SERU PROJECT TECHNICAL REPORT

No Evidence of Substantive Nonresponse Bias for the 2011 Administration
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The current nonresponse bias analysis of the 2011 SERU survey data focused on the data from one campus that attained a two-thirds response rate because it presented an opportunity to investigate whether there were response patterns extending beyond more typical response rates of 30% to 40%. Consistent with prior reports[1,2], the nonresponse bias analysis applied both traditional and response resistance techniques to the principal components factor scores of the 2011 SERU/UCUES survey employing a standard of practical significance based on effect-size statistics. While there were participation rate differences, especially by grade point average, those and other student characteristics were either not associated with group differences or were found to have differences that did not exceed a small effect size threshold. However, there were unexpected trends over time in cumulative academic engagement values, some of which were contrary to popular opinion. In particular, both students who were more engaged with studies and more engaged with nonacademic activities were more likely to participate late in data collection.

The exceptional nearly two-thirds response rate obtained by a SERU Consortium member presented an unusual opportunity to consider typical nonresponse bias statistics with a more robust database and to examine the relative characteristics of students responding after the point where most analysts have stopped sending invitations, maybe 30%-40%. What if a campus with a 30% rate were to continue to solicit students and somehow attain a 60% rate? Would that campus reach different students or just more of the same?

This study of the 2011 administration focused on principal component scores based on the 2008 and 2009 SERU administrations[3]. The first analysis is a traditional nonresponse examination where the response rates of various groups are compared to determine if the responding students represent the larger student body. For example, if the response rate was about 40%, then we would assume that any subgroup (e.g., males, Asians, high grade point average students) would have also responded at a 40% rate. Extending this reasoning, the demographic profile of responding students should mirror the profile of all students.

Table 1 displays response rates for nine demographic distributions including: grade point average, SAT scores, gender, entry from high school or other college, class level, race/ethnicity, area of major (CIP), residency and financial independence. Response rate for the subgroup is shown in the first column. The next column presents the difference between the observed rate

[1] Chatman, S.P. (2007). *Overview of the University of California Undergraduate Experience Survey (UCUES) Response Rates and Bias Issues.* JAD 5.11.07, Center for Studies in Higher Education, Berkeley, CA.

[2] Chatman, S.P. (2009). *Measures of Nonresponse Bias Associated with the 2008 Administration of the University of California Undergraduate Experience Survey.* June, 2009, Center for Studies in Higher Education, Berkeley, CA.

[3] Chatman, S.P. (2009). Factor Structure and Reliability of the 2008 and 2009 SERU/UCUES Questionnaire Core, Center for Studies in Higher Education, Berkeley, CA.

and the overall response rate with differences greater than 5% shifted left (negative) and right (positive) for ease in recognition. The last column is a Chi-Square statistic and Cramer's V statistic. This report will use an effect-size measure, Cramer's V statistic, exceeding 0.1 as a substantive result[4].

Table 1 results call attention to seven instances where subgroup response rates differed more than 5% from the overall rate. Instances of deviation in response rate were typically small:
- Grade point average, where students with higher grade point averages (in the top two quintiles), responded at higher rates and those in the bottom quintile responded at a lower rate.
- SAT total score where students in the top two quintiles responded at higher rates and those in the bottom quintile responded at a lower rate.
- Matriculation status where transfer students responded at a lower rate.
- Class level with sophomores and juniors responding at higher rates and senior students responded at a lower rate.
- Underrepresented minority students responded at a lower rate.
- African American and international students responded at lower rates.

There was one larger difference of moderate size.
- Students in the social sciences, engineering, and education responded at higher rates and those in agriculture, fine arts, architecture, humanities, and health sciences responded at lower rates. These differences were likely do to special efforts made by deans and chairpersons in some colleges.

Differences in response rates by demographic and academic categories have been found in the previous studies of the SERU Project and are common in other survey projects. Recognition of the differences is often where nonresponse bias analysis concludes with admonitions to be cautious when using the results. Instead, this study asks the simple question whether those differences matter. For example, if an analyst is concerned with student satisfaction and is using the first principal component factor score mean, does it matter that students with higher grades responded at higher rates? It certainly might matter because they might be more satisfied and skew the distribution so that the mean was higher than would be true if all groups responded at comparable rates.

