

CCR CHEMICAL
ENGINEERING CHAIRS
2014

M A R K J M C C R E A D Y

AGENDA

- ☼ Annual survey
- ☼ Other topics



CHEMICAL
ENGINEERING
SURVEY

MARK J. MCCREADY
UNIVERSITY OF NOTRE
DAME

OVERALL STATS

- ✿ 31 Surveys -- Thanks to all who helped
- ✿ We have data for 16 years, (missing 2003)
- ✿ See how you compare (tell your Dean!)



SCHOOLS

Clemson University

Notre Dame

U Maryland College Park

Tulane University

UT Austin

Vanderbilt

NC State University

University of Washington

Purdue University

Oklahoma State University

Georgia Tech

University of Virginia

University of Michigan

Michigan State University

Wayne State University

West Virginia University

The Ohio State University

University of Delaware

Auburn University

Penn State University

Iowa State University

University of Illinois at Urbana-Champaign

Worcester Polytechnic Institute

Northwestern University

University of California, Berkeley

Clarkson University

Kansas State University

University of Pittsburgh

Missouri Univ S&T

Rutgers University

U Houston



NOTE ABOUT THE TRENDS

- ☼ All trends are in dollars at the time of reporting
- ☼ So inflation is not taken into account!



SUMMARY: DECIMAL CHANGE

- ☼ Professor Salaries + 3.6%/year (highs 4.5%)
 - ☼ but we got older!
- ☼ Assistant Prof Salaries + 3%/year
- ☼ Grad student stipends + 3.1%/year
- ☼ Cost of Student on grant +4.9%/year
- ☼ #PhDs +3%



SUMMARY CONTINUED

- ✻ Federal research funding +5.9%/year
- ✻ Industrial total +5.9%/year
- ✻ \$/fac about \$400K
- ✻ Capitalization up 9%/year
- ✻ BS up 9%/year



THE FACULTY

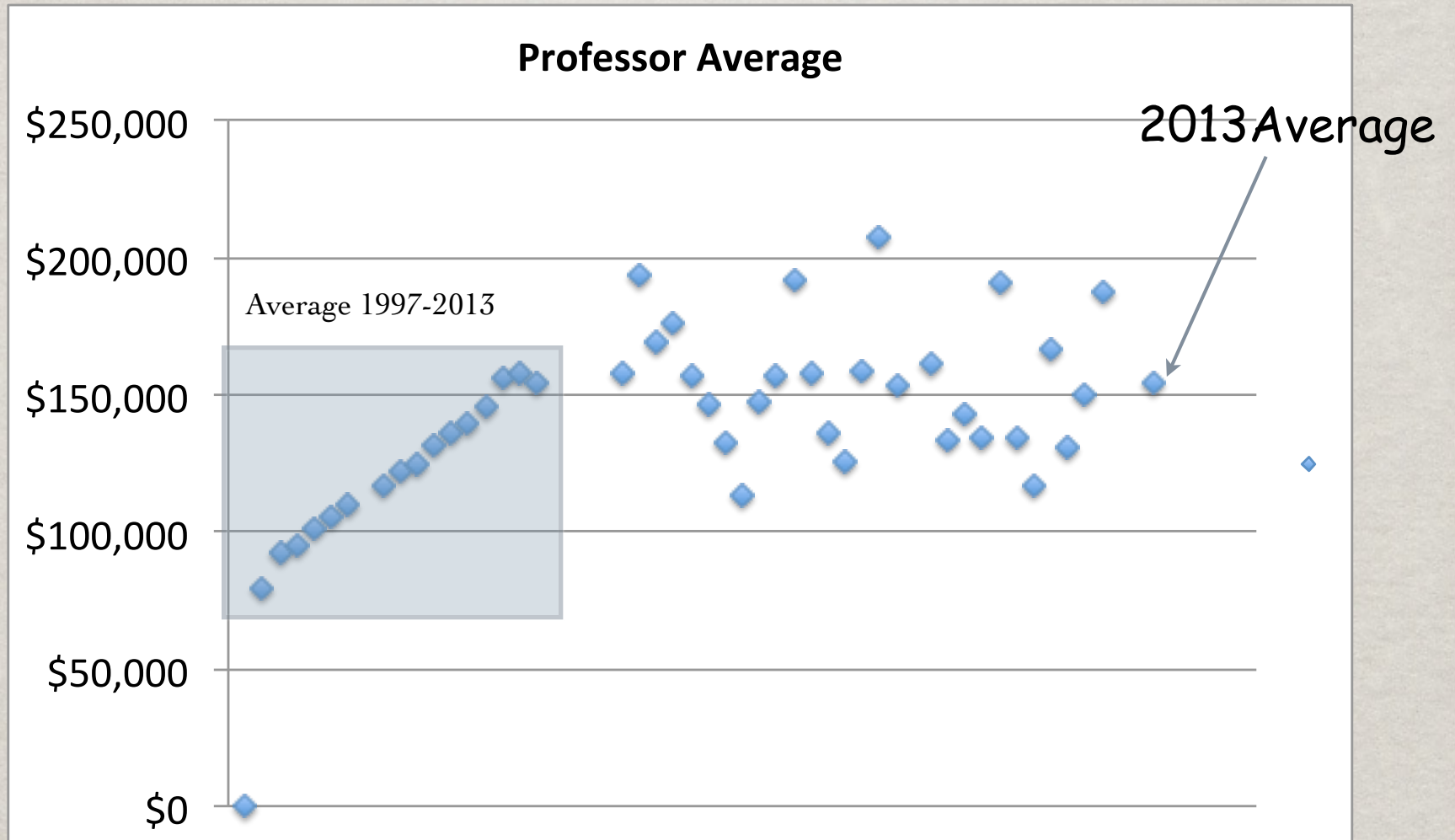


INITIAL DATA

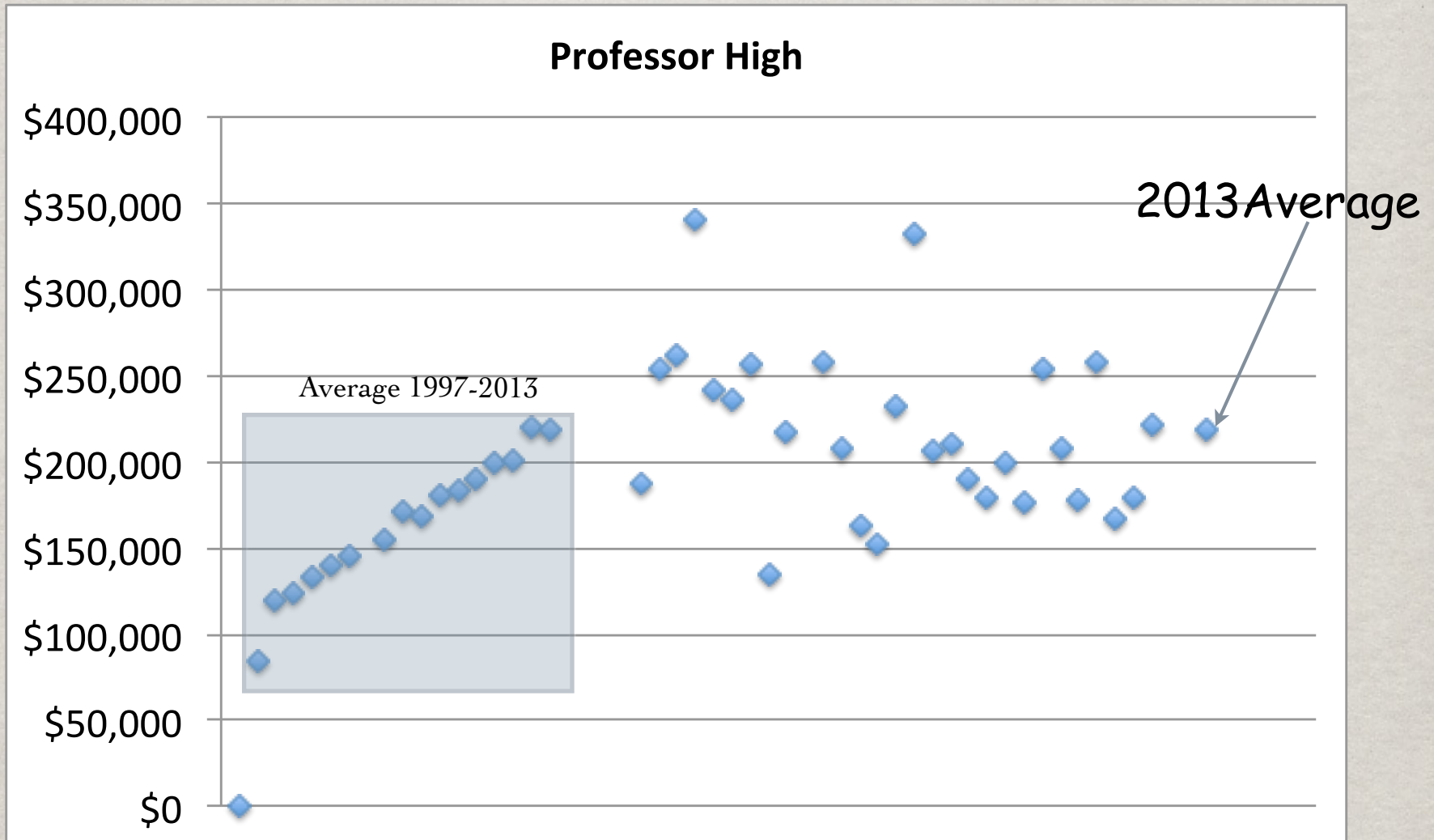
Year	FTE_tenured	FTE-Teaching	New	Openings
1997	11.20	1.08	0.50	0.85
1998	13.70	1.00	0.70	1.10
1999	13.00	1.09	0.80	1.10
2000	13.40	1.10	0.80	1.10
2001	13.10	1.90	1.20	1.60
2002	13.90	1.70	1.10	1.00
2003				
2004	14.80	1.29	0.70	1.20
2005	15.07	1.18	0.80	1.21
2006	13.64	2.44	0.90	1.40
2007	15.43	1.36	0.90	1.27
2008	14.17	1.89	0.71	0.98
2009	15.07	1.96	1.35	1.69
2010	16.09	1.60	0.66	1.36
2011	15.92	1.73	1.05	1.50
2012	20.09	1.99	0.89	1.67
2013	17.57	1.54	0.64	1.54



