

# Ratings and Rankings: The Role of Diversity and Its Measures

Eric W. Kaler Stony Brook University



# The NRC Assessment of Doctoral Programs - 2010

#### Committee on an Assessment of Research-Doctorate Programs

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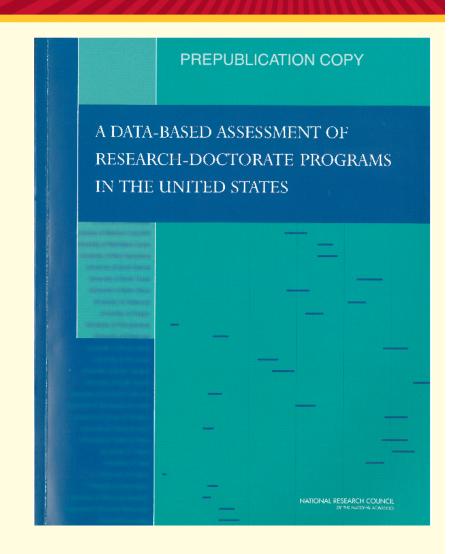
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Staff

Charlotte V. Kuh, Study Director

http://www.nap.edu/catalog/12850.html





#### Goal:

- -To provide data that will permit doctoral programs to compare themselves to other similar programs and, where possible, provide data that can be used to improve their current practices
- Also provide accessible data about program characteristics that will be of interest to students considering doctoral study



# A Substantial Study

- Data collected for 62 fields (59 rated)
- Over 5000 doctoral programs
- 221 institutions
- > 87,000 faculty questionnaires answered
- Academic year roster 2005-06





#### Based on Faculty Values Elicited in Two Ways

- Directly: Through asking faculty to choose the most important program characteristics from a list of 20. (Question G on the Faculty Questionnaire.) This is called the S method (for survey).
- 2. Statistically: Through asking a sample of faculty to rate a sample of programs in their field and then relating those ratings to the 20 characteristics. This is called the R method (for regression).



- Category I Program Faculty Quality
  - Number of publications per faculty member
  - Number of citations per faculty member
  - Receipt of extramural grants for research
  - Involvement in interdisciplinary work
  - Racial and ethnic diversity of the program faculty
  - Gender diversity of the program faculty
  - Reception of work by peers (honors and awards)



- Category II Student Characteristics
  - Median GRE scores of entering students
  - Percentage of students receiving full financial support
  - Percentage of students with portable fellowships
  - Racial and ethnic diversity of the student population
  - Gender diversity of the student population
  - A high percentage of international students



- Category III Program Characteristics
  - Average number of Ph.D.s granted over the past five years
  - Percentage of entering students who complete a doctoral degree
  - Time to degree
  - Placement of students after graduation
  - Percentage of students with individual workspace
  - Percentage of health insurance premiums covered institutionally
  - Number of student support activities provided



- Note five of these characteristics relate directly to diversity and are used in the separate Diversity Analysis
  - Racial and ethnic diversity of the program faculty
  - Gender diversity of the program faculty
  - Racial and ethnic diversity of the student population
  - Gender diversity of the student population
  - A high percentage of international students



#### Some Details

- Faculty members who served in more than one program were allocated to those programs based on whether they were core in the program and the share of that program of total dissertations supervised
- Publications per Allocated Faculty, 2001-2006 (going back to 1986 for faculty in humanities fields)
- Average Citations per Publication (citations in 2001-2006 to articles dating back to 1981, for all fields except the humanities)
- Average GRE, 2004-2006 (Verbal measure for the humanities, Quantitative measure for all other fields)
- Percent students receiving full support in the first year (fall, 2006)
- Percent first year students with external funding, 2006





- Both Survey (S) and Regression (R) approaches result in weights that can be applied to the data supplied by your programs and to data that the NRC and NSF collected from your students and faculty
- Then ratings are calculated by the sum:

Rating = Sum (Weight x Program Value) over all 20 variables

- Ratings are then listed high to low and rankings assigned from 1 for the highest rated on down
- But...



# Sources of Uncertainty

- Statistical
  - Any weight (coefficient) has variability (a standard error) associated with it
- Measurement of the variables
  - Most variables are subject to year-to-year variation
- Choice of the raters
  - A different group of raters might have produced different ratings



### Method

Obtained 500 sets of weights by running 500 regressions, randomly choosing half of raters each time and varying the data values within a range determined by which data element it is.

