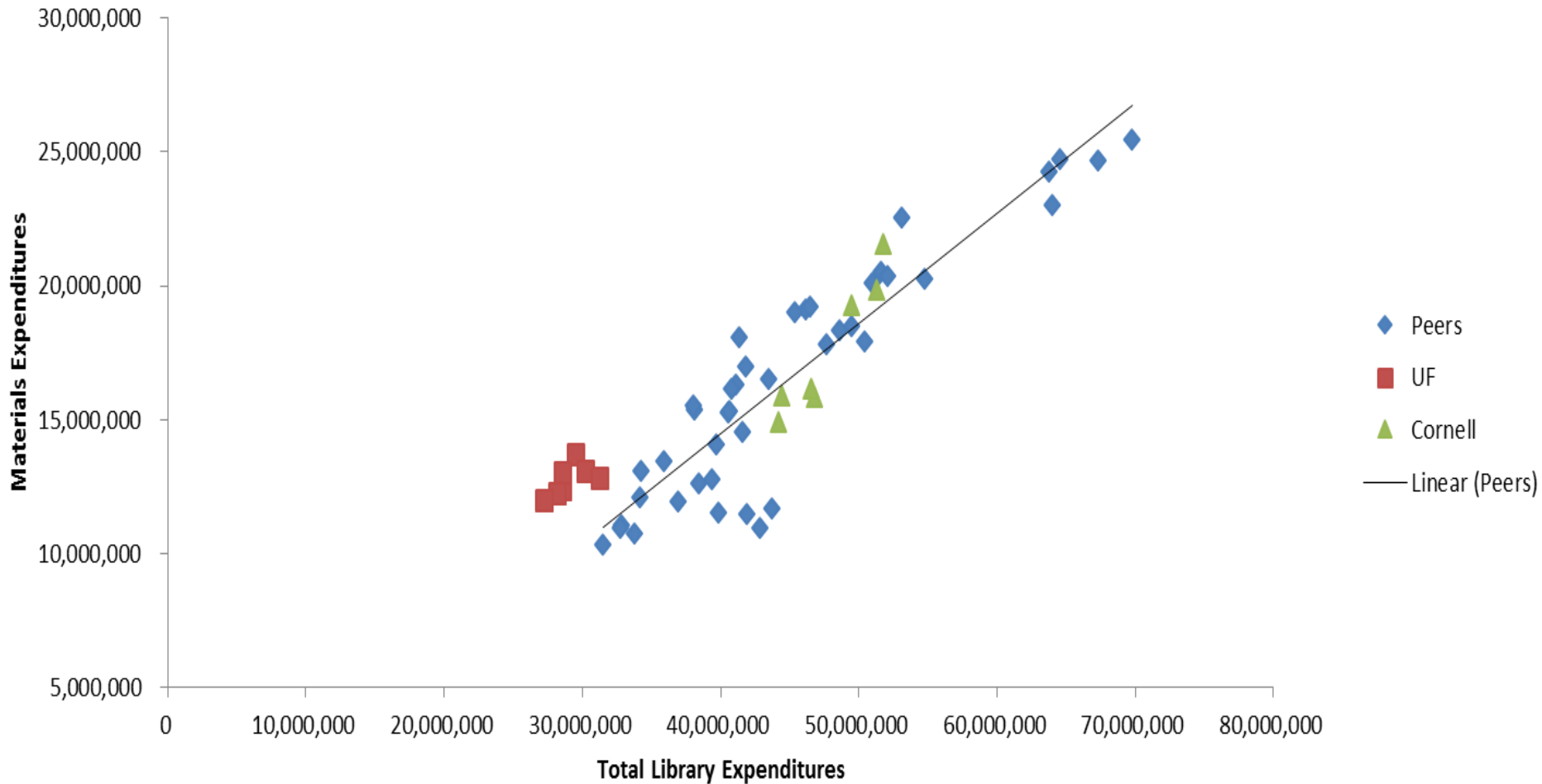
X-axis: Total Library Expenditures
Y-axis: Materials Expenditures

LINEAR REGRESSION

Linear regression line formula

$$Y = a + bX$$

In this formula:

Y = the dependent variable (materials exp.)

X = the independent variable (total library exp.)

b = the slope of the regression line

a = the intercept point of the regression line

and the y axis.