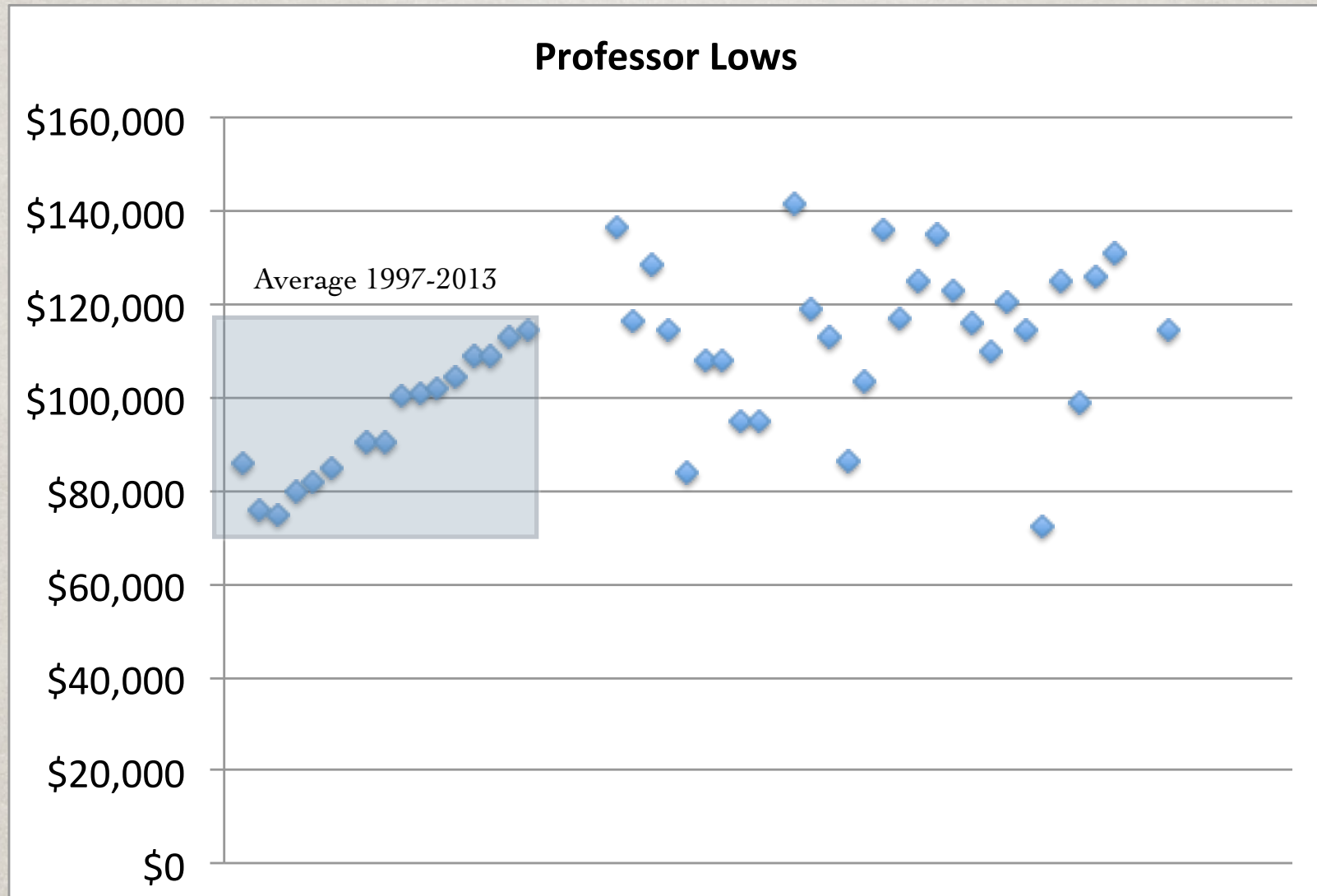
PROFESSOR SALARIES



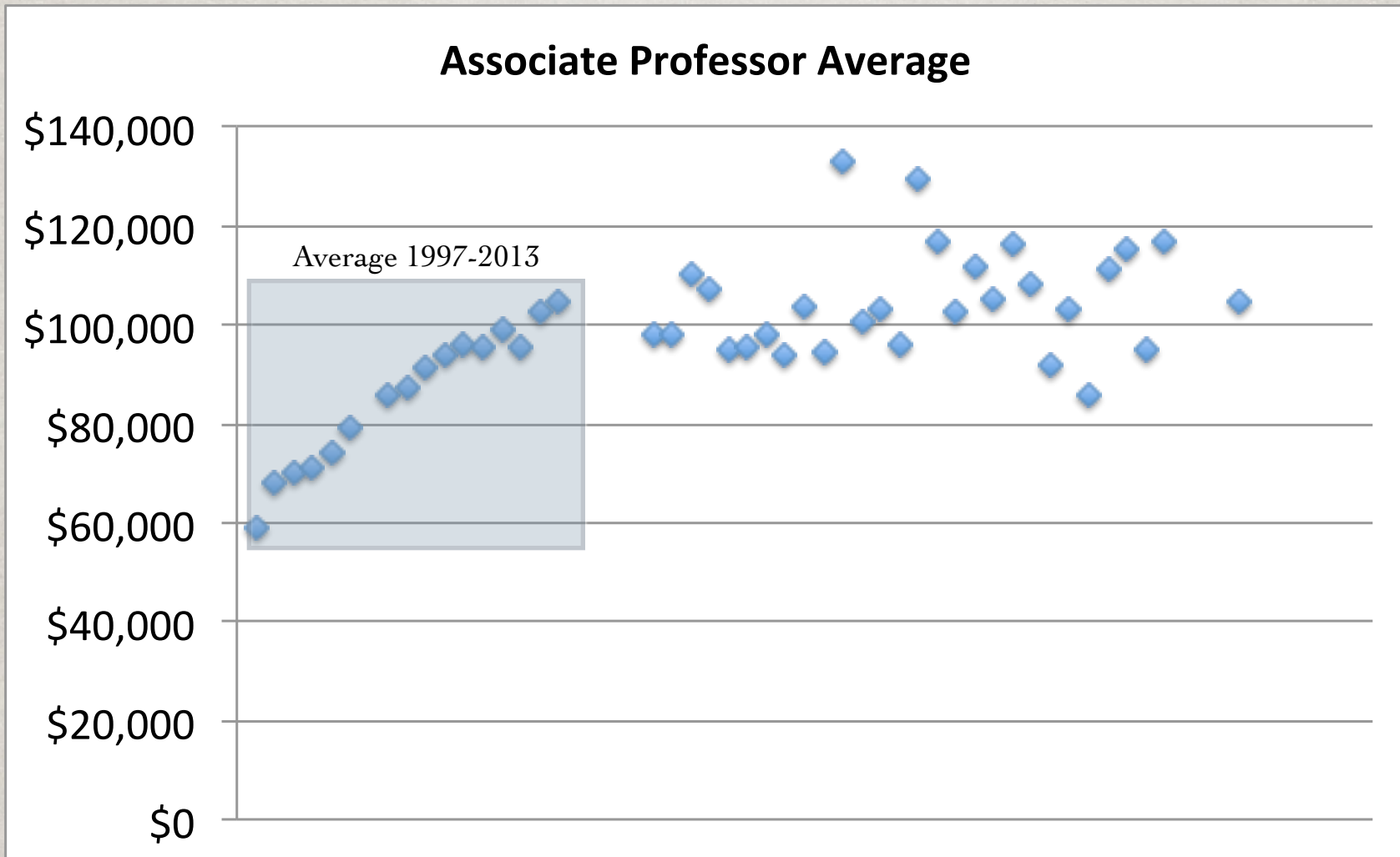
PROFESSOR HIGHS



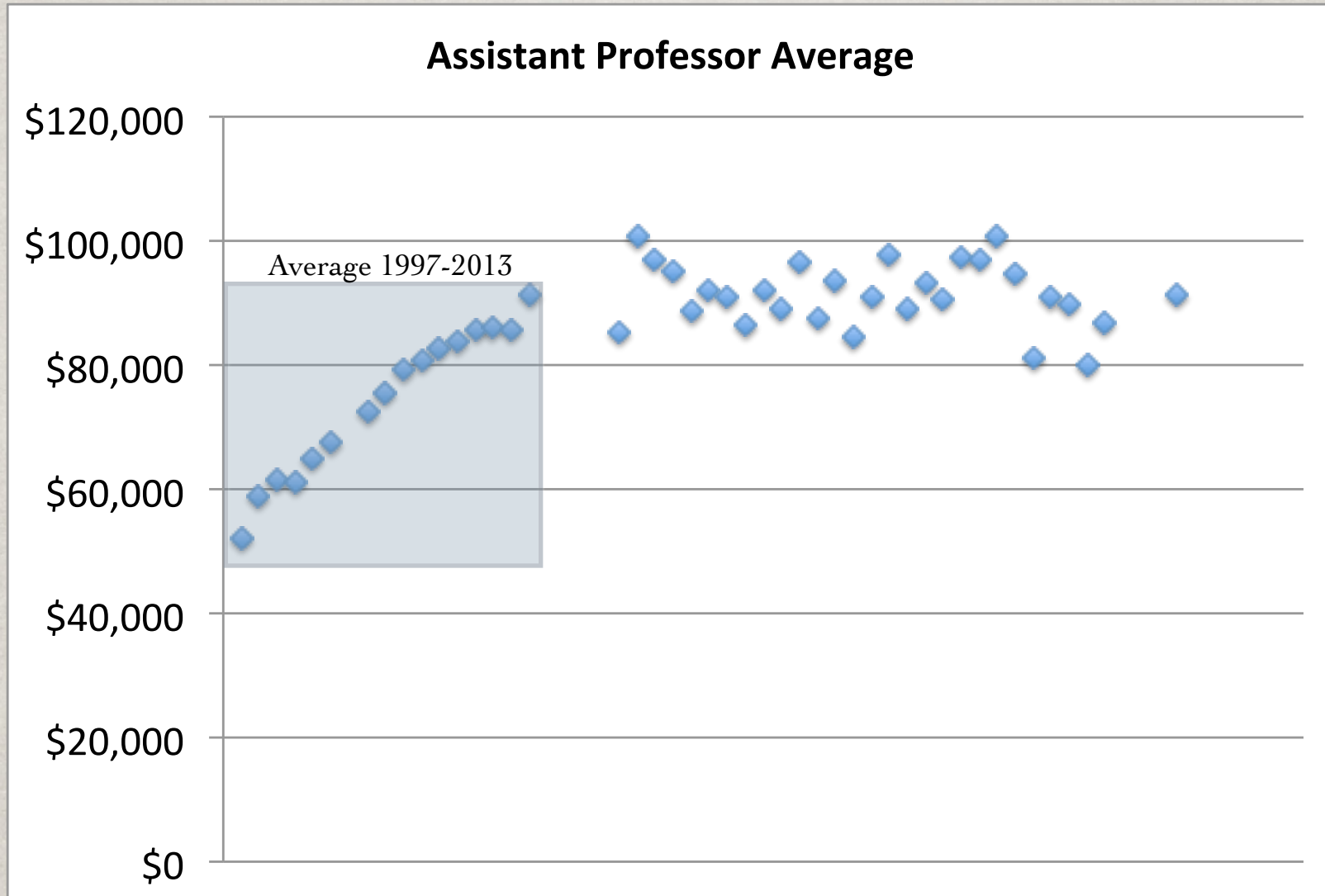
PROFESSOR LOWS



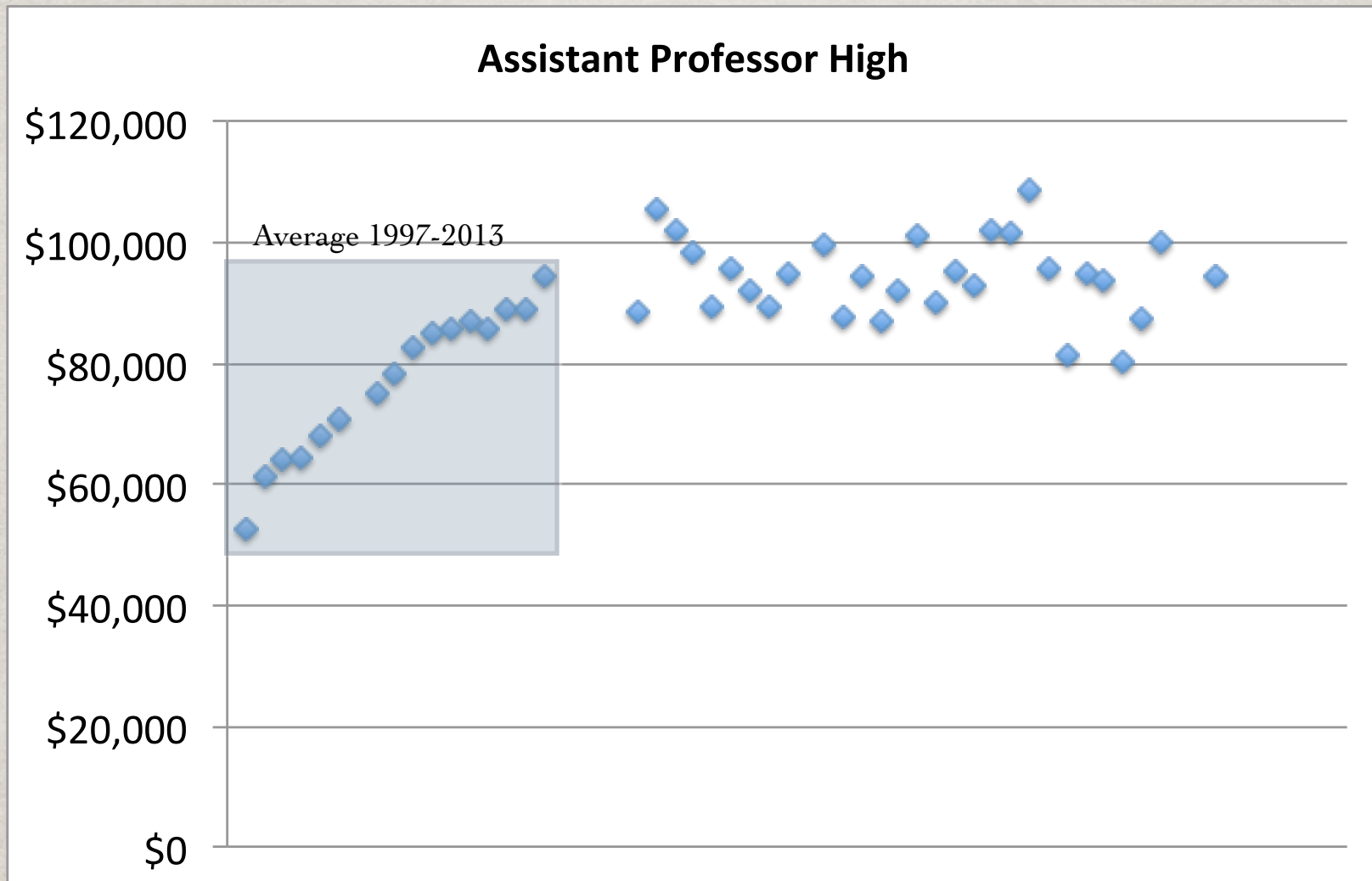
ASSOCIATE AVERAGE



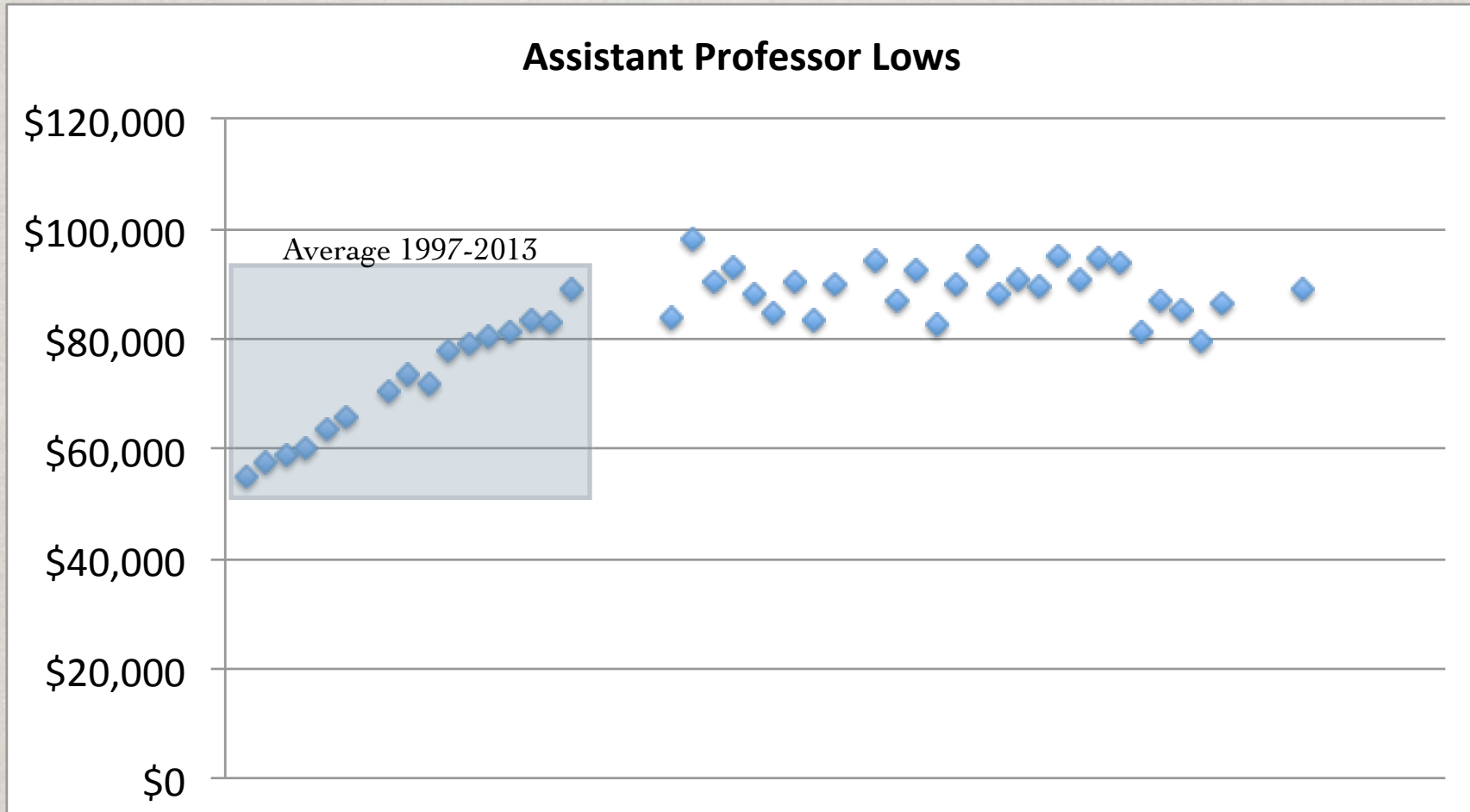
ASSISTANTS AVERAGE



ASSISTANT HIGHS



ASSISTANT LOWS

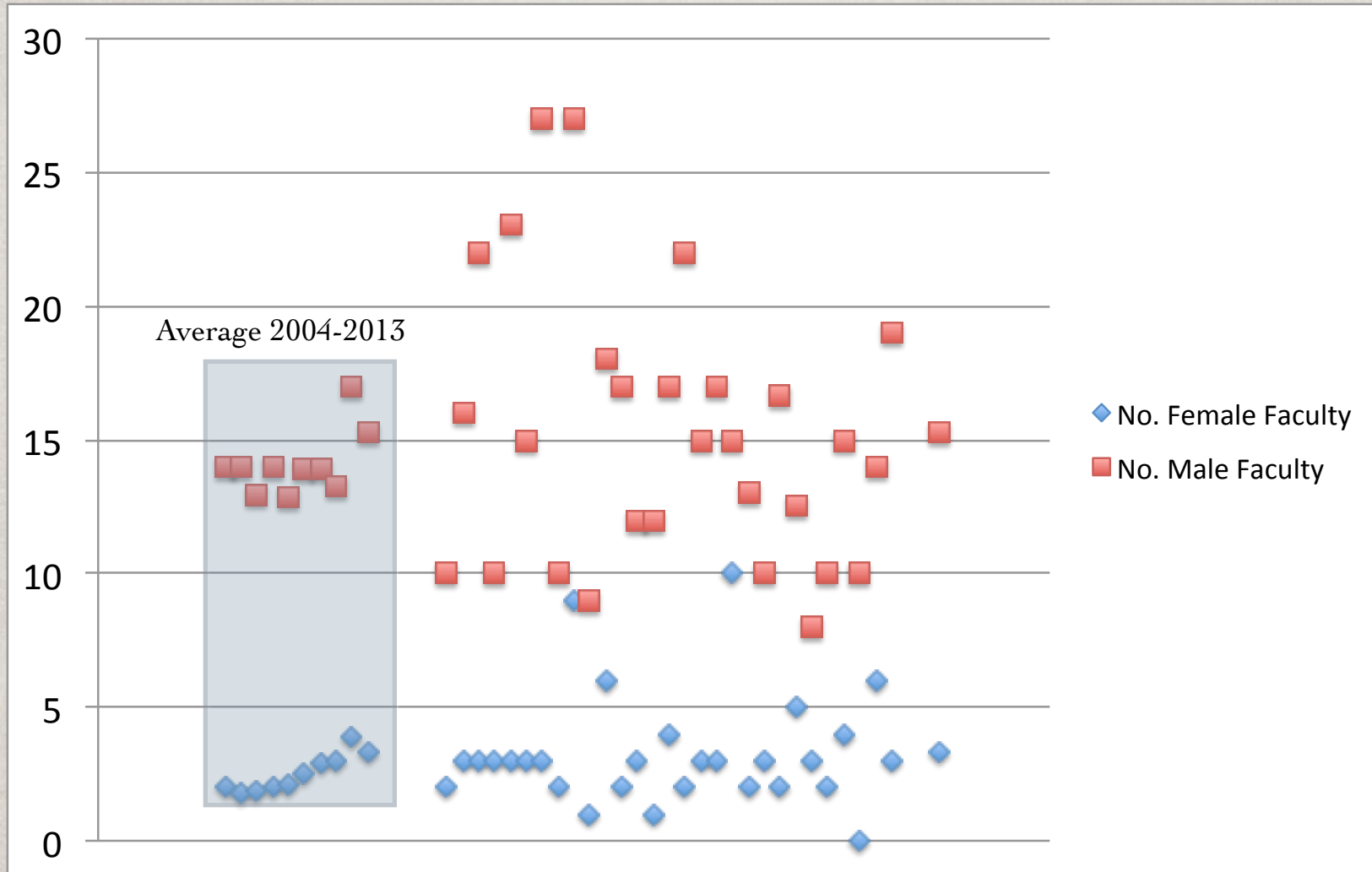


AGES

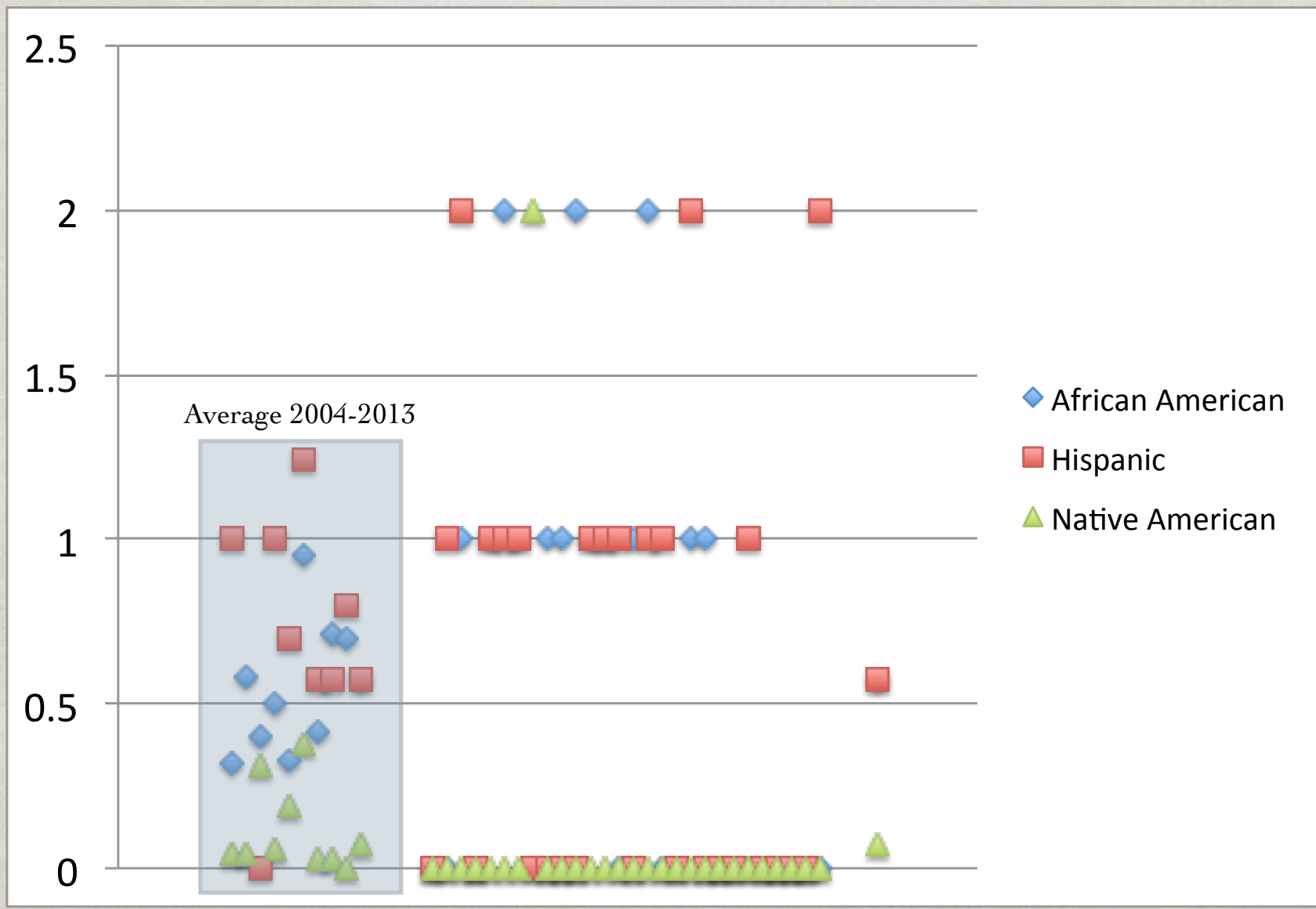
Year	Prof Age	Associate age	Assistant Age
1997	54.0	43.0	33.0
1998	53.0	40.0	33.0
1999	53.0	42.0	34.0
2000	53.9	40.9	34.0
2001	54.0	43.0	34.0
2002	54.0	43.5	33.8
2003			
2004	54.0	43.3	34.8
2005	53.9	42.5	35.6
2006	54.0	42.1	33.2
2007	54.4	43.0	34.3
2008	55.2	43.0	33.8
2009	55.0	43.6	34.4
2010	55.3	43.6	35.2
2011	55.9	45.0	35.3
2012	56.4	44.9	35.6
2013	57.2	45.0	34.9



