



University of Pennsylvania  
**ScholarlyCommons**

---

Wharton Research Scholars

Wharton Undergraduate Research

---

5-5-2022

## Socioeconomic Status Bias in Higher Education

Shaila Lothe  
*University of Pennsylvania*

Follow this and additional works at: [https://repository.upenn.edu/wharton\\_research\\_scholars](https://repository.upenn.edu/wharton_research_scholars)



Part of the [Economics Commons](#)

---

Lothe, Shaila, "Socioeconomic Status Bias in Higher Education" (2022). *Wharton Research Scholars*. 227.  
[https://repository.upenn.edu/wharton\\_research\\_scholars/227](https://repository.upenn.edu/wharton_research_scholars/227)

This paper is posted at ScholarlyCommons. [https://repository.upenn.edu/wharton\\_research\\_scholars/227](https://repository.upenn.edu/wharton_research_scholars/227)  
For more information, please contact [repository@pobox.upenn.edu](mailto:repository@pobox.upenn.edu).

---

## Socioeconomic Status Bias in Higher Education

### Abstract

This study investigated bias towards students with low socioeconomic status (SES) in higher education. Current undergraduate students viewed hypothetical profiles of students with low, high, or no SES mentioned. Participants then rated the intelligence and future likelihood of success of each of the hypothetical students. The study found that students did not rate the low SES student as lower; in fact, ratings of all three groups were statistically indistinguishable. Furthermore, students with more leadership experiences on campus did not differ from those with less leadership experiences in their ratings. Possible explanations for the lack of statistical significance are discussed.

### Keywords

socioeconomic status, higher education, bias, class, education

### Disciplines

Economics

SOCIOECONOMIC STATUS BIAS IN HIGHER EDUCATION

By

Shaila Lothe

An Undergraduate Thesis submitted in fulfillment of the requirements for the  
WHARTON RESEARCH SCHOLARS

Faculty Advisor:

Judd Kessler

Associate Professor, Business Economics and Public Policy

THE WHARTON SCHOOL, UNIVERSITY OF PENNSYLVANIA

MAY 2022

## **ABSTRACT**

This study investigated bias towards students with low socioeconomic status (SES) in higher education. Current undergraduate students viewed hypothetical profiles of students with low, high, or no SES mentioned. Participants then rated the intelligence and future likelihood of success of each of the hypothetical students. The study found that students did not rate the low SES student as lower; in fact, ratings of all three groups were statistically indistinguishable. Furthermore, students with more leadership experiences on campus did not differ from those with less leadership experiences in their ratings. Possible explanations for the lack of statistical significance are discussed.

## INTRODUCTION

Socioeconomic status (SES) plays an important role in people's lives, from the opportunities they are afforded to the people with whom they spend time. People also hold biases surrounding SES, such as classism towards the disadvantaged and disdain towards the privileged. In higher education, research has shown that students with lower SES graduate at a lower rate than those with higher SES (Sewell and Shah, 1967). Similarly, a significant gap exists between the graduation rates of first-generation college students and non-first-generation students. First-generation status correlates strongly with low SES (Lohfink & Paulsen, 2005; Pascarella, Pierson, and Terenzini, 2004). A College Board study found that 44.9 percent of first-generation college students graduated, whereas 59 percent of non-first-generation students completed their degrees.

The current understanding of the graduation gap is muddled. One leading explanation is financial hardships (McCarron and Inkelas, 2006). First generation students worked more, became less involved in extracurricular activities, and completed fewer credits than non-first-generation students (Pascarella et al., 2004). Another possible explanation is institutional characteristics; low SES students self-select into schools with lower graduation rates (McCarron and Inkelas, 2006). Parental involvement is another explanation, as are demographic factors such as race (McCarron and Inkelas, 2006). Finally, emotional factors are also important (Wiggins, 2011), with low SES students having lower self-efficacy (McMurray and Sorrells, 2009).

This study explored SES bias in the elite college setting. Although studies have investigated bias in primary and secondary education, less research has focused on higher education. This experiment attempted to reveal a causal mechanism for the lower graduation rates of first-generation students.

More generally, the project attempted to demonstrate a potential driver of economic inequality. College education remains a highly effective way to achieve higher SES (Kelly, 2014). In the United States, it is perceived as a "great equalizer." If colleges themselves treat students unequally, this reputation is unwarranted.

This study is relevant to university professors, university administrators, and higher education policymakers as they try to lower the graduation gap. Additionally, low SES students themselves may find this study useful to understand how they are perceived at higher education institutions.

## **LITERATURE REVIEW**

### **Stereotypes**

Stereotypes affect how humans perceive the world. When we encounter an unfamiliar person, shortcuts are an efficient way to make decisions. Stereotypes exist about traits such as gender, race, age, national origin, and SES. However, stereotypes, while cognitively efficient, can lead to bias.

According to Bordalo et al. (2016), there are various theories of stereotypes. The economic approach to stereotypes theorizes that stereotypes are a manifestation of statistic discrimination in which the characteristics of a whole group are used to characterize an individual (Phelps 1972). The sociological approach states that stereotypes are a fundamentally incorrect reflection of the stereotyper's prejudices (Adorno et al. 1950). Finally, the social cognition approach states that stereotypes are special cases of cognitive schemas related to heuristics (Schneider, Hastorf, and Ellsworth 1979). This approach states that stereotypes amplify systematic differences between groups and that the assessment of a target group depends on the reference group (Bordalo et al. 2016).