We then arrange the results (ratings) with each set of combined weights in rank order and take the 5th and 95th percent cutoffs of these ratings. This gives us a RANGE OF RATINGS for each program so that 90% of the ratings are in that range.

The 5th and 95th ratings are then listed in order and rank assigned: 1 to the highest rating on down.

Thus each program has a range of rankings based on S and R



# **Example**

#### TABLE 1: Standardized Program Values and Range of Regression-Based (R) and Survey-Based (S) Coefficients

Institution Name: ARIZONA STATE UNIVERSITY

Program: Chemistry
Program ID: 20034881

(Col 1)	(Col 2)	(Col 3)	(Col 4)	(Col 5)		(Col 6)	(Col 7)		(Col 8)
		Program	Program Value	Regression-Ba					
Description	Variable	Value*	Standardized**	Minus 1 SD***	P	lus 1 SD***	Minus 1 SD***		Plus 1 SD***
Dublications per Allocated Equality	V1	0.000	0.040	0.005	to	0.444	0.447	to	0.450
Publications per Allocated Faculty	= =	2.389	-0.046	0.025	to	0.144	0.147	to	0.150
Cites per Publication	V2	3.701	1.536	0.060	to	0.090	0.126	to	0.129
Percent Faculty with Grants	V3	87.44%	0.672	0.075	to	0.105	0.164	to	0.166
Percent Faculty Interdisciplinary	V4	0%	-0.910	0.018	to	0.068	0.033	to	0.036
Percent Non-Asian Minority Faculty	V5	6.67%	0.518	-0.001	to	0.043	0.007	to	0.008
Percent Female Faculty	V6	17.39%	0.459	-0.046	to	-0.007	0.012	to	0.013
Awards per Allocated Faculty	V7	0	-0.459	0.044	to	0.091	0.082	to	0.085
Average GRE-Q	V8	720	0.071	-0.004	to	0.042	0.067	to	0.069
Percent 1st yr. Students with Full Support	V9	100.00%	0.296	0.053	to	0.089	0.054	to	0.056
Percent 1st yr. Students with External Funding	V10	0%	-0.403	-0.039	to	-0.005	0.044	to	0.046
Percent Non-Asian Minority Students	V11	9.21%	-0.150	-0.047	to	-0.012	0.016	to	0.017
Percent Female Students	V12	38.10%	-0.119	-0.023	to	0.013	0.017	to	0.018
Percent International Students	V13	35.71%	-0.506	-0.059	to	-0.033	0.007	to	0.008
Average PhDs 2002 to 2006	V14	13.8	0.215	0.100	to	0.161	0.039	to	0.040
Percent Completing within 6 Years	V15	54.16%	0.320	-0.025	to	0.011	0.046	to	0.047
Time to Degree Full and Part Time	V16	4.80	-0.750	-0.008	to	0.022	-0.025	to	-0.024
Percent Students in Academic Positions	V17	9.26%	-1.112	-0.028	to	0.034	0.067	to	0.069
Student Work Space	V18	1	1.000	0.014	to	0.058	0.006	to	0.006
Health Insurance	V19	1	1.000	0.034	to	0.068	0.004	to	0.004
Number of Student Activities Offered	V20	18	1.021	0.078	to	0.111	0.023	to	0.024

<sup>\*</sup> Col 3 shows data submitted by the program or calculated from these data.

<sup>\*\*</sup> Col 4 shows the standardized program value across all program values in the field, with mean of 0 and variance of 1.

<sup>\*\*\*</sup> Col 5 shows Minus 1 Standard Deviation from the Mean for the regression-based coefficients for the field as a whole

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Program:
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ARIZONA STATE UNIVERSITY
Chemistry
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These are specific to the program - standardized to mean 0 and standard deviation 1

									-
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## Weights tell us what is valued

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## Similar for all Fields

TABLE 5-1 Most Highly Rated Characteristics of Doctoral Programs on R and S Measures