FEMALE/MALE FACULTY



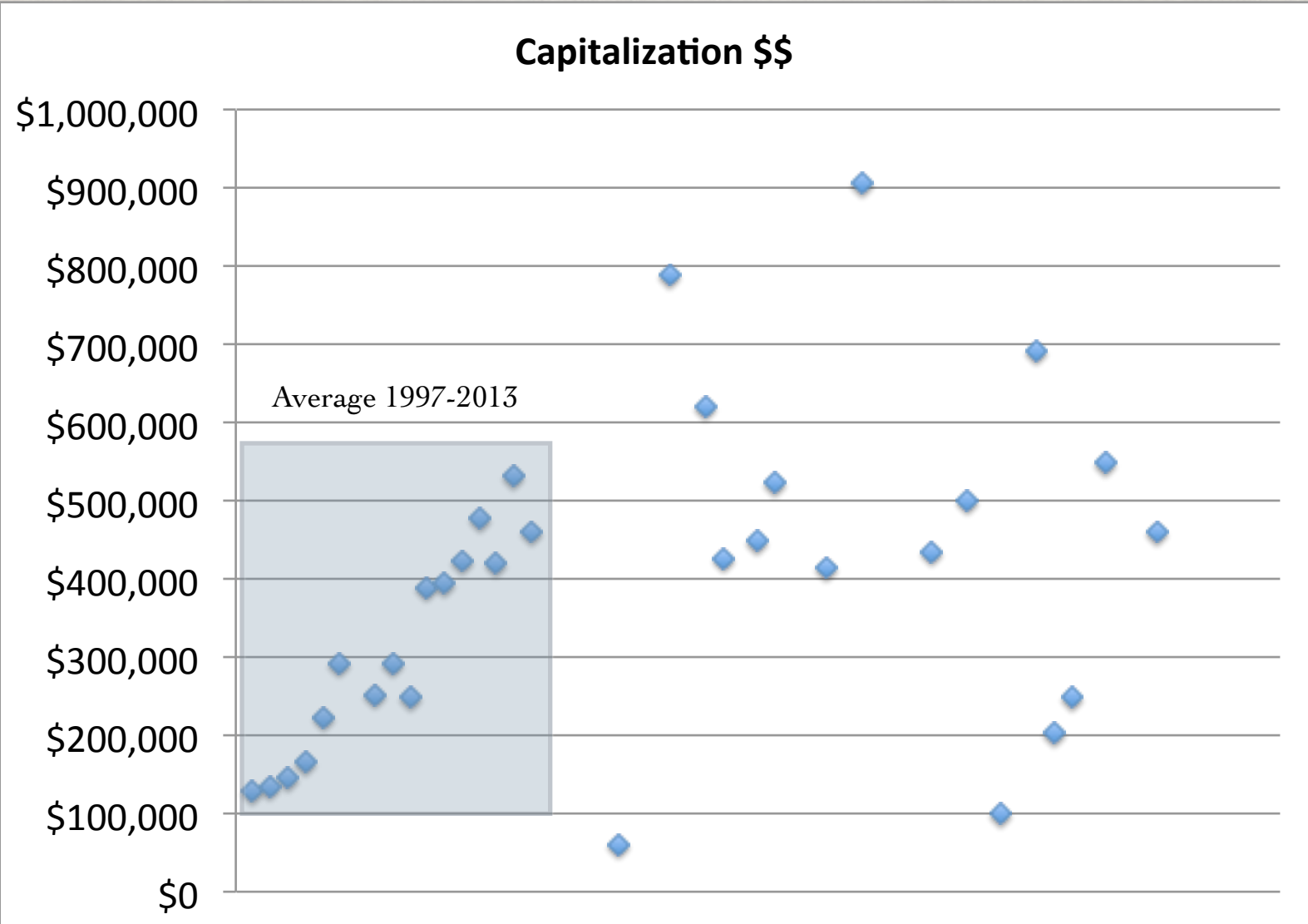
MINORITY FACULTY



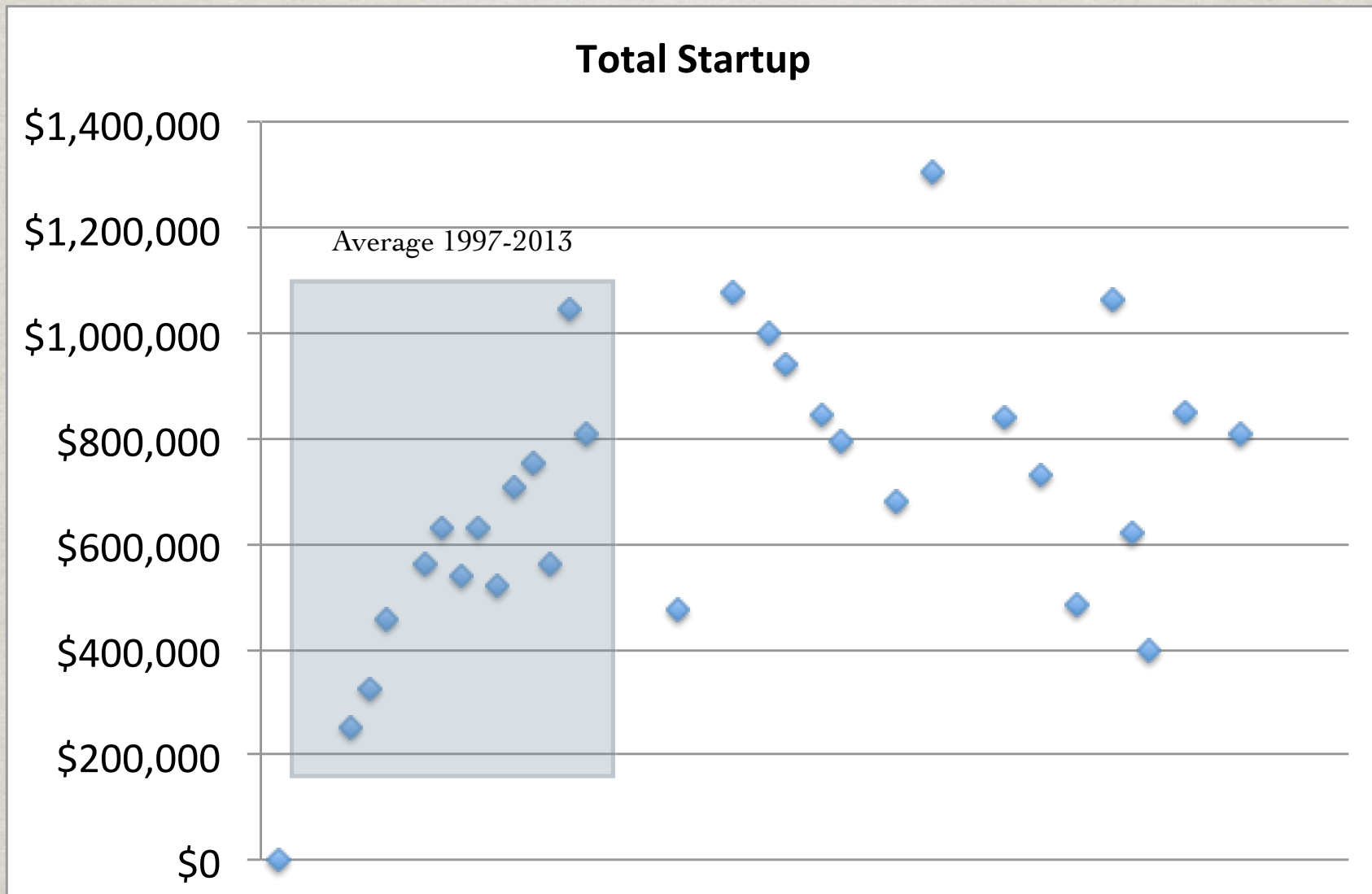
HIRING FACULTY



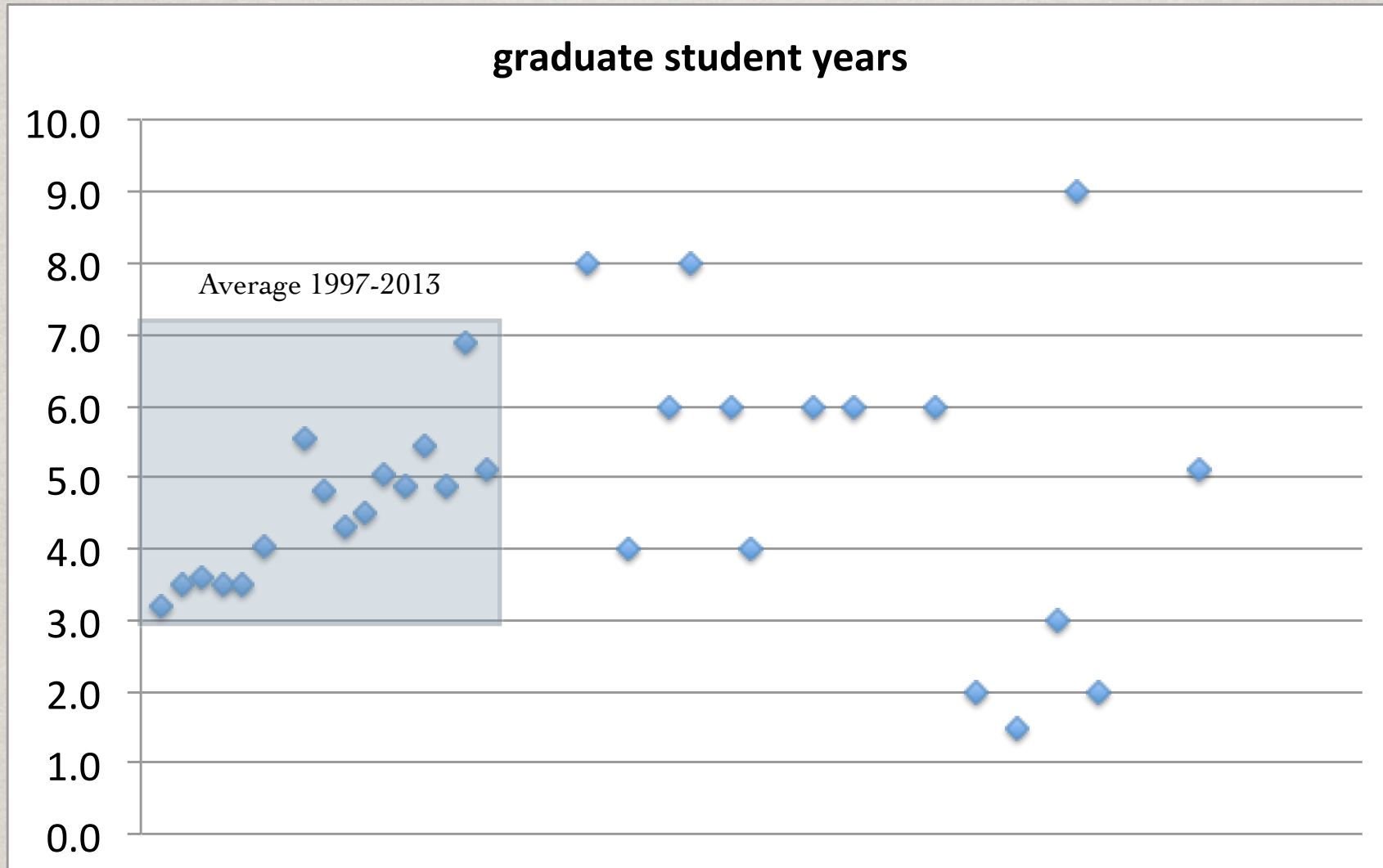
CAPITALIZATION



TOTAL STARTUP



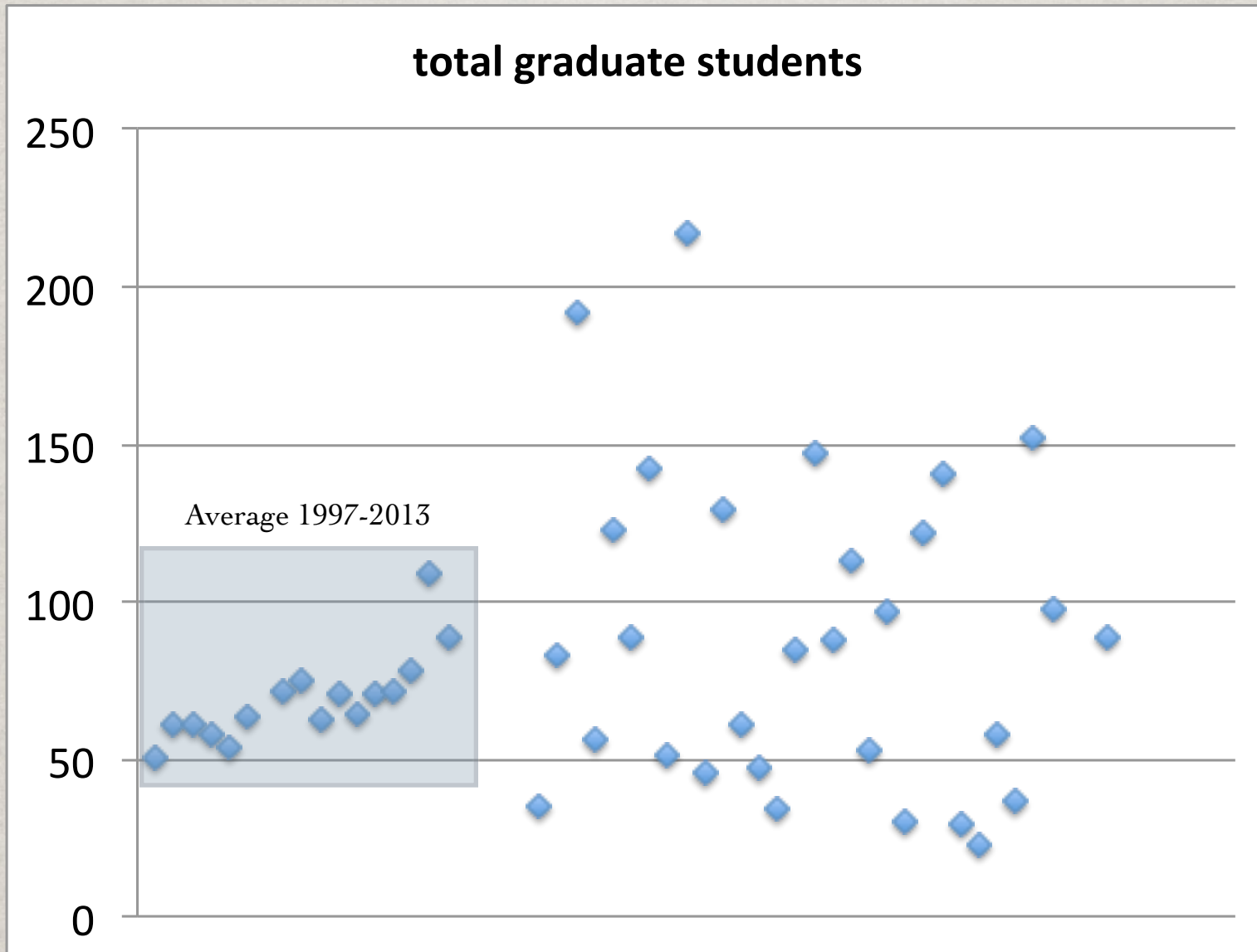
GRADUATE STUDENT YEARS (NEW FACULTY)