## **Stereotypes About Low SES Students**

In line with the social cognition approach to stereotypes, students from low SES are underestimated. In their classic study, Darley and Gross (1983) found that perceived academic achievement was linked to SES. College students were shown a video of a girl with high or low SES. Then, participants were shown the same video of the girl taking an academic test and asked to rank her grade level. Results showed that participants estimated her grade level to be higher when she shown in a higher SES setting. More recently, the World Bank replicated this study among teachers in Peru (Farfan Bertran, Holla, and Vakis 2021). Teachers were shown a video of Diego in either a middle or low-income setting. Afterwards, teachers viewed a video of Diego taking a test. When results of the test were ambiguous, teachers rated middle-class Diego to be of a higher grade level than the low SES version of Diego.

Other studies have replicated SES bias among teachers and school counselors. As far as teachers, Tournaki (2003) found that teachers sometimes used irrelevant information to predict students' academics. Auwarter and Aruguete (2008a) found that teachers thought that low SES students had less-promising futures. This bias started early; Speybroeck et al. (2012) found that kindergarten teachers judged high SES kindergartners more favorably than low SES kindergartners. However, even though low SES students do perform worse than high SES students, Ready and Wright (2011) found that teachers underestimated low SES students more than the actual performance gap. As far as counselors, in a survey, Auwarter and Aruguete (2008b) found that counselors perceive students from low SES backgrounds as having less-promising futures and lower math abilities. Cole and Grothaus (2014) found that counselors held negative views and a lack of empathy towards low-income families using qualitative methods.

## **Elite College Setting**

While stereotypes about low SES students have been demonstrated among school-aged children, the elite university level is relatively explored. However, the elite university level varies from primary school in a few important ways. First, few low-income students attend college, especially elite colleges (Chetty et al. 2020). This winnowing of low-income students means that there are more high SES students at elite colleges than in the childhood neighborhoods of either low SES or high SES students (Chetty et al. 2020). Staff at elite universities are exposed to few low-income students. Additionally, middle class students have been shown to experience stereotype threat at elite universities (Johnson, Richeson, and Finkel 2011). These differences suggest more intense stereotypes toward low SES students.

## **Methods**

Darley and Gross (1983) showed a video of a girl, in which her face could not be seen. The girl was depicted in either a high SES environment or low SES environment. Afterwards, participants viewed the girl taking a test and filled out an evaluation form about her academic achievement, work habits, motivation, sociability, emotional maturity, and cognitive skill. Auwarter and Aruguete (2008a, 2008b) mailed questionnaires to counselors and teachers which included a written scenario of a student and questions about expectations for the student, the student's need for services, personal characteristics, math and language ability, and believability of the student. Cole and Grothaus (2014) conducted individual interviews and emailed reflective questions to counselors. Finally, both Speybroeck et al. (2012) and Ready and Wright (2011) used publicly available teacher evaluations.

Ways to indicate SES include high schools, zip codes, and parents' professions. High schools and zip codes reflect income segregation in the U.S. (Saporito 2017). In their



experiment, Auwarter and Aruguete (2008a, 2008b) varied student SES by varying students' parents' professions.

### **METHODS**

Data was gathered using a survey administered via the Wharton Behavioral Lab. The Wharton Behavioral Lab serves as a hub for human subjects research on Penn's campus. The link to sign up for the survey was sent to undergraduate Wharton Behavioral Lab participants.

Afterwards, the link was sent to students who signed up to participate. The survey took about 20 minutes to complete, and students received a \$3 Amazon gift card for their participation. The survey was administered in a remote format, rather than at the lab itself.

The first screen contained a consent form, which participants read and acknowledged (Appendix A). The second through sixth screens each contained a 250-word transcript of a hypothetical first-year student's meeting with an advisor. Each hypothetical student had a different field of study: computer science, economics, political science, Pre-Med (science), or Wharton (business). The hypothetical student's SES was either high, low, or not included. Class indicators for high SES included mentions of private school and high-earning parents. For low SES students, class indicators included mentions of work-study jobs, first generation status, and working-class parents. Afterwards, participants read six statements, three about the hypothetical student's intelligence and three about their potential to succeed. They then rated their agreement with the statements on a seven-point Likert scale. Each set of questions also contained one attention check. Appendix B contains each of the transcripts and surveys administered. The stimulus and survey methodology was used in the original Darley and Gross experiment.

After the five hypothetical scenarios, participants answered questions about their leadership on campus. The leadership experience was used to segment the participants into a high leadership group and a low leadership group. Exact details of the leadership experiences

were not collected; instead, participants selected pre-written descriptions that closely matched their experiences to minimize privacy concerns. Students reported the number of their leadership experiences that matched the pre-written descriptions. Appendix C contains the leadership questionnaire. On the final screen, participants were debriefed and completed the survey.

To reach sufficient statistical power, 76 responses that pass the attention checks were necessary. 113 current University of Pennsylvania undergraduates were recruited through the Wharton Behavioral Lab. After removing participants who failed at least one attention check, 97 participants remained in the data analysis. This study focused on the elite university environment. Therefore, current University of Pennsylvania undergraduates represented an ideal population to explore the research question. Current Penn undergraduates were hypothesized to hold the biases that this study attempted to uncover.

The hypothesis of this experiment was that in the low SES condition, the means of the two dependent variables would be significantly lower than in the high SES or no SES condition. Additionally, another hypothesis was that this bias would increase for participants in the higher leadership experience group. If elite universities are biased against students with lower SES, students who were more involved with the current system should have been more biased against SES than the average student.