Subgroups responding at different rates would be important if the mean scores of subgroups differed and would be unimportant otherwise. Table 2 presents the results of a test of subgroup differences, analysis of variance, and relies on variance explained to identify important differences. There were only three cases where 5% or more of the variance in overall mean score was explained by subgroup differences: area of major (CIP) for the Quantitative Professions factor, area of major (CIP) for time spent on academic matters (Academic Time), and student class level for Gains in Self-Assessment of Skills (Non-quantitative). The differences can be easily explained and were not surprising. So, in these and in the other cases, how much did response rate and subgroup differences affect the overall statistics?

Table 3 displays the difference between the mean of each principal component factor score as computed from the respondents and from a distribution weighted by the proportions in the population. In other words and continuing with the above example, a composite mean was created that counted the responses of students with higher response rates less and responses by students with lower response rates more. The largest difference between the observed mean and weighted mean was 0.07. That is less much less than the one tenth of a standard deviation (0.20) standard that constitutes a small but significant difference using effect size. In sum, the differences in response rates observed for subgroups had no appreciable effect on the overall mean value.

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[4] Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (second ed.). Lawrence Erlbaum Associates.

Table 4 addresses the possibility that subgroups of students participated at different rates over the collection period and that some are more or less likely to respond early or late. That might be important to an analyst deciding whether to close data collection or send additional invitations. Table 3 does not address whether subgroups responded at lower overall response rates. Instead it establishes response-time deciles (e.g., first-tenth responding, second-tenth responding) and distributes the subgroups based on the deciles. Ideally, 10% of each subgroup should respond in each decile. For example, students with at least one parent with a bachelor's degree or higher were more likely to respond in the last 10%, 13% of them responded during the time period of the final 10% of all respondents. The table also displays cumulative distributions to illustrate the composition at various stages of collection. For example, the 0%-50% column shows the proportion of the subgroup that responded by the 50% point for the overall population. In this case, 50% is about a 30% response rate. For example, by the 50% point, only 41% of the responding students in the bottom quintile had participated. Students in the bottom quintile were more likely to respond in the second half of data collection. The overall difference in response rates by low GPA quintile students was ameliorated during the second half of data collection. Subgroups more likely to respond in the second half of collection (>55% in second half) included: fine arts majors, architecture majors, bottom quintile GPA students, African-American students, and International students. If it were important to the analyst to have robust information about African-American students, then the analyst should push for higher response rates than are typically achieved.

To this point, the paper has examined nonresponse bias as differences in proportional representation among respondents, whether responses by those groups differed, the extent to which the overall mean was affected by participation and mean groups differences, and whether subgroups were more or less likely to respond early or late in data collection. There has been no evidence that participation rates and group differences appreciably affected mean statistics but there has been evidence that groups of high institutional interest: international students, African-American students, students with low GPAs and students in several majors were more likely to respond late in data collection. In sum, there has been good reason to push to achieve higher response rates but no cause for concern about differences in participation rates and group differences.

The final series of analyses examine whether cumulative statistics change over the collection period. Do early responders differ from later responders about the construct being measured? For example, were earlier respondents in this study more satisfied with their experience as undergraduates than later respondents? Would the results have been appreciably changed if data collection had stopped earlier? The presumption of most analysts using survey data is that there is no change over time. That once a reasonably large number of students have responded (e.g., 300, 1,000) then additional responses would have little effect on the cumulative value. From the results in Table 2, it is known that differences in response speed decile group means did not explain much variation in the overall factor scores, but the issue is more completely addressed by tracking cumulative values across the collection period. The result of that analysis is displayed in nine figures using the factor name as the title.