GRADUATE STUDENTS

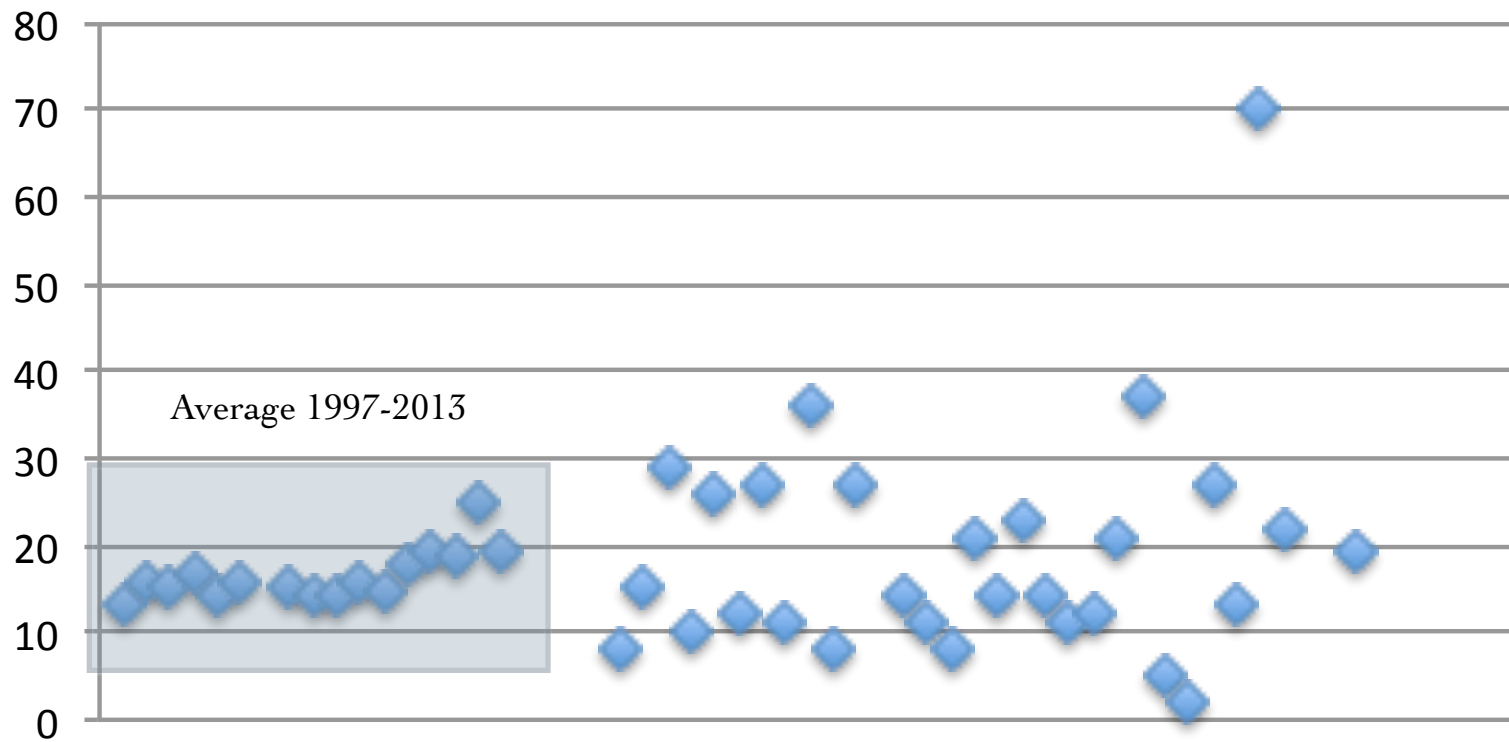


TOTAL GRADUATE STUDENTS

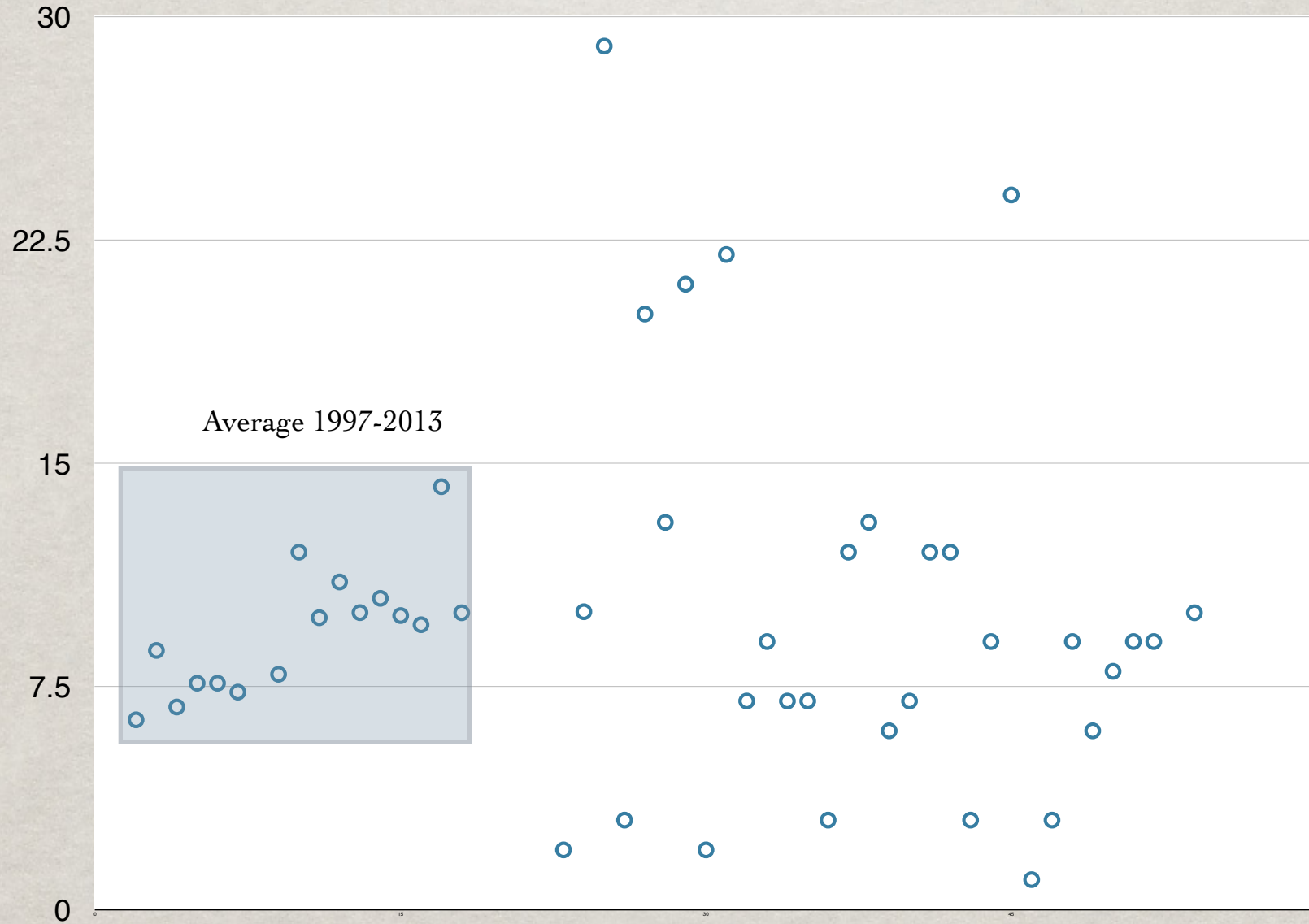


NEW GRAD STUDENTS

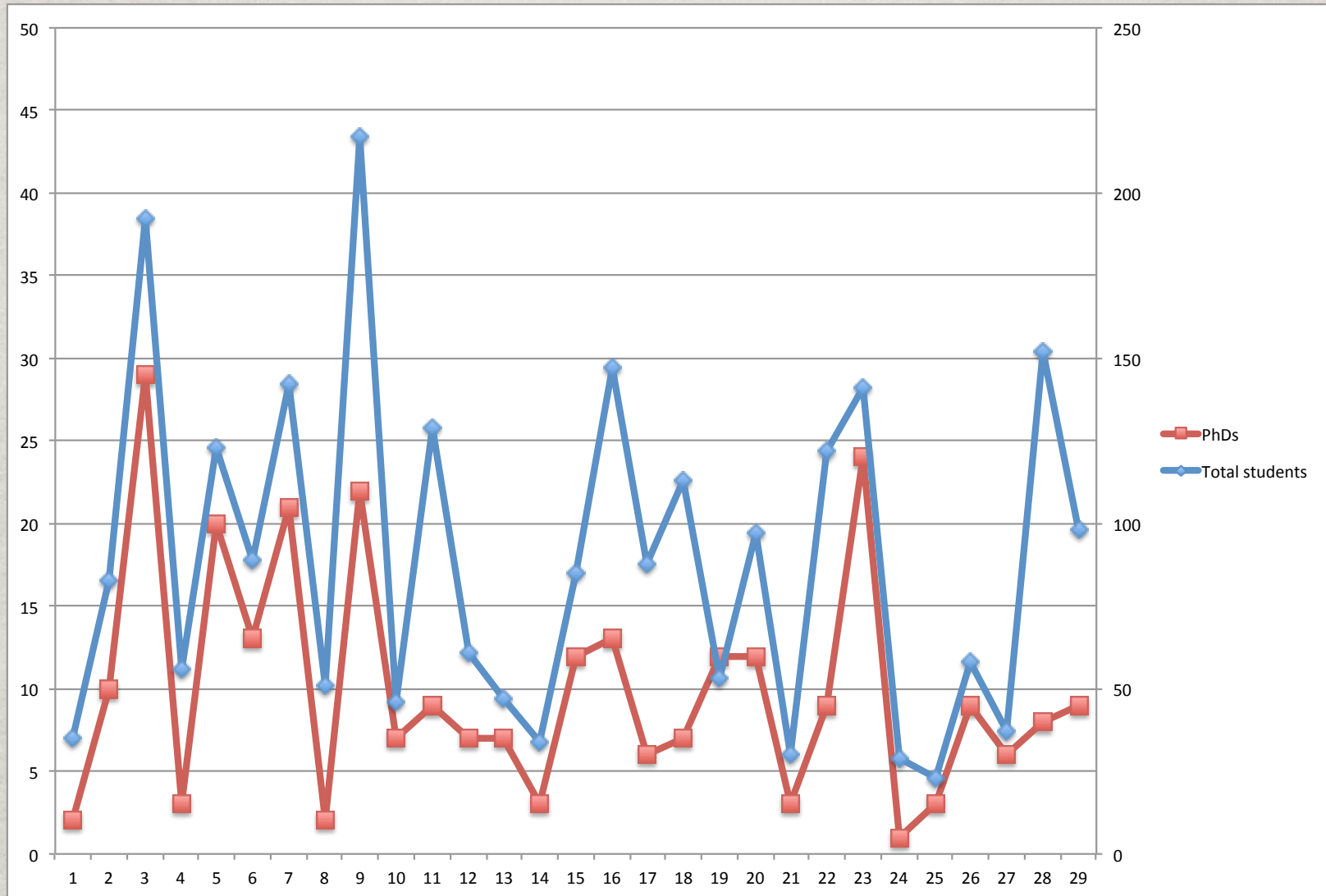
new graduate students



PHD'S FINISHED

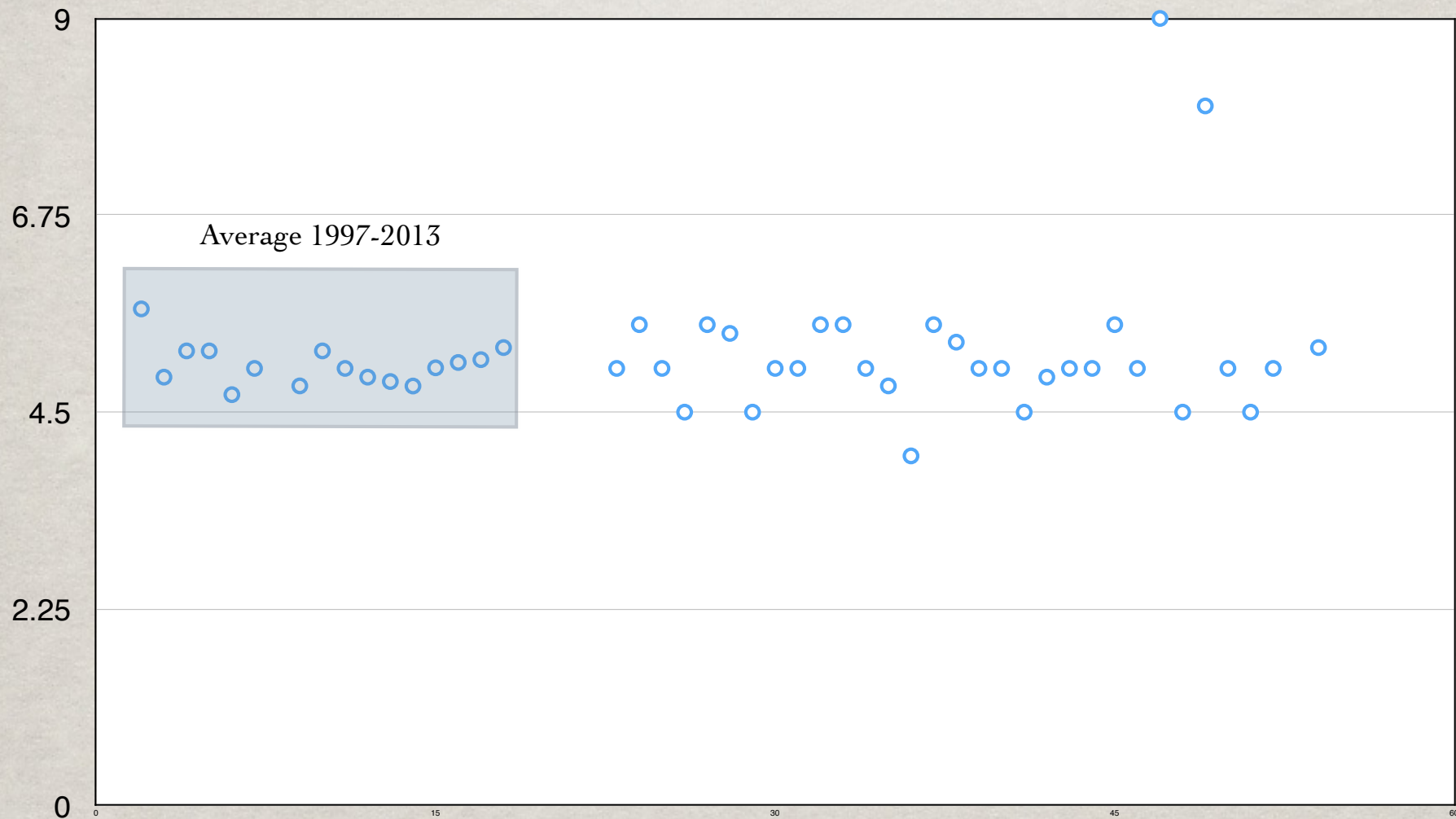


ENROLLMENT AND PHDs FINISHED

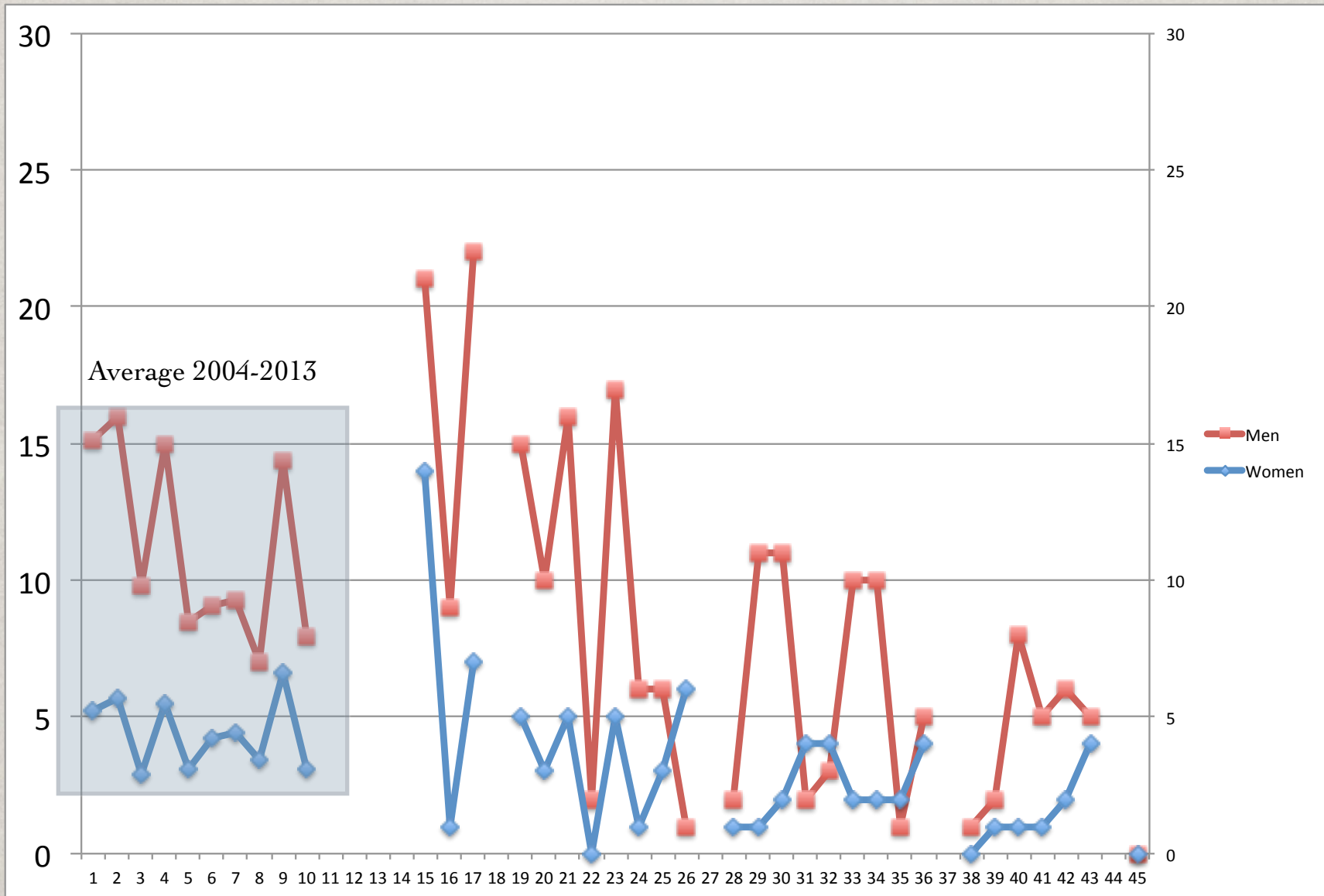


TIME TO PHD

Time to PhD



MALE/FEMALE PHD



MINORITY PHD'S

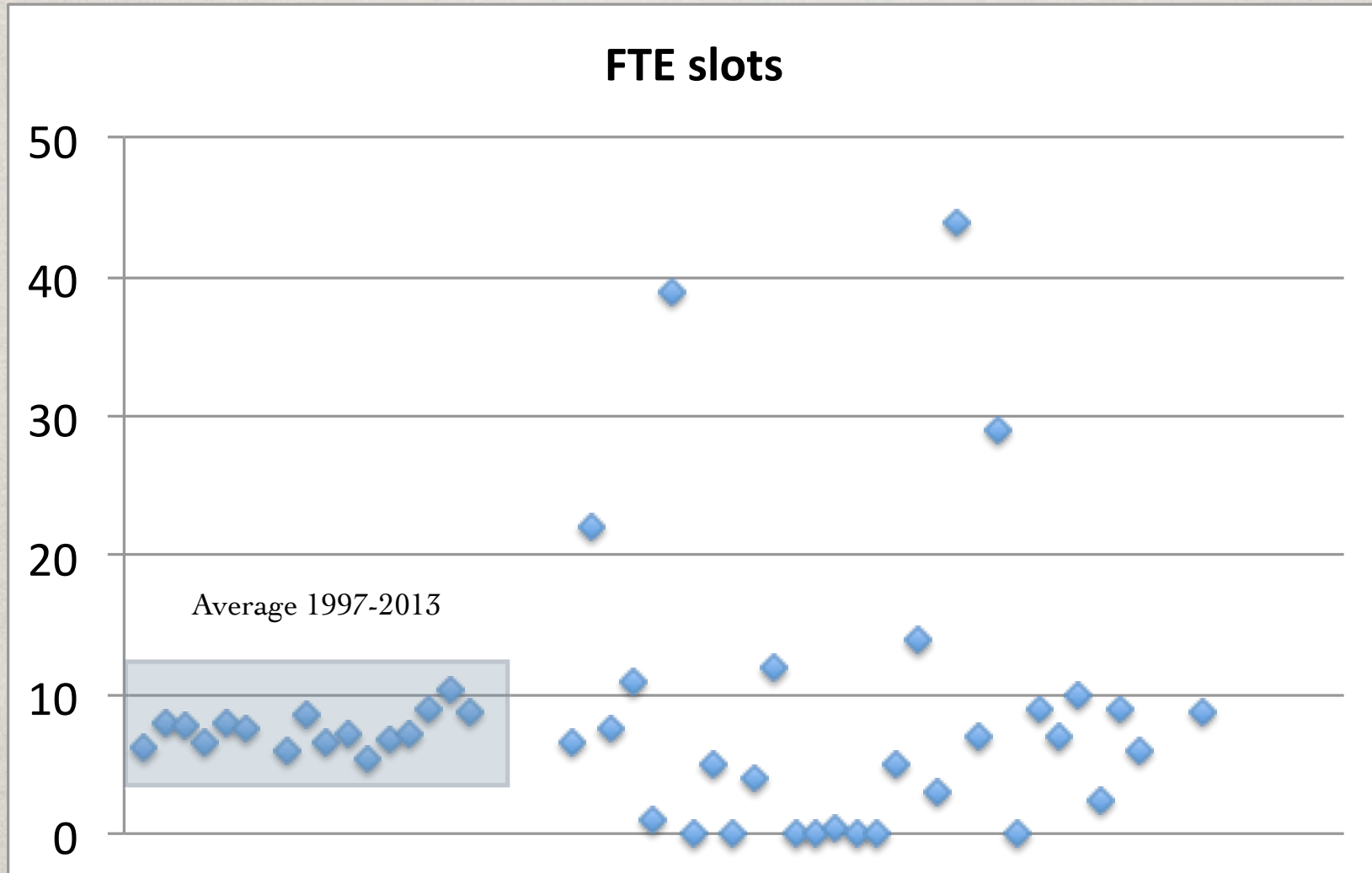
African American	Hispanic	Native American
0.80	1.08	0.00
0.96	1.00	0.00
0.15	0.60	0.00
0.35	1.00	0.10
0.21	0.33	0.11
0.38	0.49	0.17
0.43	1.30	0.03
0.21	0.44	0.00
0.30	0.40	0.20
0.20	0.56	0.04