## **RESULTS**

### **Dependent Variables**

Descriptive statistics of the dependent variables are presented below (Table 1). For each variable and major, the sum of the Likert responses to the three questions was calculated. Overall, each major appeared to have relatively similar perceptions of their intelligence and likelihood to succeed.

Variable	Major	Min.	Q1	Median	Mean	Q3	Max.
Intelligence	Computer Science	7	15	16	16.14	18	21
	Economics	5	14	16	15.66	18	21
	Political Science	10	15	17	16.41	18	21
	Pre-Med	9	15	18	16.71	18	21
	Wharton	3	14	15	15.47	18	21
Likelihood to Succeed	Computer Science	8	14	16	15.9	18	21
	Economics	7	14	16	15.71	18	21
	Political Science	8	15	18	16.86	18	21
	Pre-Med	8	14	17	16.23	18	21
	Wharton	3	15	18	16.85	18	21

Table 1. Descriptive statistics for intelligence and likelihood to succeed

Below is the distribution of intelligence and likelihood to succeed ratings by hypothetical student major. As shown, the distribution was similar for each major (Figure 1).

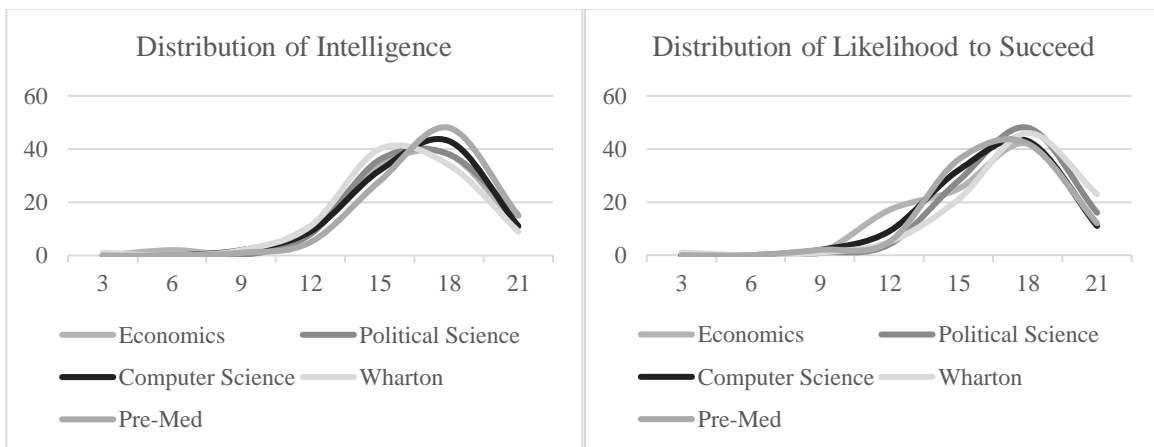


Figure 1. Distributions of intelligence and likelihood by hypothetical student major

However, there were some statistically significant differences. Based on a one-way analysis of variance (ANOVA), there was a statistically significant difference in intelligence between at least two majors ( $F(4, 480) = 3.21, p = 0.01$ ). Tukey's HSD test for multiple comparisons revealed that the mean value for intelligence was significantly different between Wharton and Pre-Med ( $p = 0.02, 95\% \text{ C.I.} = (-2.35, -0.13)$ ), with the hypothetical Pre-Med

student being rated more highly than the Wharton student on the intelligence measures. Additionally, an ANOVA revealed that there was a statistically significant difference in likelihood to succeed between at least two groups ( $F(4, 480) = 3.63, p = 0.01$ ). Tukey's HSD test showed that the mean value for likelihood to succeed was statistically different between the hypothetical Economics and Political Science students ( $p = 0.03, 95\% \text{ C.I.} = (-1.14, -2.22)$ ) as well as the hypothetical Economics and Wharton students ( $p = 0.03, 95\% \text{ C.I.} = (-1.13, -2.21)$ ). The Economics student was rated lower on the likelihood to succeed measures than the Political Science and Wharton student, respectively. See Appendix D for full results of the ANOVA and Tukey's HSD test.

### Leadership Index

Participants reported the number of leadership experiences matching pre-written descriptions. Box-and-whisker plots of the results are reported below (Figure 2). As shown, the most frequently reported leadership experiences included (1) board member of a student club ( $M_s = 1.47$ ); (2) student worker ( $M_s = 1.27$ ); (3) other significant leadership experiences ( $M_s = 1.00$ ).

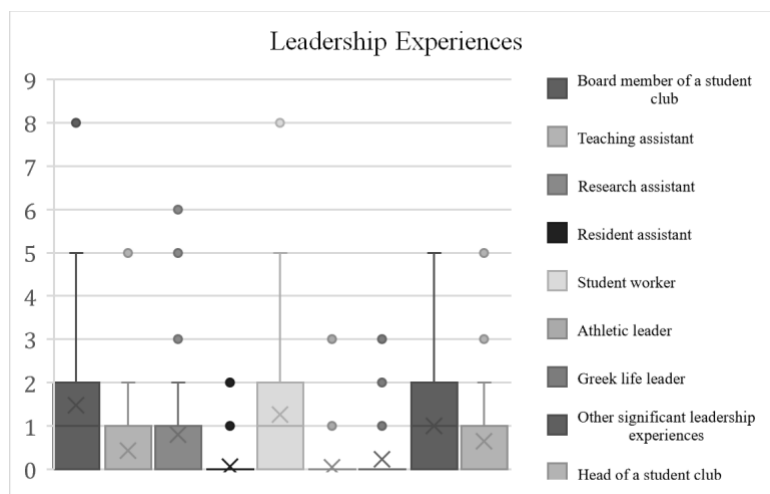


Figure 2. Box-and-whisker plots of reported student leadership experiences

The Leadership Index was calculated as the sum of the reported experiences. Below is a histogram of the Leadership Index (Figure 3). Given the right skew of the data, it appeared that most participants had few leadership experiences, while certain participants had many. The participants were segmented into two groups based on whether their leadership index was above or below the median.