			Biological and		Physical and Mathematical	Social and Behavioral	
Characteristic	Measure Type	Agricultural Sciences		Engineering	Sciences	Sciences	Humanities
Publications per allocated faculty	R S	1.83 1.17	5.77 1.85	 1.38	6.33 1.78	 1.00	7.50 1.00
Cites per publication	R S	4.00	4.23 3.69	7.25 3.00	5.44 2.44	7.90 2.40	n.a. n.a.
Percentage of faculty with grants	R S	1.83	 1.15	 1.63	 1.78	 3.20	
Percentage of interdisciplinary faculty	R S	 5.67					 4.58
Awards per allocated faculty	R S		6.62	4.88 4.50	4.44 4.44	3.60 5.10	4.25 3.08
Average GRE (GRE-V for the humanities, GRE-Q otherwise)	R S	7.17	6.54 5.00	4.13 	6.89 	3.70 	3.33
Percentage of first-year students with full support	R S			 			 4.75
Average number of Ph.D.'s, 2002–2006	R S	1.17	3.31 	1.00	2.44	4.70 	5.58
Percentage of students in academic positions	R S	3.17	 4.23	 5.25	 4.89	 4.20	6.08 2.92
Health insurance	R S	4.33					
Number of student activities offered	R S	6.17		7.12 		8.80 	

Lowest values are most important

Note: Number shown is average rank of the characteristic taken across the disciplines in the broad field. The five categories given the highest rankings are shown for each field. "---" indicates the characteristic was not one of the top five for the field. "n.a." indicates not collected; GRE-Q = GRE-Quantitative Reasoning; GRE-V = GRE-Verbal.



# Significant - S

TABLE 5-1 Most Highly Rated Characteristics of Doctoral Programs on R and S Measures										
Characteristic	Measure Type	Agricultura	l Sciences	Biological and Health Sciences	Engineering	Physical and Mathematical Sciences	Social and Behavioral Sciences	Humanities		
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Cites per publication	R S		4.00	4.23 3.69	7.25 3.00	5.44 2.44	7.90 2.40	n.a. n.a.		
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# Significant - R

TABLE 5-1 Most Highly Rated Characteristics of Doctoral Programs on R and S Measures										
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# **Diversity?**

caregories mas to equal ros.

The five characteristics given the highest rating on each measure are shown in Table 5-1. Specifically, it shows the average ranking of the characteristic in the field across all 20 measures.<sup>2</sup> This table makes the differences in the two rating methods clear. On the general survey (S measure) in all fields, the publication measure was very important. It was less important in the regression-based R measure, where for all fields size, as measured by the average number of Ph.D.'s was important. The percentage of faculty with grants was highly ranked on the S measure in all fields but the humanities. Awards per allocated faculty, a measure that may reflect reputation, was important in all fields but the agricultural sciences, and it was highly ranked for both the R and S measures in three of the five broad fields. None of the diversity measures appeared to be important in either methodology. GRE scores were important for R measures, but not for S measures, while placement of students in academic positions was important for S measures, but not for R measures.



# Diversity?

caregories mas to equal 100.

The five characteristics given the highest rating on each measure are shown in Table 5-1. Specifically, it shows the average ranking of the characteristic in the field across all 20 measures.<sup>2</sup> This table makes the differences in the two rating methods clear.

# "None of the diversity measures appeared to be important in either methodology."

Awards per allocated faculty, a measure that may reflect reputation, was important in all fields but the agricultural sciences, and it was highly ranked for both the R and S measures in three of the five broad fields. None of the diversity measures appeared to be important in either methodology. GRE scores were important for R measures, but not for S measures, while placement of students in academic positions was important for S measures, but not for R measures.



# **Diversity Dimensional Study**

The diversity questions were taken separately and faculty views analyzed (re-normed so that the weights add to 1.0)

- -Racial and ethnic diversity of the program faculty
- -Gender diversity of the program faculty
- -Racial and ethnic diversity of the student population
- -Gender diversity of the student population
- -A high percentage of international students