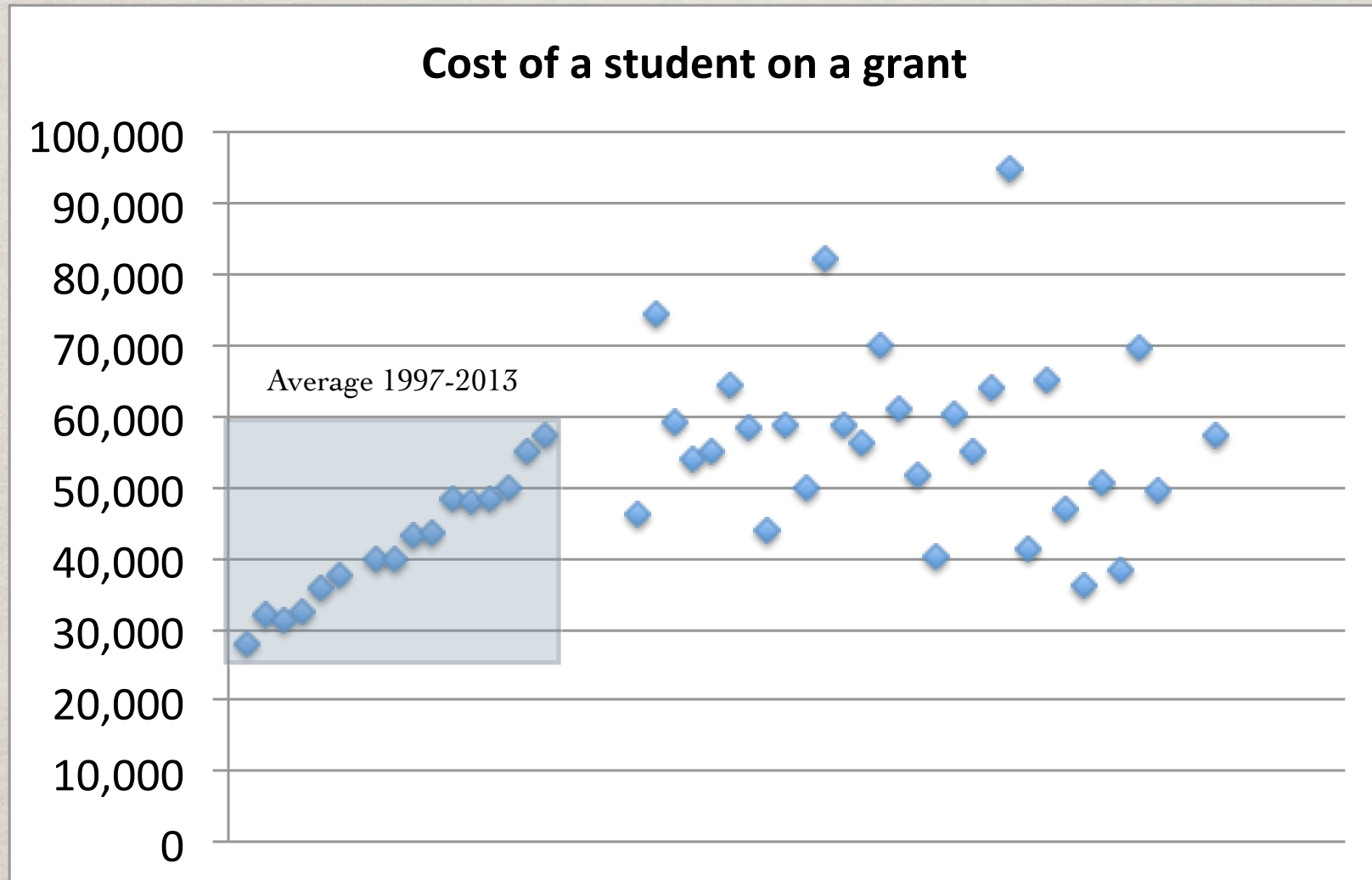
PAYING FOR GRADUATE STUDENTS



FTE'S TO DEPARTMENT

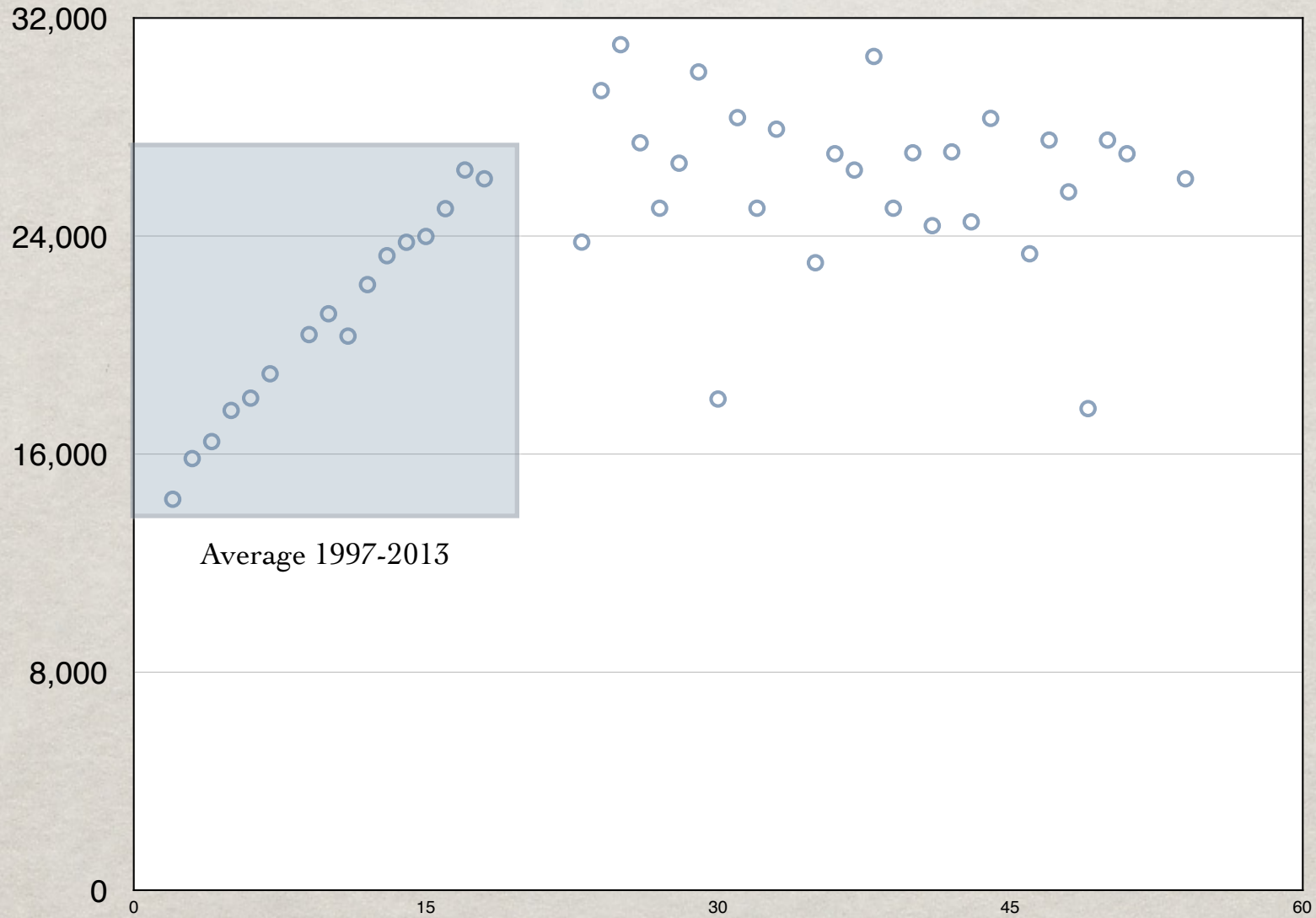


COST OF STUDENT ON GRANT



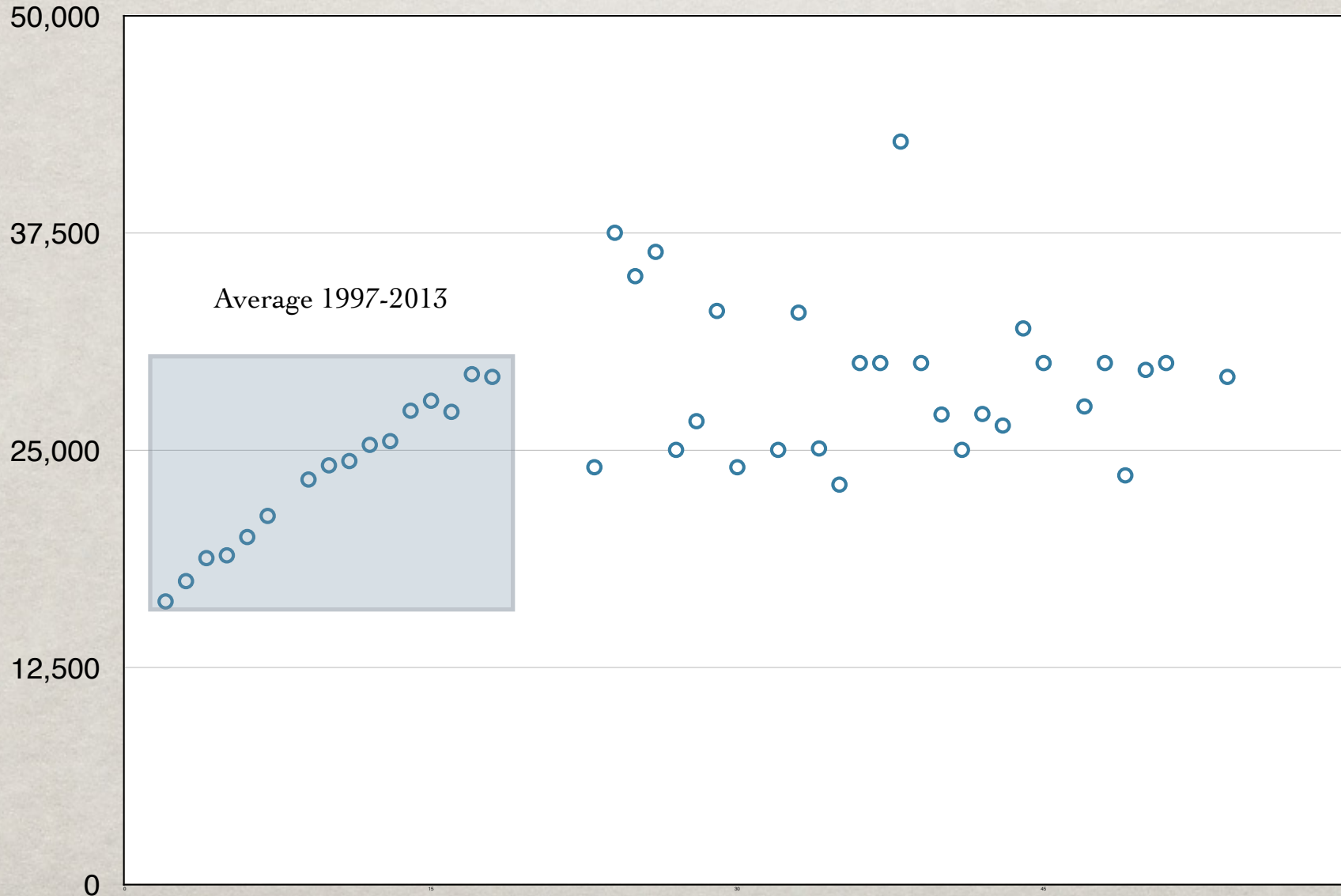
STIPEND AVERAGE

Graduate Stipends



STIPEND HIGHS

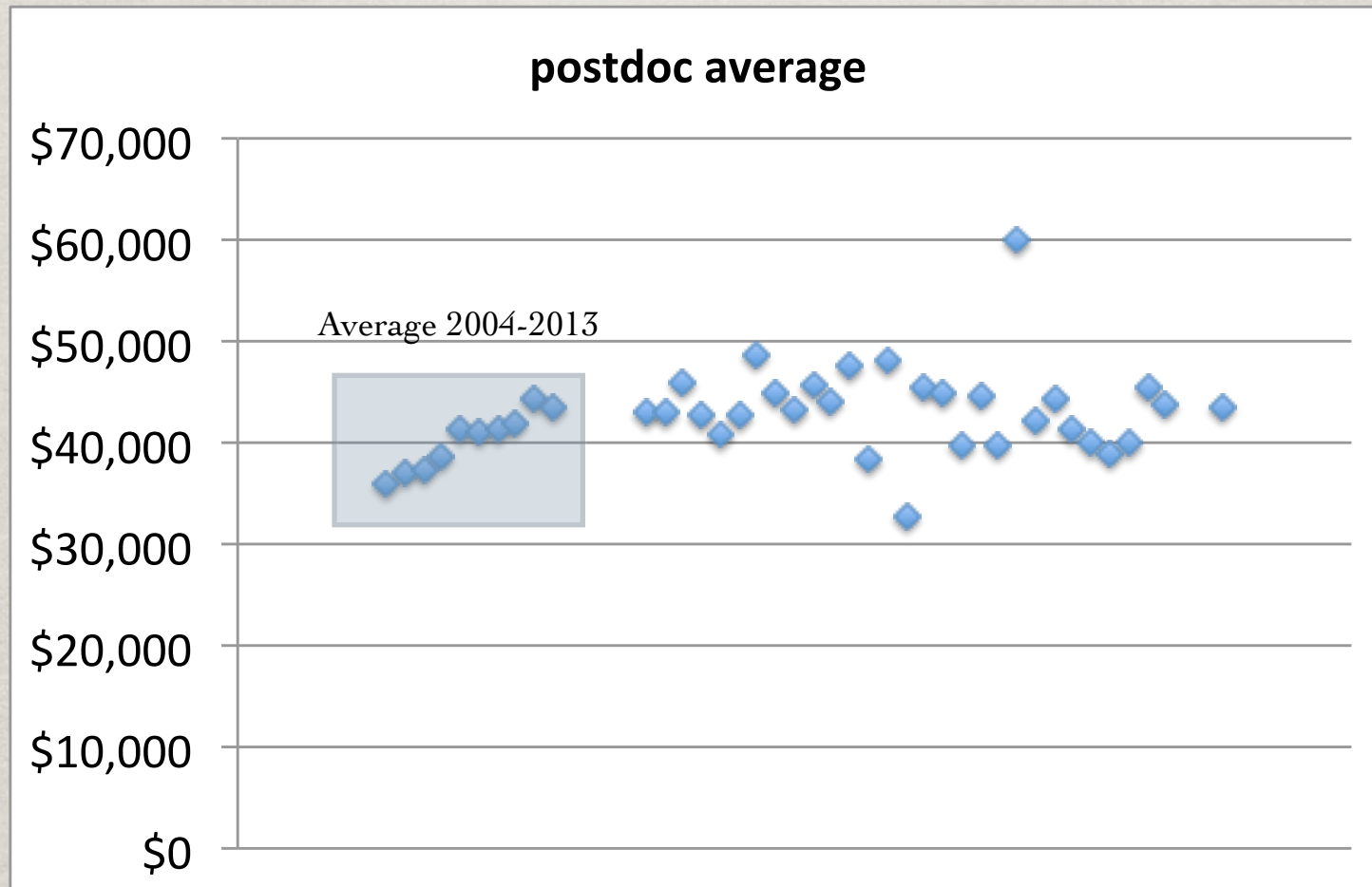
Stipend high values



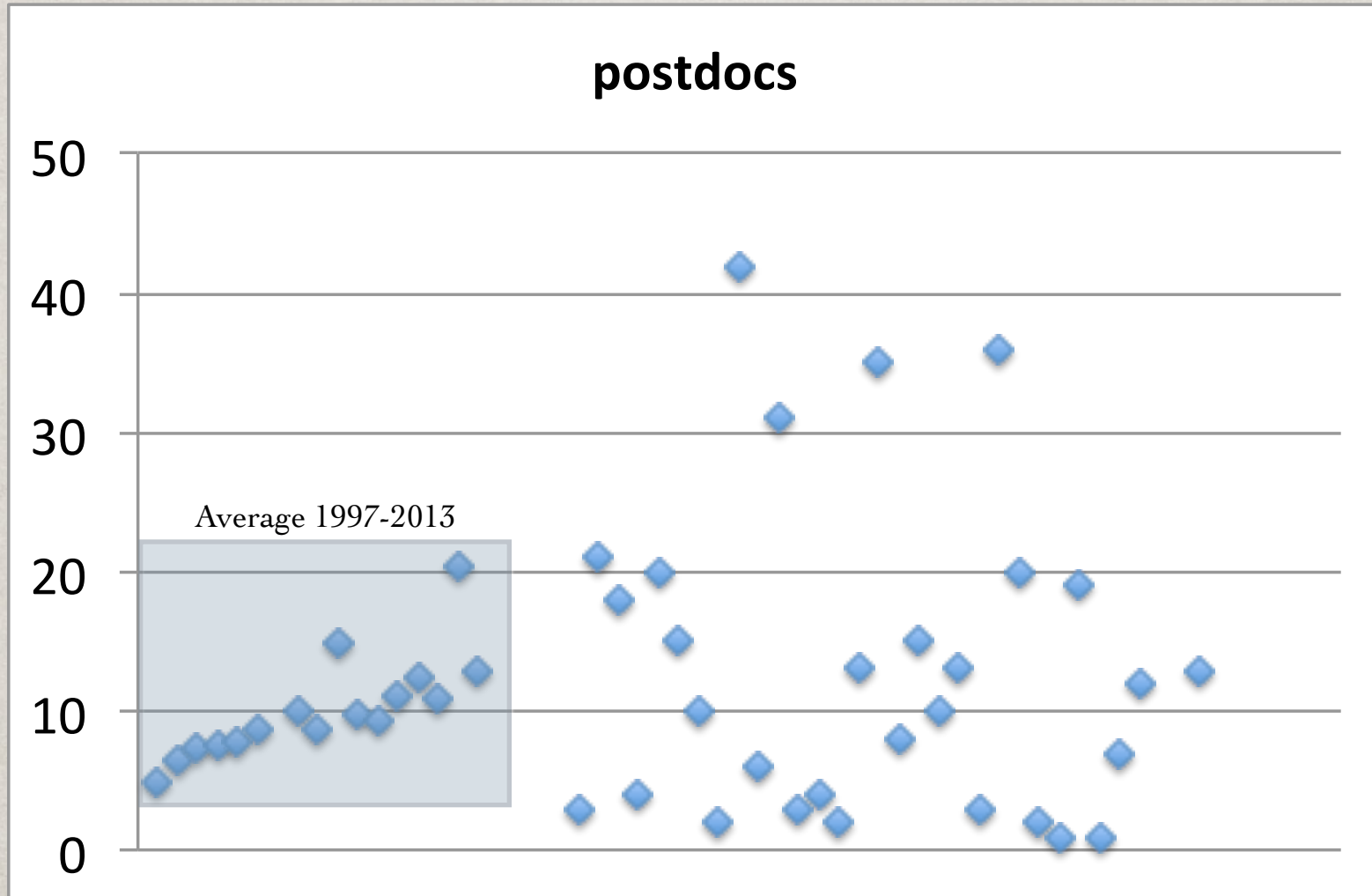
POST DOCS



POSTDOC STIPENDS



TOTAL POSTDOCS

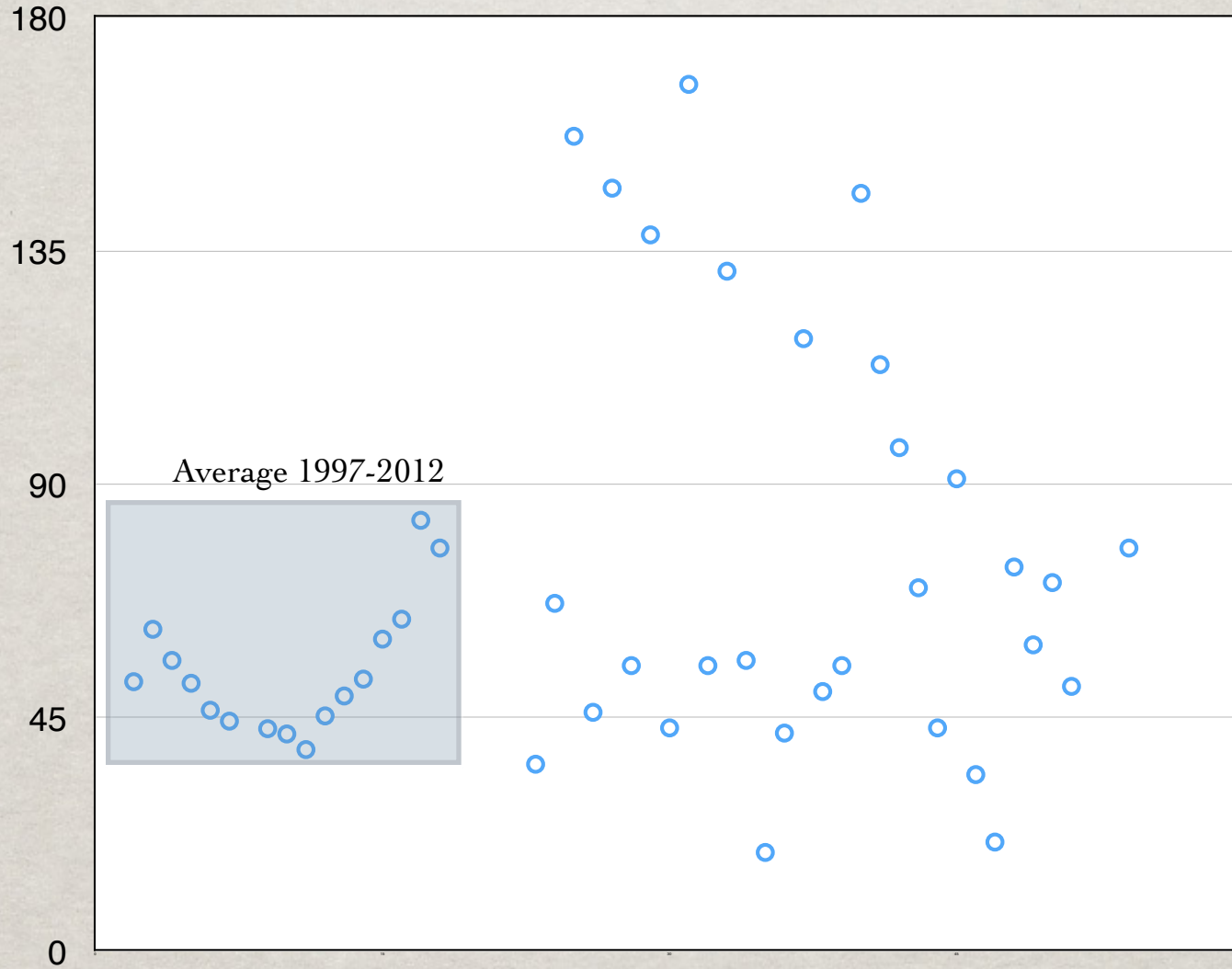


UNDERGRADUATES



BS DEGREES

BS Degrees



UNDERGRADUATE

Year	BS degrees	credits	time (years)	%unemploy	salary
1997	51.9	132.1	4.4		
1998	62.0	131.0	4.3		
1999	56.0	132.0	4.3	11.00%	
2000	51.6	130.1	4.3	14.60%	
2001	46.4	133.8	4.2	22.30%	
2002	44.3	132.1	4.3	17.80%	
2003					
2004	42.8	128.6	4.3	6.00%	\$52,935
2005	41.8	132.0	4.3	8.73%	\$53,568
2006	38.8	131.0	4.3	6.50%	\$57,289
2007	45.3	129.0	4.2	6.90%	\$61,313
2008	49.2	133.4	4.3	11.26%	\$63,868
2009	52.4	130.2	4.3	18.75%	\$65,119
2010	60.1	132.3	4.3	19.04%	\$65,274
2011	63.9	132.3	4.3	19.49%	\$64,487
2012	83.0	128.6	4.2	13.38%	\$66,454
2013	77.7	130.8	4.3	16.34%	\$69,136

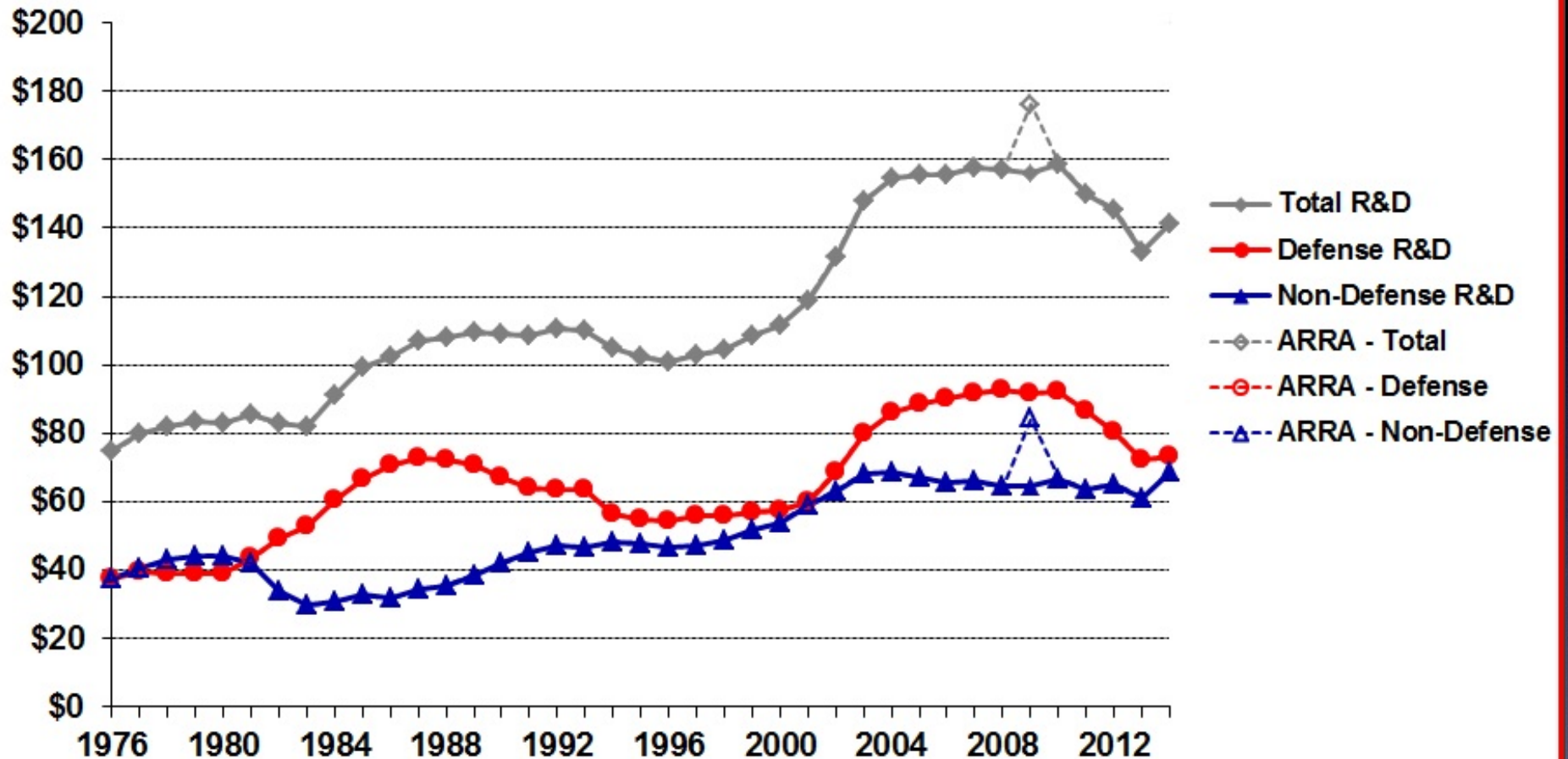


RESEARCH FUNDING



Trends in Federal R&D, FY 1976-2014