*Figure 3. Histogram of leadership index*

### **Analysis**

A two-way multivariate analysis of variance (MANOVA) was performed to analyze the effect of SES and leadership group on each dependent variable. Given the study design involved multiple continuous dependent variables (intelligence, likelihood to succeed) and multiple categorical independent variables (leadership group, SES of hypothetical student), MANOVA was an appropriate test (AM Statistical Consulting). Additionally, within the major groups, observations were independent. There was not multicollinearity between intelligence and likelihood to succeed for each major group ( $r = 0.80$ ,  $r = 0.75$ ,  $r = 0.66$ ,  $r = 0.73$ ,  $r = 0.61$ , for Computer Science, Economics, Political Science, Pre-Med, and Wharton, respectively). Furthermore, for each group of the independent variable, there was a linear relationship between

the dependent variables. Each group of the independent variables had sufficient sample size ( $n >$  number of dependent variables). Additionally, there were no univariate outliers. Appendix E contains scatterplots for each group of the independent variables showing sufficient sample size, a linear relationship between the dependent variables for each group of the independent variables, and a lack of univariate outliers.

Since there were five hypothetical majors, a total of five analyses were performed. Data could not be analyzed in one MANOVA since observations between hypothetical student majors were not independent of each other. In each of the analyses, the independent variables included SES and leadership group, while the dependent variables included intelligence and likelihood to succeed ratings. aforementioned analyses are presented below (Table 2). As shown, the results for each major group were insignificant. The SES of the hypothetical student had no effect on participants' views of their intelligence or likelihood to succeed ( $F(4, 186) = 0.62$ ;  $F(4, 186) = 0.36$ ;  $F(4, 186) = 0.56$ ;  $F(4, 186) = 0.74$ ; and  $F(4, 186) = 1.31$ , for Computer Science, Economics, Political Science, Pre-Med, and Wharton, respectively).

Leadership group was also insignificant ( $F(2, 92) = 0.70$ ;  $F(2, 92) = 0.39$ ;  $F(2, 92) = 0.85$ ;  $F(2, 92) = 0.25$ ; and  $F(2, 92) = 0.39$ , for Pre-Med, Computer Science, Wharton, Economics, and Political Science, respectively). Overall, neither of the null hypotheses could be rejected. Below are the results of each MANOVA (Table 2).

Major	IV	<i>Df</i>	Pillai's Trace	Approx. <i>F</i>	Num. <i>Df</i>	Den. <i>Df</i>	Pr ( $>F$ )
Computer Science	SES	2	0.026	0.618	4	186	0.650
	Leadership Group	1	0.008	0.386	2	92	0.681
	Residuals	93					
Economics	SES	2	0.015	0.356	4	186	0.840
	Leadership Group	1	0.005	0.253	2	92	0.777
	Residuals	93					
	SES	2	0.024	0.561	4	186	0.692

Political Science	Leadership Group	1	0.008	0.391	2	92	0.678
	Residuals	93					
Pre-Med	SES	2	0.031	0.737	4	186	0.568
	Leadership Group	1	0.015	0.703	2	92	0.498
	Residuals	93					
Wharton	SES	2	0.055	1.313	4	186	0.267
	Leadership Group	1	0.018	0.845	2	92	0.433
	Residuals	93					

*Table 2. MANOVA results*

Appendix F shows a variation of the MANOVA. The independent variables remained the same, but the dependent variables consisted of Likert responses to each survey question, rather than the aggregate measures of intelligence and likelihood to succeed. The second round of MANOVA showed that for the Wharton hypothetical student, leadership group had a statistically significant effect on the dependent variables ( $F(6, 87) = 2.56$ ). All other question-by-question MANOVA results were insignificant for leadership group ( $F(6, 87) = 0.45$ ;  $F(6, 87) = 0.36$ ;  $F(6, 87) = 0.35$ ; and  $F(6, 87) = 1.54$ , for Computer Science, Economics, Political Science, and Pre-Med, respectively). Additionally, for all hypothetical student majors, hypothetical student SES had no effect on the dependent variables ( $F(12, 176) = 1.20$ ;  $F(12, 176) = 0.79$ ;  $F(12, 176) = 1.45$ ;  $F(12, 176) = 0.74$ ; and  $F(12, 176) = 1.36$ , for Computer Science, Economics, Political Science, Pre-Med, and Wharton, respectively).