The plot of Factor 1: Satisfaction with Educational Experience cumulative value is a good example of an expected outcome. The initial responses were low, confirming the conventional wisdom that dissatisfied students respond quickly, but subsequent responses quickly moved the mean value well within the same interval as the final cumulative value by the 500th response. For this distribution, a good estimate of the final mean value was established with about two percent of responses. Except for the very first responses, tendency to respond early or late was not associated with Satisfaction with Educational Experience. The same lack of trend over time was observed for all but two principal components: Engagement with Studies and Academic Disengagement. Focusing first on instances of no significant trend over time, there were no differences associated with Satisfaction with Education Experience (previously noted), Current Skills Self-Assessment, Gains in Self-Assessment of Skills, Development of Scholarship, Campus Climate for Diversity, Quantitative Professions, or Academic Time (time studying and in class). Data collection could have been stopped very early without changing the overall mean values of these factor scores. In other words, response rates much lower than two-thirds would have been adequate to make reasonably accurate estimates of the final values.

It was surprising to find that engagement with academic activities and engagement with activities that are not academic showed trends. It is also important to note that these factor scores are uncorrelated. The first measure, academic engagement, is comprised of items that measure academic involvement, research or creative projects experience, and collaborative work. The

items include: frequency of working on projects with classmates, seeking help from instructor when needed, taken small research-oriented seminar, communicate with faculty outside class, interacting with faculty during class, contributed in class, brought up ideas from other classes, asked insightful questions, made a class presentation, took research courses, etc. In sum, these are items that measure the type of engaged student that that many disciplines, especially social sciences and humanities, promote. When joined with Factor 5, Development of Scholarship, they are also the types of activities that are the hallmark of NSSE benchmark scores. The fact that these scores continue to increase over time should encourage campuses to reach much higher response rates to raise benchmark scores.

The second cumulative factor score that moved substantially from early to late responders was Academic Disengagement. Note that this scale has been inverted so that going higher would be considered academically better by campuses. Unfortunately, the use of "disengagement" in the title for an inverted scale has resulted in confusion and the 2011 factor score revisions will propose that the scale not be inverted. Until then, rely on the fact that the higher is better from the university's academic perspective. Items that comprise this scale include: frequency of being late on assignments, being unprepared for class, skipping class, not doing reading, choosing an easy major; and more time attending movies, concerts, sports, student clubs, recreational sports, socializing with friends, partying, using the computer for non-academic purposes, partying, etc. In sum, a higher score on this factor reflects a student that is actually less disengaged with academic matters. An increasing trend is more academically desirable on the inverted scale. The Academic Disengagement factor trend very clearly shows a declining trend. On the inverted scale, this means that students late in data collection were spending MORE time in nonacademic areas and were LESS prepared for class.

Any substantive long-term trending in principal component factor scores is noteworthy and of some concern to campus researchers. The two scores showing trends here suggest conflicting outcomes, more engaged on one and less engaged on another, but these factor scores are not correlated. The correlation for the 2010 administration was actually -0.0018 (n about 100,000) It is important to examine these scores in the context of other scores, like Development of Scholarship, and as associated with demographic scores.

Table 4 reported that students with lower grade point averages were more likely to respond late as were students with at least one parent with a bachelor's degree, fine arts students, under-represented minority students, African American students, Asian and Pacific Islander students, international students, and financially independent students. The sum of these scores and characteristics fails to describe an obvious and compelling explanation. This is an area about which more research is needed, especially because of the relationship to measures of accountability. Based on the cumulative body of SERU research, area of academic major is very likely an intervening variable.