in billions of constant FY 2013 dollars

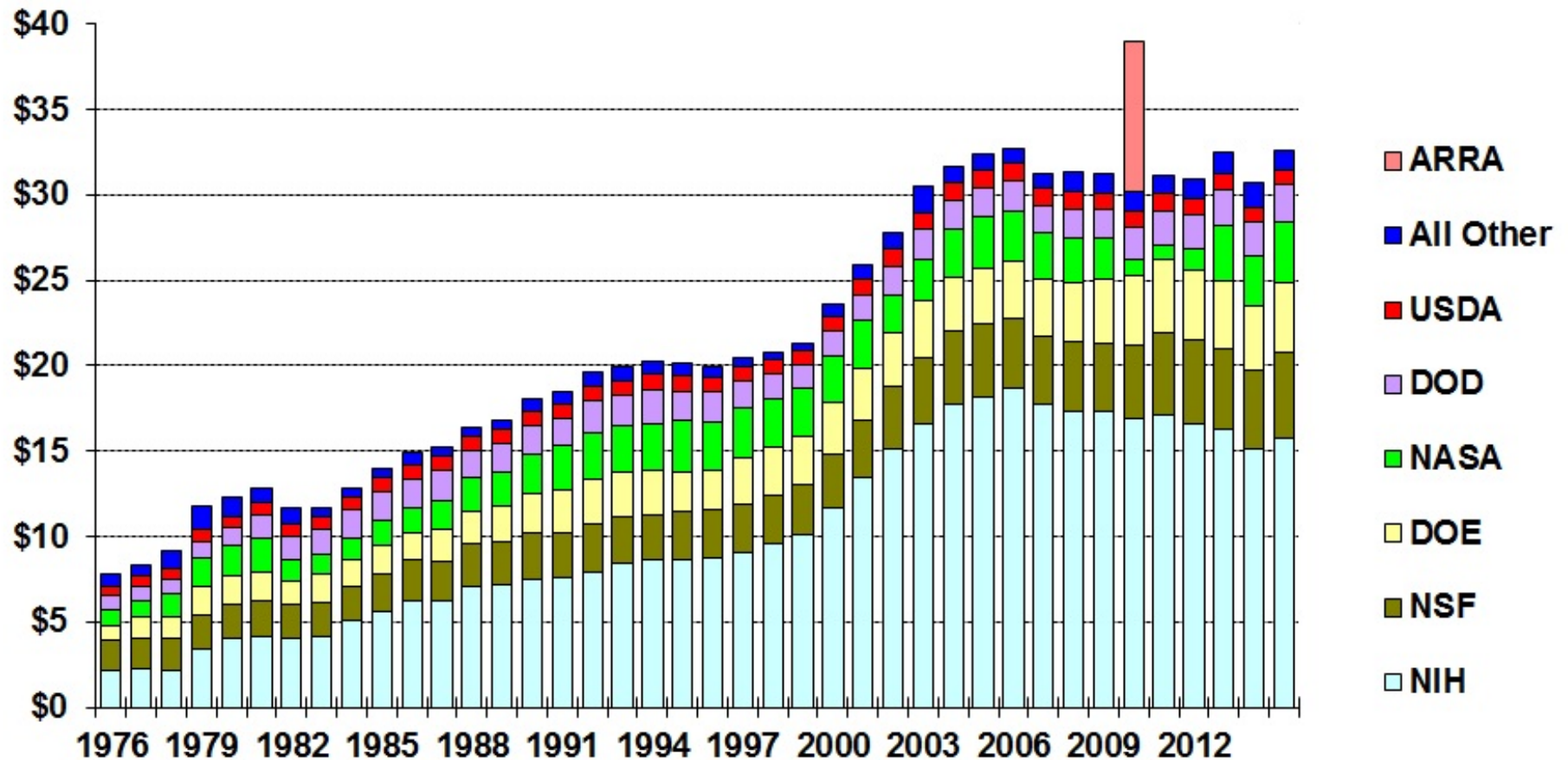


Source: AAAS *Research and Development* series. FY 2013 figures are current AAAS estimates; FY 2014 is the President's request. R&D includes conduct of R&D and R&D facilities.
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Trends in Basic Research by Agency, FY 1976-2014

in billions of constant FY 2013 dollars

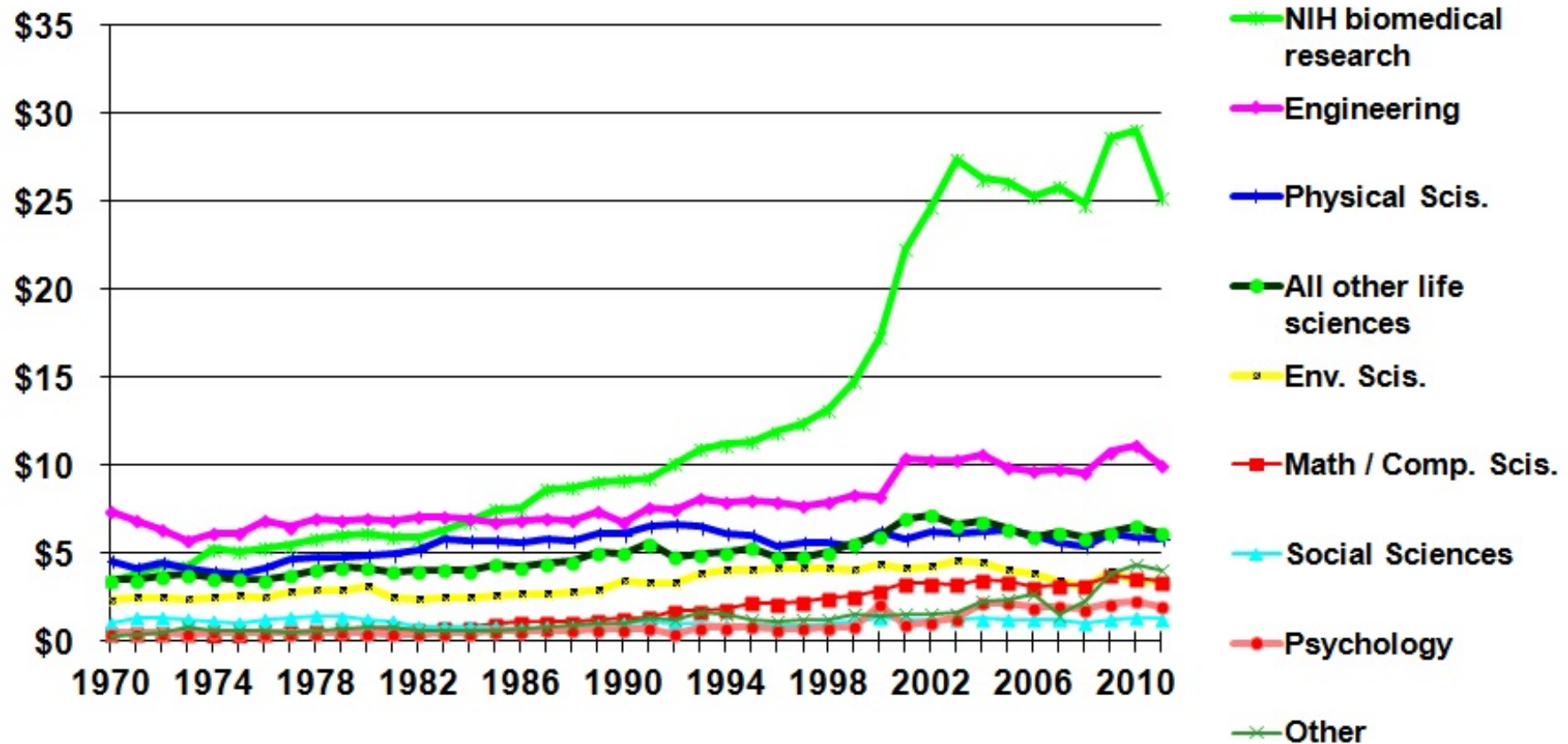


Source: AAAS Report: Research & Development series. FY 2013 figures are latest estimates, FY 2014 is the President's request.
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Trends in Federal Research by Discipline, FY 1970-2011

obligations in billions of constant FY 2012 dollars



"Other" includes research not classified (includes basic research and applied research; excludes development and R&D facilities). Life sciences are split into NIH support and other agencies' support.

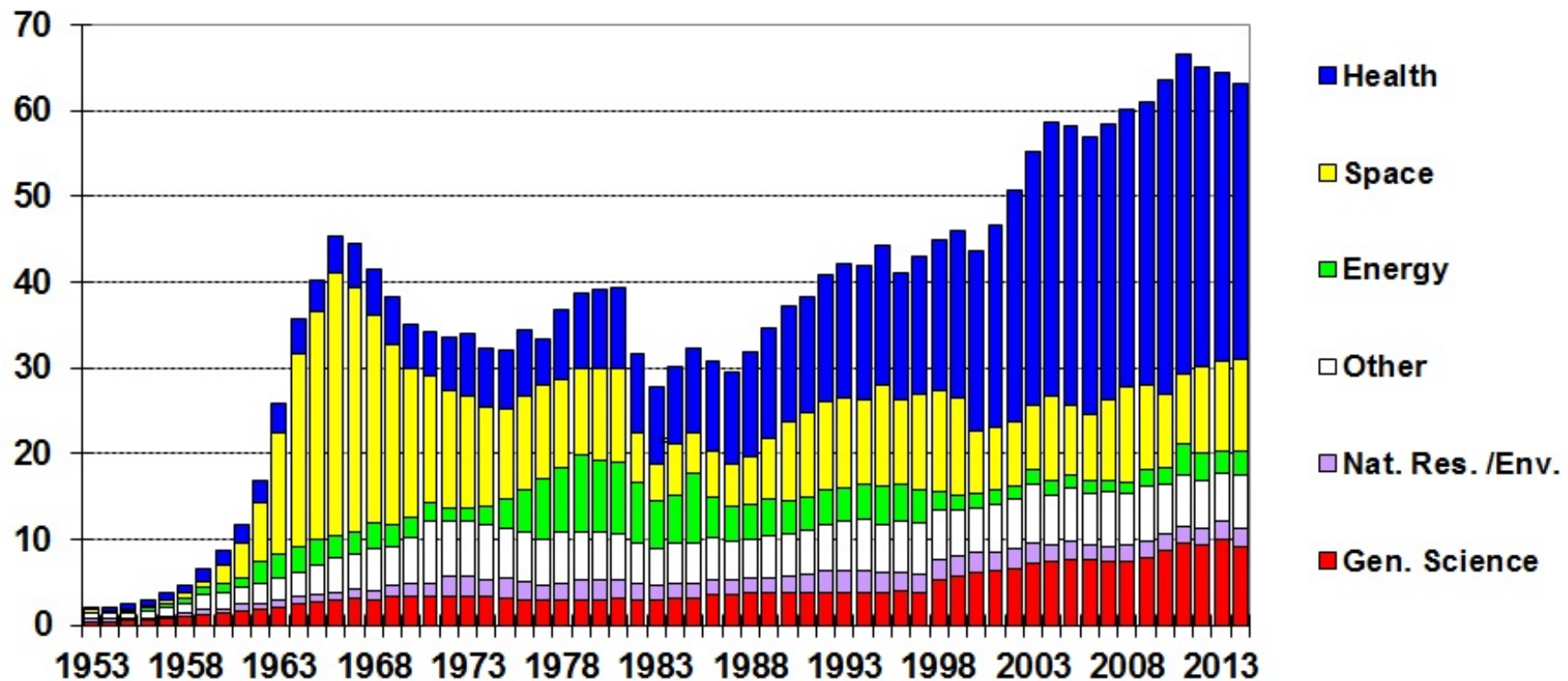
Source: National Science Foundation, *Federal Funds for R&D* series. FY 2010 and 2011 are preliminary. Includes Recovery Act funding beginning in FY09. Constant-dollar conversions based on OMB's GDP deflators.