Two final ANOVAs involved pooling the data. The independent variables included hypothetical student SES and leadership group as well as interaction effects, but the analysis also controlled for participant ID and hypothetical student major. The dependent variable for the first ANOVA was intelligence ratings. Results showed that SES, leadership group and the interaction effect were insignificant ( $F(2, 380) = 0.37$ ,  $p = 0.69$ ;  $F(1, 380) = 0.55$ ,  $p = 0.46$ ;  $F(2, 380) = 1.62$ ,  $p = 0.20$ , respectively). The dependent variable for the second ANOVA was likelihood to succeed ratings. Results showed that leadership group was significant, while SES and the

interaction effect were insignificant ( $F(1, 380) = 6.75, p = 0.01$ ;  $F(2, 380) = 0.78, p = 0.46$ ;  $F(2, 380) = 0.56, p = 0.57$ , respectively).

## DISCUSSION

Overall, neither hypothesis could be confirmed. The hypothetical students' socioeconomic status had no effect on how participants perceived their intelligence or likelihood to succeed. The lack of statistical significance could have several causes.

To begin, the experimental design may have been faulty. Since socioeconomic status was relatively subtle in each of the descriptions, it is possible that students did not process the socioeconomic differences between hypothetical students. Major may have been more salient than SES, given that participants' ratings of hypothetical students' intelligence and likelihood to succeed varied by major rather than SES. The experiment confirmed some stereotypes about majors, such as the idea that Wharton students are less intelligent than Pre-Med students and Wharton students are more likely to succeed than Economics students.

Similarly, it is possible that students did not feel motivated to answer the survey questions thoughtfully given the lack of an incentive. However, given that the measures of intelligence and likelihood to succeed are imperfectly correlated, as well as the fact that measures were statistically different between major groups, it appears that participants did answer questions thoughtfully. Additionally, all participants included in the analyses passed the attention check that indicated that they read the survey.

Alternatively, it is possible that students do not perceive student socioeconomic status as related to likelihood to succeed or intelligence. At an elite institution like Penn, numerous first-generation, low-income (FGLI) students have been successful. Particularly salient during the time of the experiment was the story of Mackenzie Fierceton, a Rhodes scholar and FGLI



student. Additionally, resources such as the First Generation, Low-Income program ensure that less advantaged students have more support at Penn. Furthermore, the quantity of students with low SES is extremely low at Penn, with just 13% of the undergraduate student body receiving Pell Grants (UnivStats). It is possible that students perceive students with low SES as just as successful as their high SES peers given the low quantity of low SES students. In sum, the hypothetical students' SES did not affect participants' perception of their intelligence or likelihood to succeed.

Furthermore, leadership had no effect, except for in the question-by-question analysis of the hypothetical Wharton student. This result suggests that top leaders do not perceive socioeconomic status differently. Again, the lack of statistical significance has many possible explanations. To begin, experimental design could have caused the lack of statistical significance. The measurement of leadership could have been flawed such that students may have understood the questions differently. In some clubs, in particular, the definition of "board member" can be broader than in other clubs. Also, the questions may not have comprehensively captured the leadership experiences of Penn students. In particular, the "other significant leadership experiences" question was one of the questions with the highest mean response. This finding suggests that the questionnaire did not effectively capture students' leadership experiences on campus. Additionally, given the lack of incentive, students may have not answered thoughtfully.

However, top leaders may also not perceive students' chance of success differently. In particular, if top leadership is simply a proxy for one's year in school, since seniors would presumably have more leadership experiences than freshmen, then top leadership would become insignificant in this experiment. Furthermore, there are many leadership experiences targeted

towards students with low SES, such as resident assistant and student worker, which means that students of all SES have the chance to become involved at Penn.

Future research is necessary to investigate whether universities are biased against low SES students. In future iterations of this experiment, researchers should make several changes. For one, the study should be designed such that participants have an incentive to answer thoughtfully and truthfully. Perhaps, instead of using hypothetical students, participants could read profiles of alumni and guess who had the highest starting salary, with additional incentives for guessing correctly. Additionally, experimenters should ensure that participants fully process and read all information through improved attention checks. For example, researchers could ask participants to provide reasoning to support their ratings. Also, researchers should create a clearer version of the leadership index. Instead of including only objective information about the number of leadership experiences, perhaps researchers could also include subjective ratings about involvement on campus. Furthermore, future research could incorporate opinions of faculty and staff members in addition to students. Faculty and staff members are integral to college experiences. To continue, major should be made less salient, and SES should be made more salient. Instead of including intended major towards the top of the transcripts, perhaps the hypothetical students' high school should be included. Finally, a more socioeconomically diverse campus may also reveal higher levels of bias compared to a largely privileged campus like Penn.

While this experiment did not produce statistically significant results, the gap in outcomes between high SES and low SES students remains an important area to investigate in the context of socioeconomic mobility in the United States.