Table 1: Traditional and Less Common Nonresponse Bias Demographics

	Response Rate	Difference from Overall Response Rate Low <5%	Middle 5%<x>5%	High >5%	Chi Square / Cramer's V Strength of Association
Campus					
Overall	65%		0%		
GPA (Above or below campus median)					**0.17** Small
Top Quintile	75%			10%	
2nd Quintile	71%			5%	
3rd Quintile	66%		1%		
4th Quintile	62%		-3%		
Bottom Quintile	52%	-14%			
SAT Total					**0.11** Small
Top Quintile	72%			7%	
2nd Quintile	72%			7%	
3rd Quintile	70%		4%		
4th Quintile	68%		3%		
Bottom Quintile	58%	-7%			
Sex					**0.06** Inconsequential
Female	68%		3%		
Male	62%		-3%		
Matriculation Status					**0.10** Small
Matriculant from High School	68%		2%		
Transfer Student	56%	-10%			
Academic Area of Major					**0.29** Medium
Social Sciences	71%			6%	
Agriculture	45%	-20%			
Fine Arts	56%	-9%			
Humanities	49%	-16%			
Architecture	49%	-17%			
Science and Mathematics	81%			15%	
Engineering	68%		3%		
Business	66%		0%		
Education	86%			21%	
Health Sciences	31%	-35%			
Class Level					**0.17** Small
Freshman	68%		3%		
Sophomore	75%			9%	
Junior	72%			7%	
Senior	57%	-9%			
Resident for Fee Purposes					**0.05** Inconsequential
Yes	66%		0%		
No	53%	-13%			
Financially Independent Student					**0.08** Inconsequential
Yes	54%	-12%			
English Plus Another Language	66%		1%		
Race/Ethnicity					**0.10** Small
Underrepresented Minority	58%	-8%			
White and Asian	69%		3%		
					0.14 Small
American Indian/Alaskan Native	64%		-1%		
Black/African American	50%	-15%			
Chicano/Mexican-American	62%		-3%		
Asian/Pacific Islander	61%		-5%		
White/Caucasian	70%		4%		
International	49%	-16%			
Unknown	66%		0%		
Summary			**65%**		

.1-.23 Small
.24-.36 Medium
.37 up Large
Jacob Cohen (1988). *Statistical Power Analysis for the Behavioral Sciences* (second ed.). Lawrence Erlbaum Associates.

Table 2: Analysis of Variance R-Square (Variance by Group Differences)

	Levels	F1	F2	F3	F4	F5	F6	F7	F8	Ftb	Mean
CIP Group	10	0.01	0.02	0.04	0.01	0.01	0.00	0.01	**0.14**	**0.08**	0.04
GPA Group	5	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
SAT Group	5	0.00	0.00	0.01	0.03	0.01	0.00	0.00	0.00	0.00	0.01
URM (without international)	2	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Ethnic Group (with international)	7	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00
Class Level	4	0.00	0.02	0.04	**0.06**	0.01	0.00	0.00	0.01	0.00	0.02
Matriculation	2	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
Resident	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gender	2	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.02	0.00	0.01
Independent Student	2	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
Speed of Response	10	0.00	0.00	0.01	0.00	0.00	0.00	0.02	0.01	0.00	0.00
Mean		0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.02	0.01	0.01

Factor 1: Satisfaction with Educational Experience
Factor 2: Current Skills Self-Assessment (Nonquantitative)
Factor 3: Engagement with Studies
Factor 4: Gains in Self-Assessment of Skills (Nonquantitative)
Factor 5: Development of Scholarship
Factor 6: Campus Climate for Diversity
Factor 7: Academic Disengagement (Inverted Scale)
Factor 8: Quantitative Professions
Subfactor Tb: Academic Time

Table 3: Effect on Overall Mean Caused by Distribution Differences

	Levels	F1	F2	F3	F4	F5	F6	F7	F8	Ftb
CIP Group	10	0.01	0.01	0.03	0.01	0.00	-0.01	-0.02	-0.04	-0.01
GPA Group	5	-0.03	0.00	-0.01	0.00	-0.01	0.00	-0.02	-0.01	**-0.07**
SAT Group	5	0.00	-0.01	0.02	0.02	0.01	0.00	0.01	0.00	0.01
URM (without international)	2	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
Ethnic Group (with international)	7	-0.01	0.00	0.01	0.01	0.00	-0.01	0.00	0.00	0.00
Class Level	4	0.01	0.03	0.04	0.05	0.02	-0.01	0.00	-0.01	0.01
Matriculation	2	0.01	0.00	0.01	-0.01	0.01	0.00	0.02	-0.01	0.00
Resident	2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gender	2	0.00	-0.01	0.00	0.00	-0.01	0.00	-0.01	0.01	0.00
Independent Student	2	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00