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Trends in Nondefense R&D by Function

outlays for the conduct of R&D, billions of constant FY 2013 dollars

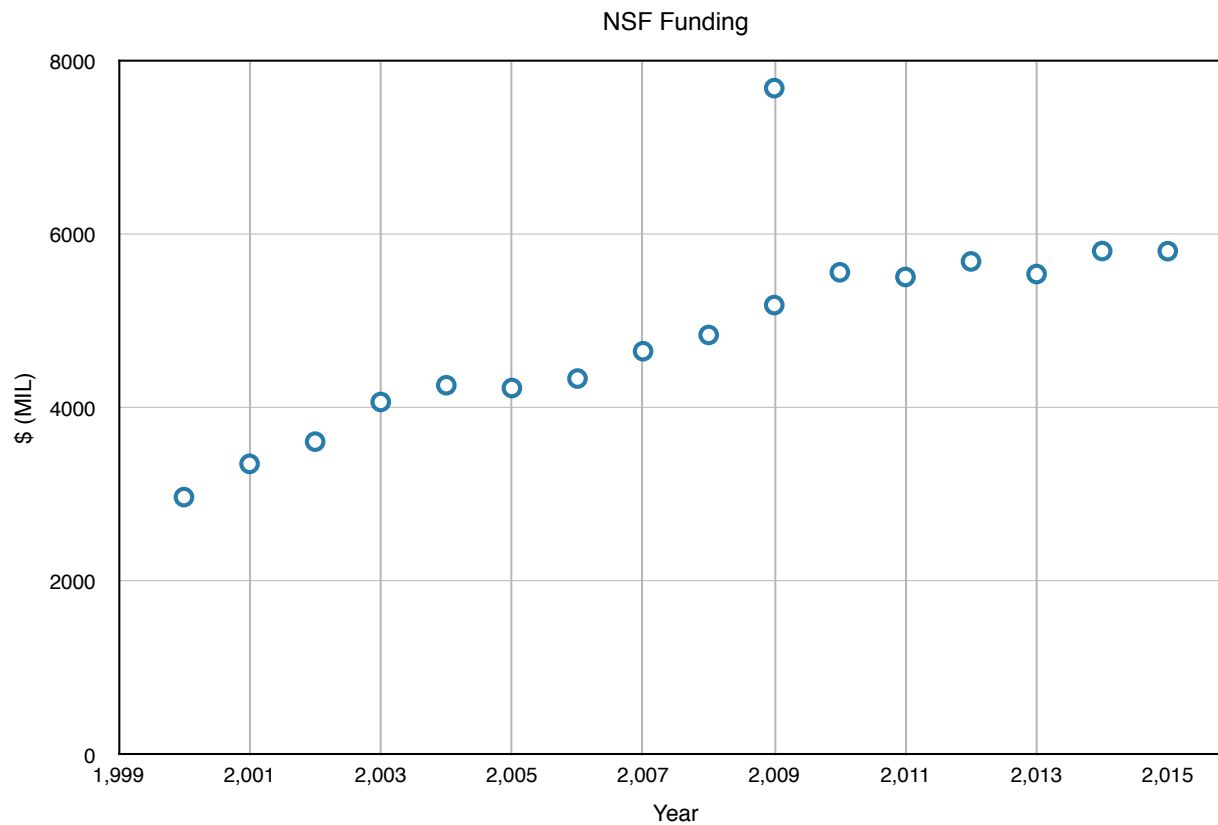


Source: AAAS, based on OMB Historical Tables in *Budget of the United States Government FY 2014*. FY 2014 is the President's request; FY 2013 does not reflect final appropriations or sequestration. Some Energy programs shifted to General Science beginning in FY 1998.

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NSF over time



NSF Budget

**National Science Foundation
Summary Tables
FY 2015 Request to Congress
(Dollars in Millions)**

NSF by Account	FY 2012 Actual	FY 2013 Actual	FY 2014 Estimate	FY 2015 Request	FY 2015 Request over:			
					FY 2013 Actual		FY 2014 Estimate	
					Amount	Percent	Amount	Percent
BIO	\$712.28	\$679.21	\$721.27	\$708.52	-\$3.76	-0.5%	-\$12.75	-1.8%
CISE	937.16	858.13	894.00	893.35	-43.81	-4.7%	-0.65	-0.1%
ENG	824.55	820.18	851.07	858.17	33.62	4.1%	7.10	0.8%
<i>Eng Programs</i>	677.69	658.84	691.68	693.18	15.49	2.3%	1.50	0.2%
<i>SBIR/STTR</i>	146.86	161.34	159.39	164.99	18.13	12.3%	5.60	3.5%
GEO	1,321.37	1,273.77	1,303.03	1,304.39	-16.98	-1.3%	1.36	0.1%
MPS	1,308.70	1,249.34	1,299.80	1,295.56	-13.14	-1.0%	-4.24	-0.3%
SBE	254.19	242.62	256.85	272.20	18.01	7.1%	15.35	6.0%
IIA	398.60	434.28	481.59	473.86	75.26	18.9%	-7.73	-1.6%
U.S. Arctic Research Commission	1.45	1.39	1.30	1.41	-0.04	-2.8%	0.11	8.1%
Research & Related Activities	\$5,758.30	\$5,558.88	\$5,808.92	\$5,807.46	\$49.16	0.9%	-\$1.46	0.0%
Education & Human Resources	\$830.54	\$834.62	\$846.50	\$889.75	\$59.21	7.1%	\$43.25	5.1%
Major Research Equipment & Facilities Construction	\$198.08	\$196.49	\$200.00	\$200.76	\$2.68	1.4%	\$0.76	0.4%
Agency Operations & Award Management	\$299.30	\$293.50	\$298.00	\$338.23	\$38.93	13.0%	\$40.23	13.5%
National Science Board	\$4.37	\$4.10	\$4.30	\$4.37	-	0.0%	\$0.07	1.6%
Office of Inspector General	\$14.12	\$13.17	\$14.20	\$14.43	\$0.31	2.2%	\$0.23	1.6%
OIG FY 2013 ARRA Actual Obligation	\$0.70	\$1.16						
Total, NSF	\$7,105.41	\$6,901.91	\$7,171.92	\$7,255.00	\$149.59	2.1%	\$83.08	1.2%

Totals may not add due to rounding.

NSF EG divisions

DIRECTORATE FOR ENGINEERING (ENG)

\$858,170,000
+\$7,100,000 / 0.8%

ENG Funding (Dollars in Millions)

	FY 2013 Actual	FY 2014 Estimate	FY 2015 Request	Change Over FY 2014 Estimate	
				Amount	Percent
Chemical, Bioengineering, Environmental, and Transport Systems (CBET)	\$167.01	\$173.00	\$174.99	\$1.99	1.2%
Civil, Mechanical, and Manufacturing Innovation (CMMI)	200.81	209.20	210.40	1.20	0.6%
Electrical, Communications, and Cyber Systems (ECCS)	104.58	110.06	110.41	0.35	0.3%
Engineering Education and Centers (EEC)	115.21	122.24	117.38	-4.86	-4.0%
Industrial Innovation and Partnerships (IIP)	202.41	205.97	213.69	7.72	3.8%
<i>SBIR/STTR</i>	<i>161.34</i>	<i>159.39</i>	<i>164.99</i>	<i>5.61</i>	<i>3.5%</i>
Emerging Frontiers in Research and Innovation (EFRI)	30.16	30.60	31.30	0.70	2.3%
Total, ENG	\$820.18	\$851.07	\$858.17	\$7.10	0.8%

Totals may not add due to rounding.

NSF physical Science

DIRECTORATE FOR MATHEMATICAL AND PHYSICAL SCIENCES (MPS)

\$1,295,560,000
-\$4,242,000 / -0.3%

MPS Funding (Dollars in Millions)

	FY 2013 Actual	FY 2014 Estimate	FY 2015 Request	Change Over FY 2014 Estimate	
				Amount	Percent
Astronomical Sciences (AST)	\$232.17	\$239.06	\$236.24	-\$2.82	-1.2%
Chemistry (CHE)	229.39	235.79	237.23	1.44	0.6%
Materials Research (DMR)	291.09	298.01	298.99	0.98	0.3%
Mathematical Sciences (DMS)	219.02	225.64	224.40	-1.24	-0.5%
Physics (PHY)	250.45	266.30	263.70	-2.60	-1.0%
Office of Multidisciplinary Activities (OMA)	27.22	35.00	35.00	-	-
Total, MPS	\$1,249.34	\$1,299.80	\$1,295.56	-\$4.24	-0.3%

Totals may not add due to rounding.

DOE

Overview Appropriation Summary by Program

(dollars in thousands)

	FY 2012 Current	FY 2013 Annualized CR*	FY 2014 Request
Advanced Scientific Computing Research	428,304	443,566	465,593
Basic Energy Sciences	1,644,767	1,698,424	1,862,411
Biological and Environmental Research	592,433	613,287	625,347
Fusion Energy Sciences	392,957	403,450	458,324
High Energy Physics	770,533	795,701	776,521
Nuclear Physics	534,642	550,737	569,938
Workforce Development for Teachers and Scientists	18,500	18,613	16,500
Science Laboratories Infrastructure	111,800	112,485	97,818
Safeguards and Security	80,573	81,066	87,000
Program Direction	185,000	186,132	193,300
Small Business Innovation Research/Technology Transfer (SBIR/STTR) (SC funding)	114,125	0	0
Subtotal, Office of Science	4,873,634	4,903,461	5,152,752
SBIR/STTR (Other DOE funding)	61,346	0	0
Total, Science appropriation/Office of Science ^a	4,934,980	4,903,461	5,152,752

BES

Funding (\$K)

	FY 2013 Current	FY 2014 Enacted	FY 2014 Current	FY 2015 Request	FY 2015 vs. FY 2014 Enacted
Materials Sciences and Engineering					
Scattering and Instrumentation Sciences Research	61,731	64,022	64,022	64,022	0
Condensed Matter and Materials Physics Research	120,946	120,946	120,946	120,946	0
Materials Discovery, Design, and Synthesis Research	73,983	73,983	73,983	73,983	0
Experimental Program to Stimulate Competitive Research (EPSCoR)	8,416	9,953	9,953	8,520	-1,433
Energy Frontier Research Centers (EFRCs)	57,320	58,000	58,000	58,000	0
Energy Innovation Hubs—Batteries and Energy Storage	24,237	24,237	24,237	24,175	-62
Computational Materials Sciences	0	0	0	24,175	+24,175
SBIR/STTR	0	11,608	11,608	12,757	+1,149
Total, Materials Sciences and Engineering	346,633	362,749	362,749	386,578	+23,829
Chemical Sciences, Geosciences, and Biosciences					
Fundamental Interactions Research	72,757	75,999	75,999	75,999	0
Chemical Transformations Research	93,531	93,531	93,531	93,531	0
Photochemistry and Biochemistry Research	69,556	69,556	69,556	69,556	0
Energy Frontier Research Centers (EFRCs)	42,680	42,000	42,000	42,000	0
Energy Innovation Hubs—Fuels from Sunlight	24,237	24,237	24,237	24,175	-62
General Plant Projects (GPP)	5,950	600	600	600	0
SBIR/STTR	0	10,093	10,093	10,417	+324
Total, Chemical Sciences, Geosciences, and Biosciences	308,711	316,016	316,016	316,278	+262

NIH

History of Obligations by Institute or Center¹ Fiscal Years 2006 - 2015 (Dollars in Thousands)

Institutes and Centers	FY 2006 Actual Obligations	FY 2007 Actual Obligations	FY 2008 Actual Obligations	FY 2009 Actual Obligations	FY 2010 Actual Obligations	FY 2011 Actual Obligations	FY 2012 Actual Obligations	FY 2013 Actual Obligations	FY 2013 Comparable Budget Authority	FY 2014 Comparable Budget Authority	FY 2015 President's Budget
NCI ²	\$4,754,121	\$4,792,615	\$4,827,552	\$4,966,927	\$5,098,147	\$5,058,105	5,062,763	4,789,014	\$4,783,442	\$4,922,771	\$4,930,715
NHLBI	2,893,527	2,922,323	2,937,333	3,014,552	3,093,501	3,069,550	3,073,302	2,903,768	2,900,321	2,982,737	2,987,685
NIDCR	385,589	389,060	391,136	402,011	412,527	409,549	409,947	387,309	386,874	397,102	397,131
NIDDK ³	1,688,511	1,702,990	1,712,188	1,761,795	1,808,905	1,792,155	1,793,706	1,694,677	1,692,748	1,741,874	1,743,336
NINDS	1,519,971	1,532,977	1,549,543	1,590,781	1,633,568	1,622,001	1,623,344	1,533,793	1,531,975	1,585,797	1,608,461
NIAID	4,274,201	4,264,034	4,286,410	4,400,398	4,515,426	4,478,595	4,482,369	4,235,094	4,230,080	4,392,670	4,423,357
NIGMS	1,916,927	1,932,481	1,942,783	1,994,426	2,048,112	2,033,663	2,425,522	2,293,044	2,290,525	2,361,894	2,368,877
NICHD	1,252,598	1,252,765	1,259,435	1,292,929	1,327,349	1,317,682	1,318,943	1,246,140	1,244,707	1,280,830	1,283,487
NEI	660,340	665,863	669,534	687,350	705,792	700,781	701,407	657,055	656,291	674,249	675,168
NIEHS ⁴	630,454	647,020	651,557	668,037	694,807	683,557	684,297	646,467	645,782	664,524	665,080
NIA	1,036,559	1,045,468	1,050,998	1,079,004	1,108,208	1,100,445	1,120,391	1,040,565	1,039,399	1,169,427	1,170,880
NIAMS	502,954	507,292	510,358	523,887	538,028	534,260	534,791	505,206	504,691	519,338	520,189
NIDCD	389,623	392,937	395,515	406,516	418,001	415,104	415,500	392,540	392,113	403,493	403,933
NIMH	1,390,009	1,402,385	1,414,541	1,454,377	1,493,510	1,477,257	1,477,516	1,396,006	1,394,354	1,416,825	1,440,076
NIDA	990,405	1,001,952	1,007,295	1,039,561	1,066,909	1,050,519	1,051,410	993,404	992,232	1,015,754	1,023,268
NIAAA	431,726	435,366	437,839	449,524	461,544	458,257	458,665	433,247	432,849	445,411	446,017
NINR	136,020	137,167	137,990	141,660	145,420	144,369	144,500	136,516	136,367	140,324	140,452
NHGRI	481,339	508,240	505,380	507,210	524,131	511,469	512,258	483,650	483,107	497,128	498,451
NIBIB	293,954	296,380	299,726	307,701	316,028	313,787	337,728	319,062	318,720	326,359	328,532
NIMHD ⁵	193,522	199,083	200,252	205,616	211,194	209,693	275,927	260,671	260,396	267,953	267,953
NCCR ⁶	1,088,500	1,131,618	1,153,911	1,224,629	1,267,021	1,257,641	---	---	---	---	---
NCCAM	120,294	121,369	122,013	125,265	128,615	127,706	127,820	120,767	120,624	124,125	124,509
NCATS ⁶	---	---	---	---	---	---	574,297	542,598	541,973	632,396	657,471
FIC	65,726	66,348	66,828	68,607	69,957	69,413	69,493	65,627	65,581	67,484	67,776
NLM ⁷	311,721	321,354	323,385	329,614	340,267	336,660	364,887	316,888	352,268	367,223	372,851
ORIP & SEPA ⁶	---	---	---	---	---	---	303,525	290,042	289,376	294,195	294,195
Common Fund ⁸	332,556	482,961	498,240	541,133	544,028	543,017	544,930	513,461	513,476	533,039	583,039
OD - Other ⁹	392,275	563,596	613,454	706,295	632,966	623,887	608,713	608,584	607,663	572,519	574,552
B&F ²	170,456	89,114	127,227	88,815	203,056	62,161	125,308	106,676	118,109	128,663	128,663
Total, Labor/HHS Budget Authority	\$28,303,878	\$28,804,758	\$29,092,423	\$29,978,620	\$30,807,017	\$30,401,283	\$30,623,259	\$28,911,870	\$28,926,041	\$29,926,104	\$30,126,104
Interior/Superfund	79,101	79,111	77,531	78,070	79,201	79,045	78,928	74,864	74,871	77,349	77,349
Type I Diabetes	150,000	150,000	150,000	150,000	150,000	150,000	150,000	142,350	142,350	139,200	150,000
Total, NIH Budget Authority	\$28,532,979	\$29,033,869	\$29,319,954	\$30,206,690	\$31,036,218	\$30,630,328	\$30,852,187	\$29,129,085	\$29,143,262	\$30,142,653	\$30,353,453

¹ Actual fiscal years obligations exclude all lapses and excludes NIAID Global AIDS for FY 2006 through FY 2012. FY 2013 Actual Obligations are displayed in Noncomparable and Comparable levels.

² NCI obligations include obligations associated with repair and improvement (R&I) related construction for the Frederick facility. Those obligations are excluded from amounts identified to B&F.

³ Excludes amount for Type I Diabetes.

⁴ Excludes amount allocated for Superfund Research activities from Interior, Environment & Related Agencies appropriation.

⁵ NIMHD was designated as an Institute from Center starting FY 2009 under the section 10334 of the Patient Protection and Affordable Care Act (PPACA; P.L. 111-148).

⁶ ICs realigned to reflect creation of NCATS.

⁷ NLM is treated as a stand-alone IC starting FY 2009.

⁸ Common Fund name was changed from Roadmap starting in FY 2009.

⁹ Includes Bridge Award amount of \$89,656 thousand for both FY 2008 and FY 2009.