## References

- Adorno, Theodor, et al. 2019. *The authoritarian personality*. Verso Books.
- AM Statistical Consulting. "Two-Way MANOVA ." AM Statistical Consulting., accessed Apr 23, 2022, <https://www.amstatisticalconsulting.com/banking-fees-2-11/>.
- Auwarter, Amy E., and Mara S. Aruguete. 2008a. Effects of student gender and socioeconomic status on teacher perceptions. *The Journal of Educational Research* 101, no. 4:242-246.
- Auwarter, Amy, and Mara Aruguete. 2008b. Counselor perceptions of students who vary in gender and socioeconomic status. *Social psychology of education* 11, no. 4:389-395.
- Bordalo, Pedro, Katherine Coffman, Nicola Gennaioli, and Andrei Shleifer. 2016. Stereotypes. *The Quarterly Journal of Economics* 131, no. 4:1753-1794.
- Browman, Alexander S., and Mesmin Destin. 2016. The effects of a warm or chilly climate toward socioeconomic diversity on academic motivation and self-concept. *Personality and Social Psychology Bulletin* 42, no. 2:172-187.
- Chetty, Raj, et al. 2020. Income segregation and intergenerational mobility across colleges in the United States. *The Quarterly Journal of Economics* 135, no. 3:1567-1633.
- Cole, Rebekah F., and Tim Grothaus. 2014. A Phenomenological Study of Urban School Counselors' Perceptions of Low-Income Families. *Journal of School Counseling* 12, no. 5:n5.
- Darley, John M., and Paget H. Gross. 1983. A hypothesis-confirming bias in labeling effects. *Journal of personality and social psychology* 44, no. 1:20-33.
- Farfan Bertan, Maria G., Alaka Holla, and Renos Vakis. 2021. Poor Expectations: Experimental Evidence on Teachers' Stereotypes and Student Assessment.

- Glenn, David. 2008. Study finds graduation gap for first-generation students, regardless of preparation. *The Chronicle of Higher Education*.
- Johnson, Sarah E., Jennifer A. Richeson, and Eli J. Finkel. 2011. Middle class and marginal? Socioeconomic status, stigma, and self-regulation at an elite university. *Journal of personality and social psychology* 100, no. 5:838.
- Kelly, Andrew. Does College Really Improve Social Mobility? 2014 [cited Oct 10, 2021]. Available from <https://www.brookings.edu/blog/social-mobility-memos/2014/02/11/does-college-really-improve-social-mobility/>.
- Kraus, Michael W., and Dacher Keltner. 2009. Signs of socioeconomic status: A thin-slicing approach. *Psychological science* 20, no. 1:99-106.
- Lohfink, Mandy M., and Michael B. Paulsen. 2005. Comparing the determinants of persistence for first-generation and continuing-generation students. *Journal of College Student Development* 46, no. 4:409-428.
- McCarron, Graziella P., and Karen K. Inkelas. 2006. The gap between educational aspirations and attainment for first-generation college students and the role of parental involvement. *Journal of College Student Development* 47, no. 5:534-549.
- McDermott, Lauren A., and T. F. Pettijohn. 2011. The influence of clothing fashion and race on the perceived socioeconomic status and person perception of college students. *Psychology & Society* 4, no. 2:64-75.
- McMurray, Andrew J., and Darrin Sorrells. 2009. Bridging the Gap: Reaching First-Generation Students in the Classroom. *Journal of Instructional Psychology* 36, no. 3:.

- Pascarella, Ernest T., Christopher T. Pierson, Gregory C. Wolniak, and Patrick T. Terenzini. 2004. First-generation college students: Additional evidence on college experiences and outcomes. *The Journal of Higher Education* 75, no. 3:249-284.
- Phelps, Edmund S. 1972. The statistical theory of racism and sexism. *The American Economic Review* 62, no. 4:659-661.
- Ready, Douglas D., and David L. Wright. 2011. Accuracy and inaccuracy in teachers' perceptions of young children's cognitive abilities: The role of child background and classroom context. *American Educational Research Journal* 48, no. 2:335-360.
- Saporito, Salvatore. 2017. Shaping income segregation in schools: The role of school attendance zone geography. *American Educational Research Journal* 54, no. 6:1345-1377.
- Sewell, William H. and Shah, Vimal P. 1967. Socioeconomic status, intelligence, and the attainment of higher education. *Sociology of education* 40, no 1:1-23.
- Schneider, David J., Hastorf, Albert H., and Ellsworth, Phoebe. 1979. *Person perception*. Vol. 67. Addison Wesley Publishing Company.
- Speybroeck, Sara, et al. 2012. The role of teachers' expectations in the association between children's SES and performance in kindergarten: A moderated mediation analysis. *PloS one* 7, no. 4:e34502.
- Tournaki, Nelly. 2003. Effect of student characteristics on teachers' predictions of student success. *The Journal of Educational Research* 96, no. 5:310-319.
- "UPenn Financial Aid." UnivStats., accessed 24 April, 2022, <https://www.univstats.com/colleges/university-of-pennsylvania/financial-aid/>.
- Wiggins, Janice. 2011. Faculty and first-generation college students: Bridging the classroom gap together.

## APPENDICES

**Appendix A**

## Consent Form

The purpose of this study is to examine intelligence and success in higher education. This study is being conducted by a researcher at the Wharton School, University of Pennsylvania (Philadelphia, Pennsylvania) and will be conducted online.

You must be 18 years or older to participate in this study.

If you agree to be in this study, you will be asked to do the following:

You will read a series of student introductions to their peer advisors. You will rate each hypothetical student. Finally, you will provide information about your leadership experience on campus.

Participation in this study will involve a total of 30 minutes of your time.

- There are no known risks associated with your participation in this research beyond those of everyday life.
- This study is part of the Behavioral Lab's regular sessions, and you will be compensated for your time according to their procedures.
- Participation in this research is voluntary. You will not receive any direct benefits from the study.
- If you have questions about your rights and welfare as a volunteer in the research study, please contact the Office of Regulatory Affairs at the University of Pennsylvania at 215-898-2614.
- Confidentiality of your research records will be strictly maintained by ensuring all data is kept secure, and only the primary investigator and the research team will have access to this data. This means that nobody else will have access to your data at any point during or after the study.