Factor 1: Satisfaction with Educational Experience
Factor 2: Current Skills Self-Assessment (Nonquantitative)
Factor 3: Engagement with Studies
Factor 4: Gains in Self-Assessment of Skills (Nonquantitative)
Factor 5: Development of Scholarship
Factor 6: Campus Climate for Diversity
Factor 7: Academic Disengagement (Inverted Scale)
Factor 8: Quantitative Professions
Subfactor Tb: Academic Time

Table 4: Group Composition Patterns of Participation

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	Cramer's V	01-10	01-20	01-30	01-40	01-50	01-60	01-70	01-80	01-90
															Cumulative Distribution Percentages					
First Generation Bachelors																				
Yes	10%	11%	11%	11%	10%	11%	9%	9%	10%	8%	0.10	10%	21%	31%	42%	**53%**	63%	73%	82%	92%
No	10%	9%	9%	9%	10%	9%	11%	11%	10%	13%		10%	19%	29%	38%	**47%**	56%	67%	78%	87%
Area of Major																				
Social Sciences	11%	10%	10%	9%	10%	10%	11%	9%	10%	10%	0.05	11%	21%	31%	40%	**50%**	60%	71%	80%	90%
Agriculture	9%	9%	8%	11%	10%	9%	11%	12%	10%	11%		9%	18%	26%	37%	**47%**	55%	67%	78%	89%
Fine Arts	9%	7%	7%	8%	13%	11%	12%	10%	10%	13%		9%	16%	23%	31%	**44%**	55%	67%	77%	87%
Humanities	13%	9%	10%	8%	10%	10%	13%	9%	7%	11%		13%	22%	32%	40%	**50%**	59%	73%	82%	89%
Architecture	9%	10%	9%	8%	9%	9%	7%	15%	14%	11%		9%	18%	27%	34%	**43%**	52%	60%	75%	89%
Science and Math	10%	11%	11%	10%	9%	11%	10%	9%	9%	9%		10%	21%	32%	42%	**52%**	63%	73%	82%	91%
Engineering	8%	10%	9%	10%	10%	10%	8%	12%	11%	11%		8%	18%	28%	38%	**48%**	58%	66%	78%	89%
Business	9%	10%	9%	11%	10%	9%	8%	11%	13%	10%		9%	19%	28%	39%	**49%**	59%	67%	78%	90%
Education	12%	13%	20%	14%	11%	9%	4%	5%	6%	5%		12%	25%	46%	60%	**71%**	80%	84%	89%	95%
Health Sciences	8%	7%	11%	13%	12%	10%	11%	8%	9%	11%		8%	15%	27%	40%	**51%**	61%	72%	81%	89%
Grade Point Average																				
Bottom Quintile	7%	8%	8%	8%	9%	10%	12%	12%	11%	14%	0.07	7%	16%	24%	32%	**41%**	51%	63%	74%	86%
2nd	8%	9%	8%	9%	11%	11%	11%	11%	11%	12%		8%	17%	25%	34%	**45%**	55%	66%	77%	88%
3rd	10%	10%	9%	10%	10%	10%	9%	11%	11%	10%		10%	20%	29%	40%	**49%**	60%	69%	79%	90%
4th	11%	11%	11%	11%	10%	10%	10%	9%	9%	8%		11%	22%	33%	43%	**53%**	63%	73%	82%	92%
Top Quintile	13%	12%	12%	11%	10%	9%	9%	9%	8%	8%		13%	24%	37%	48%	**58%**	67%	76%	84%	92%
SAT Total Score																				
Bottom Quintile	9%	10%	10%	9%	10%	9%	10%	10%	10%	12%	0.04	9%	19%	29%	38%	**48%**	57%	68%	78%	88%
2nd	9%	9%	11%	10%	10%	10%	10%	10%	11%	9%		9%	18%	29%	39%	**49%**	60%	70%	80%	91%