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PEER ANALYSIS

Application of Linear Regression Formulas to Examine UF Libraries Expenditures

	Average UF Libraries **Material** Expenditures for 2008-2014
AVG	$12,759,536

PEER ANALYSIS

## Application of Linear Regression Formulas to Examine UF Libraries Expenditures

Average UF Libraries Material Expenditures for 2008-2014	Linear Regression for Peers: Library Materials & Total Library Expenditures	UF Libraries Projected Total Expenditures
$12,759,536	y = 0.41x − 1,961,274	$35,809,231

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PEER ANALYSIS

Application of Linear Regression Formulas to Examine UF Libraries Expenditures

UF Libraries Projected Average Total Expenditures	UF Libraries Actual	Difference
$35,809,231	$31,207,901	($4,601,330)

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FY 2008-2014 Material Expenditures v. Total Library Expenditures
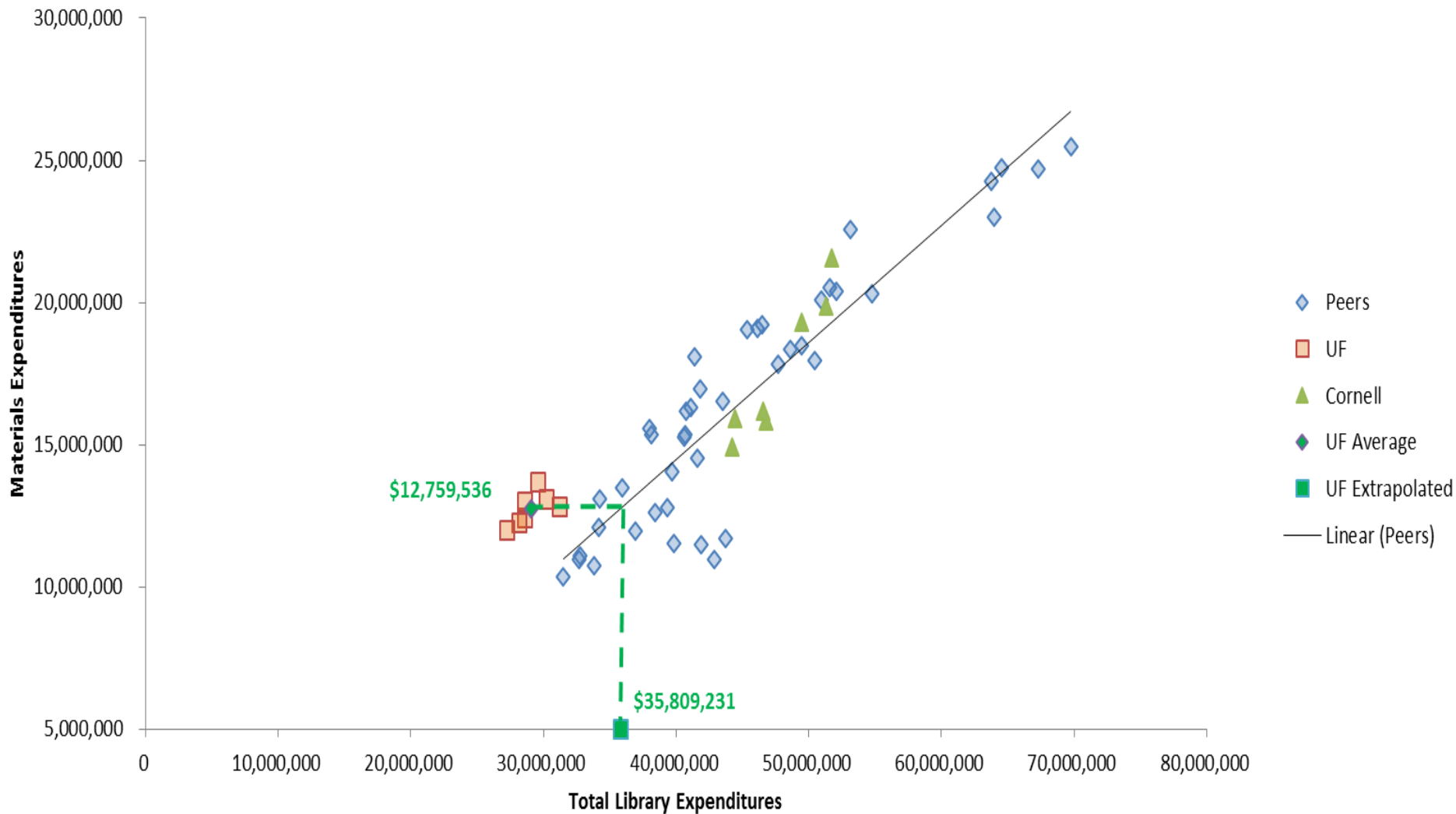
FINDINGS

- **Linear regression showed there exists a relationship between library spending for staffing and materials, and total library expenditures at these top institutions**

- **The relationship can serve as a basis for assessing library expenditures at other institutions**

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Questions?

http://ufdc.ufl.edu/AA00037701

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Thank You!

http://ufdc.ufl.edu/AA00037701