By continuing to the next page, you are agreeing to take part in this research study. If you have any questions or there is something you do not understand, please ask.

## Appendix B

### Survey Material

Major	High SES	Low SES	No SES
Pre-Med	<p>Class Year: Freshman</p> <p>Intended Major: Biology/Chemistry</p> <p>Placement Test Results (if any): Math 104, Span 130</p> <p>External Credit (if any):</p> <p>Comments/Concerns:</p> <p>I am a freshman in the college. I'm not sure exactly what I want to study... I was thinking something in the sciences, since my dad is a doctor and I have always liked going to the hospital with him. I remember specific patients that he treated, and I like the idea of building a personal connection with people. Some of my dad's patients even send us fruit baskets around the holidays. I want to do something to give back to the community I came from and help people in my career.</p> <p>I also think that my academic background suits my goal. Science was my strongest subject in high school. I want to take more science classes at Penn...I'm thinking of taking Introductory Biology and Introductory</p>	<p>Class Year: Freshman</p> <p>Intended Major: Biology/Chemistry</p> <p>Placement Test Results (if any): Math 104, Span 130</p> <p>External Credit (if any):</p> <p>Comments/Concerns:</p> <p>I am a freshman in the college. I'm not sure exactly what I want to study... I was thinking something in the sciences, since I have always dreamed of being a doctor. I am most strongly considering the Biology and Chemistry majors. I like the idea of building a personal connection with people. Being a doctor will allow me to give back to the community I came from and help people through my career.</p> <p>I also think that my academic background suits my goal. Science was my strongest subject in high school. I was one of the top science students in my grade. I want to take some science classes at Penn this semester...I'm thinking of taking biology and chemistry classes. I am a bit nervous about adjusting</p>	<p>Class Year: Freshman</p> <p>Intended Major: Biology/Chemistry</p> <p>Placement Test Results (if any): Math 104, Span 130</p> <p>External Credit (if any):</p> <p>Comments/Concerns:</p> <p>I am a freshman in the college. I'm not sure exactly what I want to study... I was thinking something in the sciences, since I have always dreamed of being a doctor. I am most strongly considering the Biology and Chemistry majors. I like the idea of building a personal connection with people. Being a doctor will allow me to give back to the community I came from and help people through my career.</p> <p>I also think that my academic background suits my goal. Science was my strongest subject in high school. I was one of the top science students in my grade. I want to take some science classes at Penn this semester...I'm thinking of taking introductory biology and chemistry classes. I am a bit nervous about</p>

	<p>Chemistry this semester. The big lectures scare me a bit, since I went to an independent school with small classes. But I think I can get that small class feel with a writing seminar related to science. I would like to know if you have any suggestions about what my fourth class this semester should be.</p> <p>If you have any suggestions about what clubs to join related to science, I would be interested in hearing those as well. I want to learn more about medicine and treating people in the community.</p>	<p>to Penn classes, since my high school did not offer advanced science classes. Also, I would like to know if you have any suggestions about what my other classes this semester should be. Is there anything else I need to take to stay on track with the pre-med requirements?</p> <p>If you have any suggestions about work-study jobs related to science, I would be interested in hearing those as well. I want to learn more about medicine and meet other people with similar interests. I am very excited to be at Penn to start off my future medical career!</p>	<p>adjusting to Penn classes. I would like to know if you have any suggestions about what my other classes this semester should be. Is there anything else I need to take to stay on track with the pre-med requirements?</p> <p>If you have any suggestions about what organizations to join related to science, I would be interested in hearing those as well. I want to learn more about medicine and meet other people with similar interests. I am very excited to be at Penn to start off my future medical career!</p>
Political Science	<p>Class Year: Freshman</p> <p>Intended Major: Political Science</p> <p>Placement Test Results (if any):</p> <p>External Credit (if any): French 202</p> <p>Comments/Concerns:</p> <p>My strongest academic interest lies in political science. I am an avid reader of political news and listener of political podcasts. I like keeping up with the latest elections and bills in Congress. In high school, I was very involved</p>	<p>Class Year: Freshman</p> <p>Intended Major: Political Science</p> <p>Placement Test Results (if any):</p> <p>External Credit (if any): French 202</p> <p>Comments/Concerns:</p> <p>My strongest academic interest lies in political science. I am an avid reader of political news and listener of political podcasts. I like keeping up with the latest elections and bills in Congress. In high school, I was very</p>	<p>Class Year: Freshman</p> <p>Intended Major: Political Science</p> <p>Placement Test Results (if any):</p> <p>External Credit (if any): French 202</p> <p>Comments/Concerns:</p> <p>My strongest academic interest lies in political science. I am an avid reader of political news and listener of political podcasts. I like keeping up with the latest elections and bills in Congress. In high school, I was very</p>