### Results

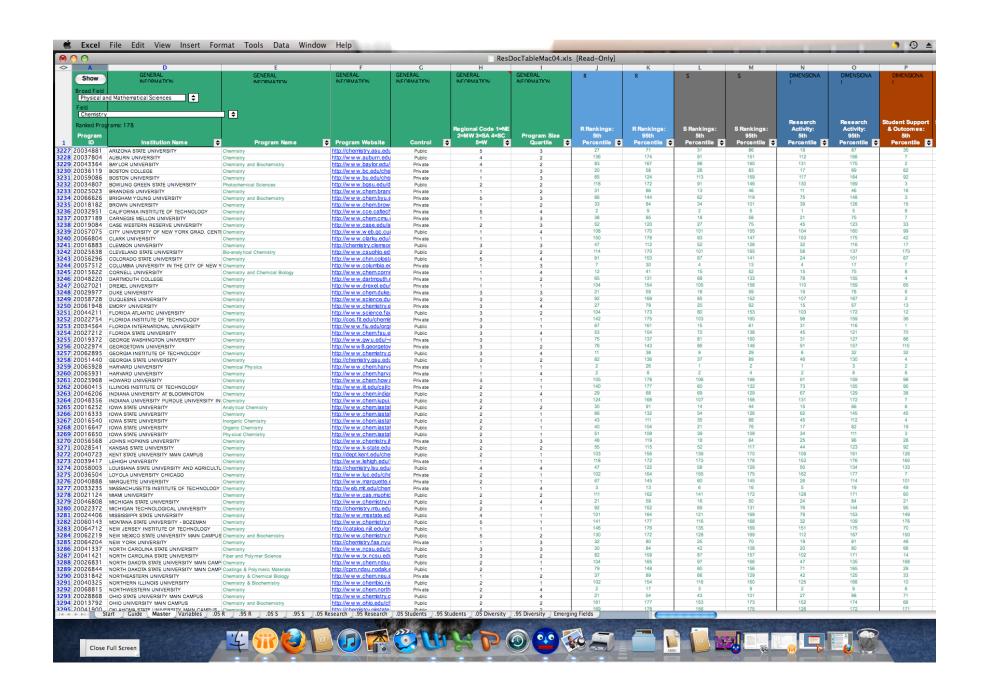
TABLE 5-2C Average Faculty Importance Weights on Components of the Diversity Dimensional									
Measure									
			Non-						
	Non-Asian		Asian						
	Minority	Female	Minority	Female	International				
Broad Field	Faculty	Faculty	Students	Students	Students				
Agricultural sciences	0.101	0.124	0.348	0.231	0.196				
Biological and health sciences	0.115	0.173	0.362	0.235	0.115				
Physical and mathematical	0.059	0.144	0.200	0.318	0.279				
sciences									
Engineering	0.083	0.107	0.281	0.295	0.234				
Social and behavioral sciences	0.156	0.150	0.298	0.166	0.230				
Humanities	0.172	0.212	0.212	0.192	0.213				

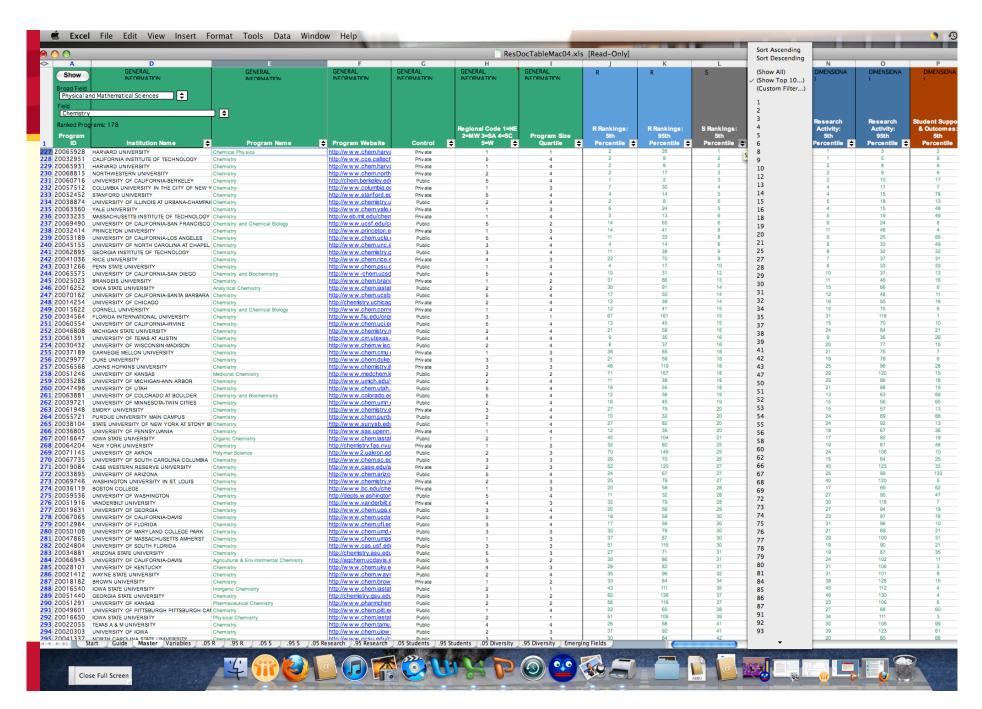
Science: highest value female students, international students Biology and Health Science: minority students, female students Engineering: female students, minority students