3rd	10%	10%	11%	11%	10%	10%	9%	10%	10%	10%		10%	19%	30%	41%	**51%**	61%	71%	80%	90%
4th	9%	10%	9%	11%	10%	11%	10%	10%	10%	9%		9%	19%	29%	40%	**50%**	60%	70%	80%	91%
Top Quintile	13%	11%	10%	10%	9%	10%	9%	10%	9%	9%		13%	24%	34%	44%	**53%**	63%	72%	82%	91%
Under-Represented Minority (US)																				
Yes	9%	10%	9%	9%	10%	9%	11%	11%	9%	13%	0.06	9%	19%	28%	37%	**47%**	56%	67%	78%	88%
No (Asian and White)	10%	10%	10%	10%	10%	10%	10%	10%	10%	9%		10%	20%	31%	41%	**51%**	61%	71%	81%	91%
Racial or Ethinic Group and International Students																				
American Indian	5%	15%	12%	13%	6%	9%	14%	8%	9%	9%	0.04	5%	19%	32%	45%	**51%**	60%	74%	82%	91%
African American	9%	9%	9%	8%	9%	9%	11%	12%	9%	15%		9%	18%	27%	34%	**44%**	52%	64%	76%	85%
Chicano-Latino	10%	10%	9%	10%	10%	9%	11%	10%	10%	11%		10%	19%	29%	38%	**49%**	58%	69%	79%	89%
Asian and Pacific Island	11%	9%	9%	9%	11%	9%	8%	11%	11%	13%		11%	20%	28%	37%	**48%**	57%	66%	76%	87%
White	10%	10%	11%	10%	10%	11%	10%	10%	10%	9%		10%	20%	31%	41%	**51%**	62%	72%	81%	91%
International	13%	9%	7%	8%	5%	5%	13%	13%	13%	14%		13%	22%	28%	36%	**41%**	47%	60%	72%	86%
Unknown	11%	9%	9%	12%	9%	12%	8%	10%	8%	10%		11%	20%	29%	41%	**51%**	63%	71%	82%	90%
Class Level																				
Freshman	9%	10%	12%	10%	11%	11%	9%	7%	12%	9%	0.06	9%	20%	31%	42%	**53%**	64%	72%	80%	91%
Sophomore	10%	11%	11%	12%	10%	11%	9%	8%	11%	8%		10%	21%	32%	43%	**53%**	65%	74%	81%	92%
Junior	10%	9%	10%	10%	10%	10%	9%	10%	11%	9%		10%	19%	30%	40%	**50%**	60%	70%	80%	91%
Senior	10%	10%	9%	9%	9%	9%	11%	11%	9%	12%		10%	20%	29%	38%	**47%**	56%	68%	79%	88%
Matriculation																				
Freshman	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	0.03	10%	20%	30%	41%	**51%**	61%	70%	80%	90%
Transfer	9%	10%	9%	9%	10%	10%	12%	11%	9%	11%		9%	19%	28%	37%	**47%**	57%	69%	80%	89%
Resident for Fees																				
No	9%	9%	7%	12%	11%	8%	12%	10%	11%	10%	0.03	9%	18%	26%	38%	**48%**	56%	68%	78%	90%
Yes	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%		10%	20%	30%	40%	**50%**	60%	70%	80%	90%
Gender																				
Female	12%	11%	11%	10%	10%	9%	10%	9%	8%	9%	0.12	12%	23%	34%	44%	**54%**	63%	74%	82%	91%
Male	7%	9%	9%	10%	10%	11%	10%	12%	12%	11%		7%	16%	25%	35%	**45%**	56%	65%	77%	89%
Financially Independent																				
No	11%	10%	10%	10%	10%	10%	10%	10%	9%	10%	0.05	11%	21%	31%	41%	**51%**	61%	71%	81%	90%
Yes	10%	11%	8%	9%	11%	10%	12%	8%	8%	13%		10%	20%	28%	37%	**48%**	58%	70%	78%	87%