DOD Agencies

DOD total basic research (about \$2 BIL — largely university research)

<http://www.aip.org/fyi/2013/067.html>

Army: \$300 MIL

Navy: \$575 Mil

<http://navylive.dodlive.mil/2013/04/10/navy-unveils-fy14-budget-2/>

Air Force \$470 MIL

Defense-wide: \$600 MIL

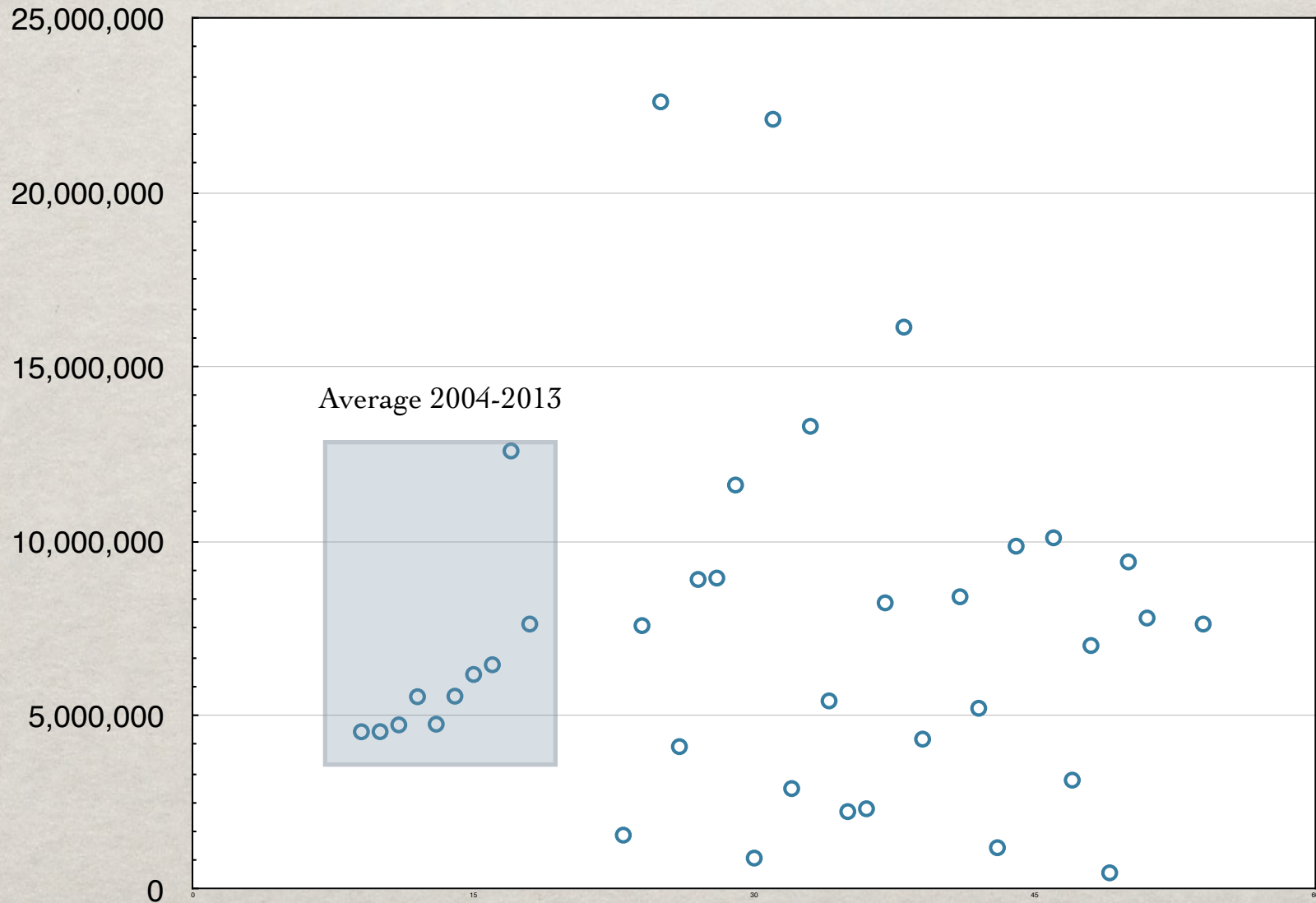
DARPA \$3 Billion

FY2013_Budget_Request_Overview_Book

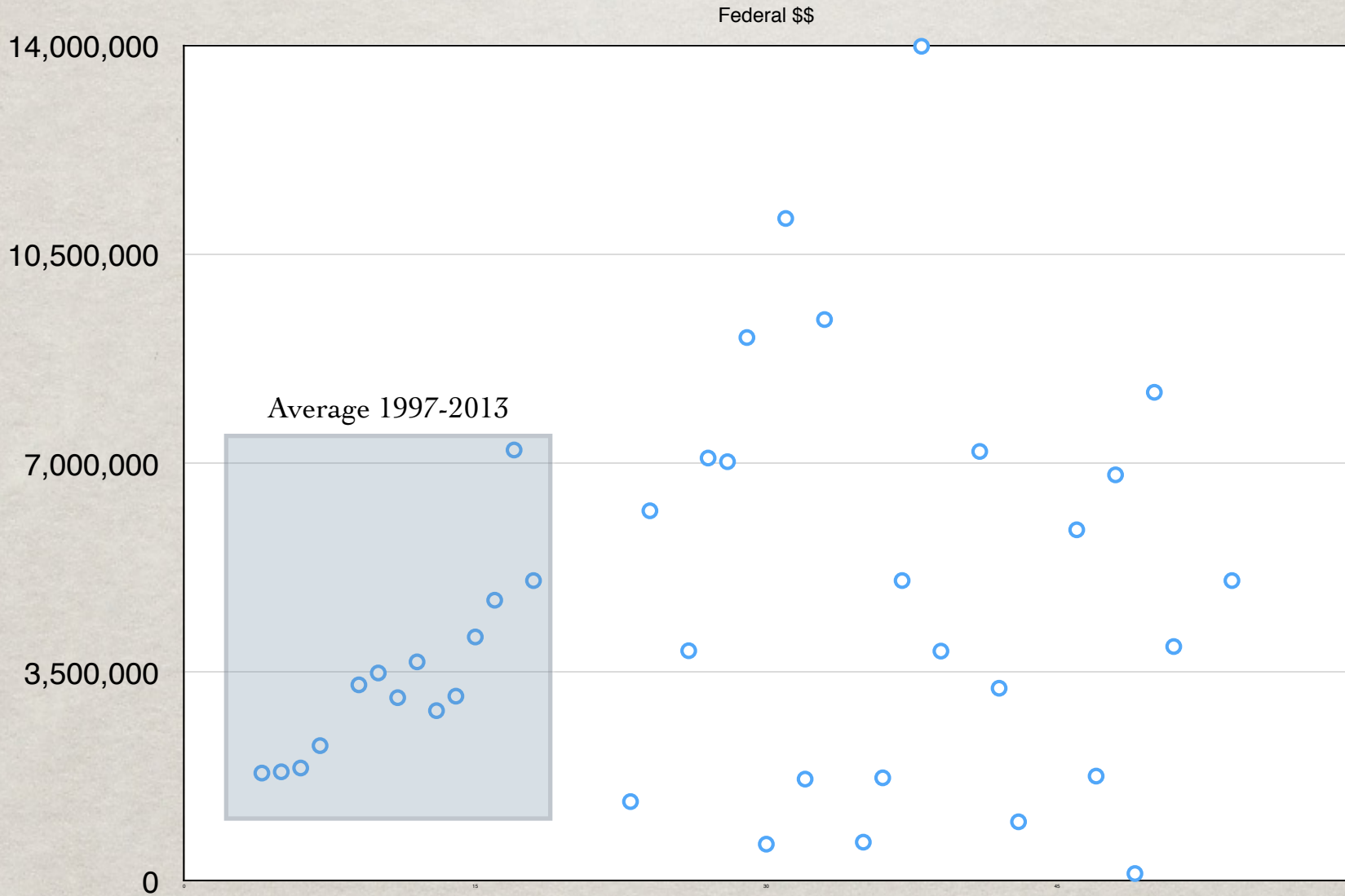
<http://www.darpa.mil/NewsEvents/Releases/2014/03/05.aspx>

TOTAL RESEARCH EXPENDITURES

Total Expenditures

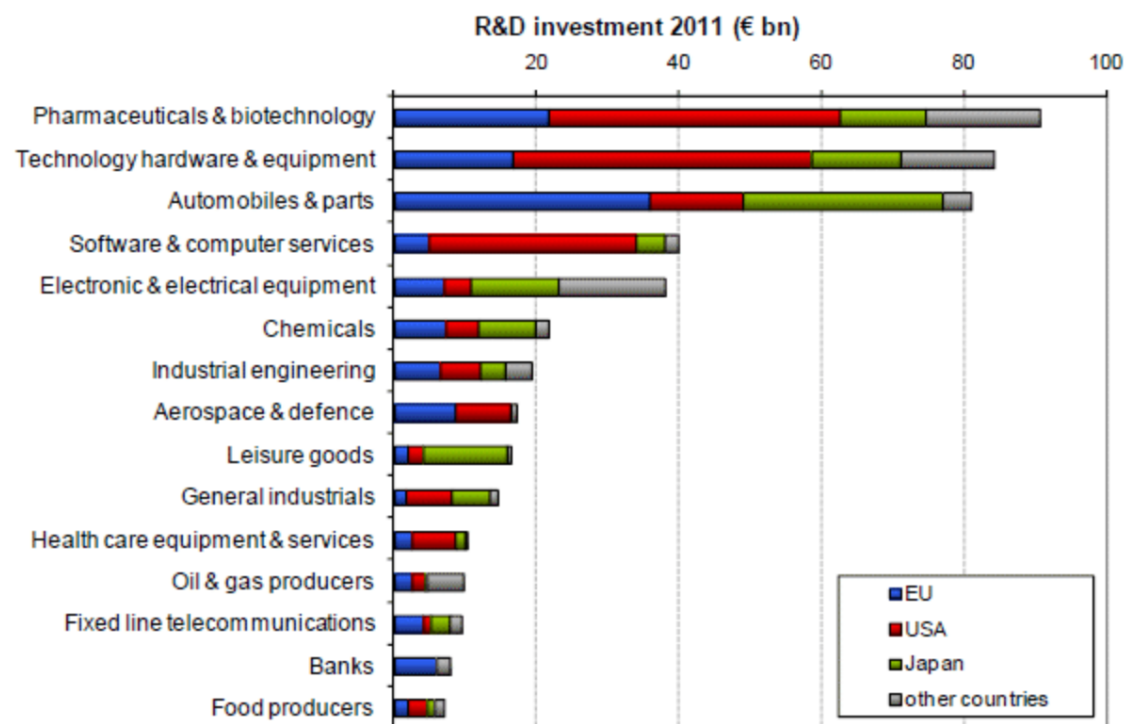


FEDERAL \$\$



Industrial R&D

R&D Ranking of Industrial Sectors and Shares of World Regions for the Top 1,500 Companies



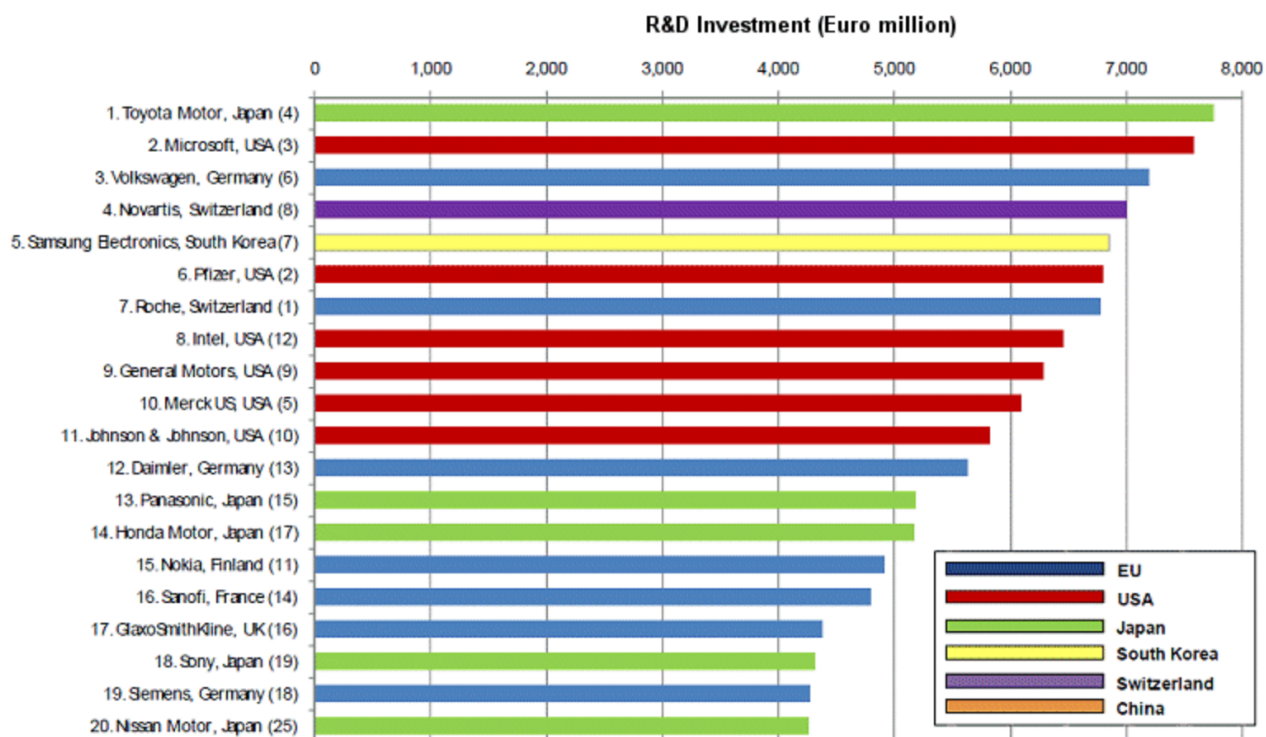
Source: [1]

http://www.chemistryviews.org/details/ezone/4256721/Industrial_RD_Investment_2011_Data.html

Industrial R&D

World's Top 20 Companies by their R&D Investment in 2011

The top ten companies each invested more than € 5 bn in R&D. They account for 13.5 % of the total R&D investment by the top 1,500 companies – a similar proportion to 2010.



Source: [1]

Number in brackets after the company's name indicates the company's ranking in 2010.

http://www.chemistryviews.org/details/ezone/4256721/Industrial_RD_Investment_2011_Data.html

Oil Companies

Petroleum spends at a lower rate.
There are maybe about \$7 Trillion oil
and gas revenues

http://en.wikipedia.org/wiki/List_of_largest_oil_and_gas_companies_by_revenue

Shell has \$480 Bil in revenue and
Exxon about \$450 Bil in revenue, BP
is about \$360 Bil in revenue.

<http://www.oilgaspost.com/2013/05/21/top-40-oil-gas-companies-investment/>

Exxon spends about \$800 Mil in
research, Shell is about \$900Mil and
BP is about \$500Mil.

Chemical R&D

Chemicals & Advanced Materials	2009	2010	Q1-Q3 2011
Top U.S. R&D Expenditures	Millions, U.S.\$		
Dow Chemical	1,492.0	1,660.0	1,213.0
DuPont	1,378.0	1,651.0	1,418.0
3M Co.	1,293.0	1,434.0	1,191.0
PPG Industries	388.0	394.0	321.0
Goodyear Tire & Rubber	337.0	342.0	328.0
Honeywell - Advanced Materials (e)	178.3	207.6	185.8
ALCOA	169.0	174.0	136.0
Huntsman International LLC	145.0	151.0	123.0
Eastman Chemical Co.	137.0	145.0	116.0
Air Products & Chemicals	110.3	116.7	89.6

Source: Battelle/R&D Magazine/Company information; (e) = estimated

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Chemical Industry: \$4 TRIL revenue,
research is about \$30 BIL (\$10BIL in US)
Petroleum is much lower

Compare to:

Semiconductor industry: \$300 BIL revenue
research is about \$53 BIL

[http://electroiq.com/blog/2013/02/
semiconductor-rand-spending-rises-7percent-
despite-weak-market/](http://electroiq.com/blog/2013/02/semiconductor-rand-spending-rises-7percent-despite-weak-market/)

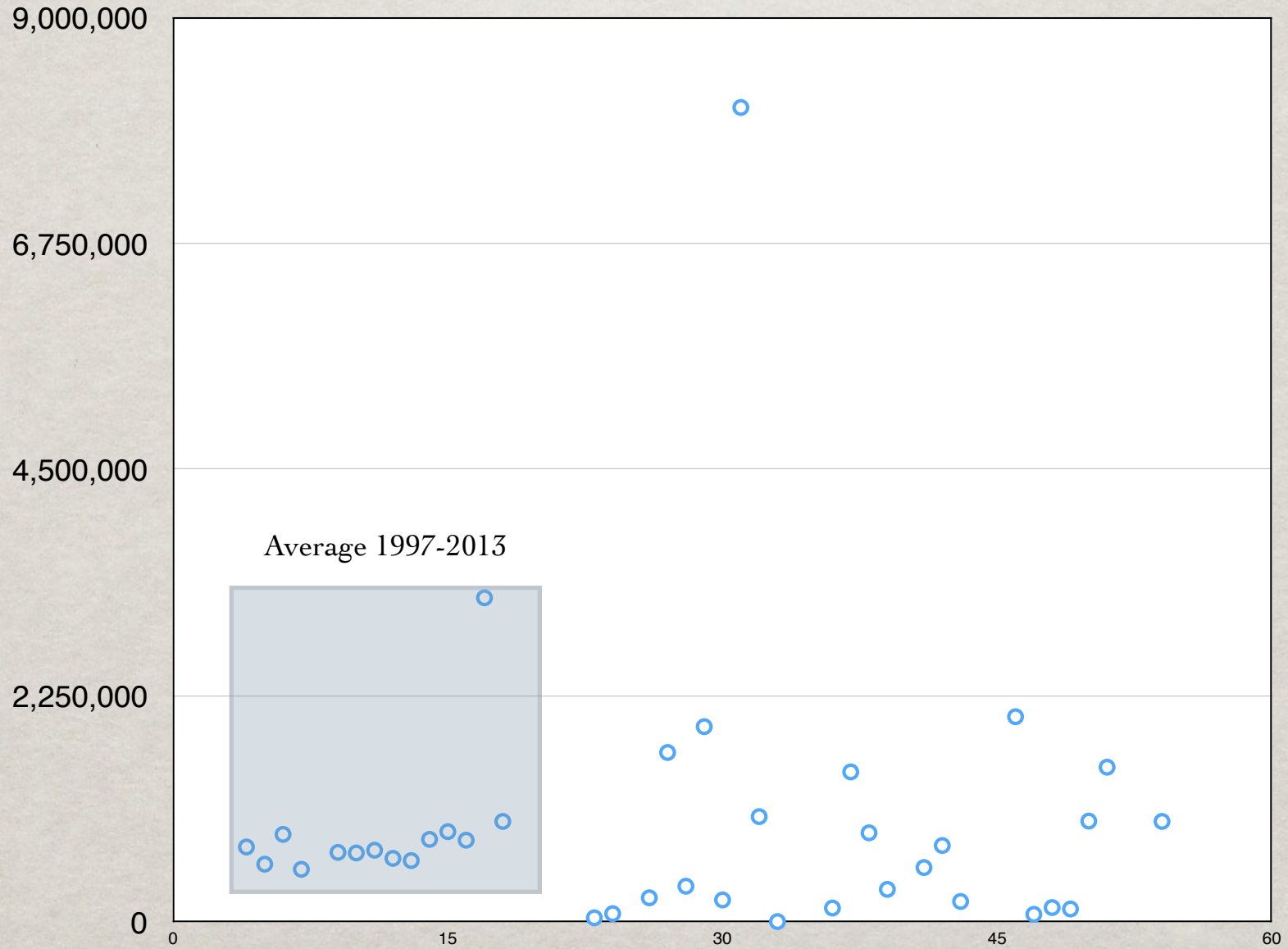
CHEMICAL R&D



<http://www.rdmag.com/articles/2011/12/2012-global-r-d-funding-forecast-industrial-r-d—chemicals-materials>

INDUSTRIAL \$\$

Industrial Funding



TOTAL \$\$/FACULTY