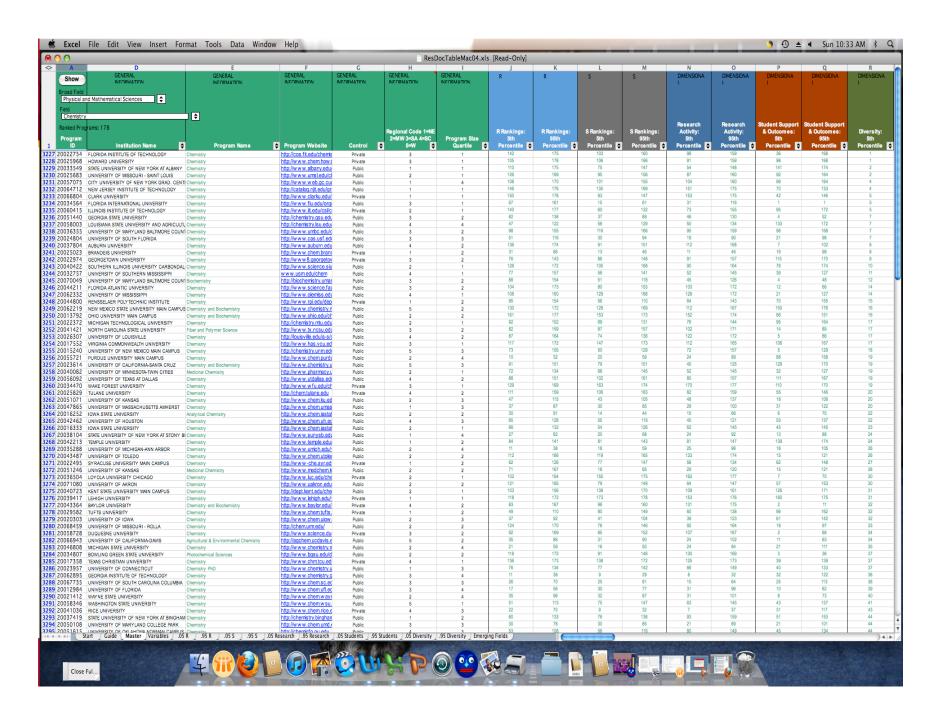


# Program by Program Results

- Down load the spreadsheet (34MB)
  - http://www.nap.edu/rdp/
- And sort as you like









# **Top Programs**

#### **Diversity Measures**

HOWARD UNIVERSITY

FLORIDA INSTITUTE OF TECHNOLOGY

STATE UNIVERSITY OF NEW YORK AT ALBANY

UNIVERSITY OF MISSOURI - SAINT LOUIS

CITY UNIVERSITY OF NEW YORK GRAD. CENTER

NEW JERSEY INSTITUTE OF TECHNOLOGY

FLORIDA INTERNATIONAL UNIVERSITY

ILLINOIS INSTITUTE OF TECHNOLOGY

**CLARK UNIVERSITY** 

LOUISIANA STATE UNIVERSITY

UNIVERSITY OF SOUTH FLORIDA

GEORGIA STATE UNIVERSITY

UNIVERSITY OF MARYLAND BALTIMORE COUNTY

**BRANDEIS UNIVERSITY** 

GEORGETOWN UNIVERSITY

AUBURN UNIVERSITY

SOUTHERN ILLINOIS UNIVERSITY CARBONDALE

#### S at 5%

HARVARD UNIVERSITY

CALIFORNIA INSTITUTE OF TECHNOLOGY

HARVARD UNIVERSITY

UNIVERSITY OF CALIFORNIA-BERKELEY

NORTHWESTERN UNIVERSITY

COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK

YALE UNIVERSITY

STANFORD UNIVERSITY

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

UNIVERSITY OF CALIFORNIA-SAN FRANCISCO

UNIVERSITY OF CALIFORNIA-LOS ANGELES

UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL

PRINCETON UNIVERSITY

GEORGIA INSTITUTE OF TECHNOLOGY

RICE UNIVERSITY

PENN STATE UNIVERSITY





"Well, I see my time is about up. . . "