	<p>with my local community and volunteered on a local political campaign. I was also involved with my high school's student government. I hope to learn more about politics during my time at Penn and get involved with elections in Philadelphia. Following in my parents' footsteps, I might attend law school after Penn.</p> <p>Since I am a freshman, I was thinking of taking a 100-level political science class and a writing seminar related to politics. I want to stay away from quantitative classes. Math is not my strongest subject. Are there any other classes I should take this semester? What professors do you recommend? I also want to get involved with the political community on campus. What clubs and organizations can I join?</p>	<p>involved with my local community and became a paid fellow on a local political campaign. I was also involved with my high school's student government. I hope to learn more about politics during my time at Penn and get involved with elections in Philadelphia. I am considering law school after Penn; I want to empower disadvantaged communities like the town where I grew up.</p> <p>Since I am a freshman, I was thinking of taking a 100-level political science class and a writing seminar related to politics. I want to stay away from quantitative classes. Math is not my strongest subject. Are there any other classes I should take this semester? What professors do you recommend? I also want to get involved with the political community on campus. Are there work-study jobs available related to politics?</p>	<p>involved with my local community. I was also involved with my high school's student government. I hope to learn more about politics during my time at Penn and get involved with elections in Philadelphia. I am considering going to law school after college.</p> <p>Since I am a freshman, I was thinking of taking a 100-level political science class and a writing seminar related to politics. I want to stay away from quantitative classes. Math is not my strongest subject. Are there any other classes I should take this semester? What professors do you recommend? I also want to get involved with the political community on campus. What clubs and organizations can I join?</p>
Wharton	<p>Class Year: Freshman</p> <p>Intended Major: Finance</p> <p>Placement Test Results (if any):</p> <p>External Credit (if any): Math 104</p> <p>Comments/Concerns:</p>	<p>Class Year: Freshman</p> <p>Intended Major: Finance</p> <p>Placement Test Results (if any):</p> <p>External Credit (if any): Math 104</p> <p>Comments/Concerns:</p>	<p>Class Year: Freshman</p> <p>Intended Major: Finance</p> <p>Placement Test Results (if any):</p> <p>External Credit (if any): Math 104</p> <p>Comments/Concerns:</p>

	<p>I am excited to be at Penn. I want to study finance and eventually work as an investment banker in New York. Working a fast-paced job in finance, just like my dad, sounds exciting to me. I enjoy working with numbers and I want to learn about the cutting edge of finance. In high school, I spent at least 20 hours per week at an internship on my dad's company. I learned a lot about business in that internship, and I am excited to learn more at Wharton.</p> <p>My classes for the semester are relatively set, but I wanted advice about extracurriculars. What clubs should I join? Do I need to join finance-related clubs to get a job in finance? Where can I get more information about clubs?</p>	<p>I am excited to be at Penn. I want to study finance and eventually work as an investment banker in New York. Working a fast-paced job sounds exciting to me. I enjoy working with numbers and I want to learn about the cutting edge of finance. In high school, I worked 20 hours per week at a local restaurant. I learned a lot about business from that experience, and I am excited to learn more at Wharton.</p> <p>My classes for the semester are relatively set, but I wanted advice about extracurriculars. What work-study jobs are available for finance concentrators? Do I need to join finance-related clubs to get a job in finance? Where can I get more information about work-study jobs?</p>	<p>I am excited to be at Penn. I want to study finance and eventually work as an investment banker in New York. Working a fast-paced job sounds exciting to me. I enjoy working with numbers and I want to learn about the cutting edge of finance. In high school, I spent at least 20 hours per week at an internship with a local bank. I learned a lot about business in that role, and I am excited to learn more at Wharton.</p> <p>My classes for the semester are relatively set, but I wanted advice about extracurriculars. What clubs should I join? Do I need to join finance-related clubs to get a job in finance? Where can I get more information about clubs?</p>
Computer Science	<p>Class Year: Freshman</p> <p>Intended Major: Computer Science</p> <p>Placement Test Results (if any): Math 104, Fren 140</p> <p>External Credit (if any):</p> <p>Comments/Concerns:</p> <p>Right now, I want to major in computer science. Eventually, I want to work as a software engineer in</p>	<p>Class Year: Freshman</p> <p>Intended Major: Computer Science</p> <p>Placement Test Results (if any): Math 104, Fren 140</p> <p>External Credit (if any):</p> <p>Comments/Concerns:</p> <p>Right now, I want to major in computer science. Eventually, I want to work as a software engineer in</p>	<p>Class Year: Freshman</p> <p>Intended Major: Computer Science</p> <p>Placement Test Results (if any): Math 104, Fren 140</p> <p>External Credit (if any):</p> <p>Comments/Concerns:</p> <p>Right now, I want to major in computer science. Eventually, I want to work as a software engineer in</p>

	<p>the Bay Area. My parents work as software engineers, so I am familiar with the field. I prefer quantitative classes, and computer science works well with my interests. However, I have never coded before, so I am a bit nervous about taking my first computer science classes at Penn. I have heard that computer science classes at Penn can be very difficult and time-intensive. I am planning to take CIS 110. What other classes should I take to complete my schedule?</p> <p>I am also interested in joining a performing arts group. How do auditions work? Will I be able to balance the time commitment of a performing arts group with computer science classes?</p>	<p>the Bay Area. I prefer quantitative classes, so computer science works well with my interests. However, I have never coded before, so I am a bit nervous about taking my first computer science classes at Penn. My family has no idea how this stuff works. I have heard that computer science classes at Penn can be very difficult and time-intensive. I am planning to take CIS 110. What other classes should I take to complete my schedule?</p> <p>I am also looking to add a work-study job. Where can I find jobs? Will I be able to balance the time commitment of a job with computer science classes?</p>	<p>the Bay Area. I prefer quantitative classes, so computer science works well with my interests. However, I have never coded before, so I am a bit nervous about taking my first computer science classes at Penn. I have heard that computer science classes at Penn can be very difficult and time-intensive. I am planning to take CIS 110. What other classes should I take to complete my schedule?</p> <p>I am also interested in joining a performing arts group. How do auditions work? Will I be able to balance the time commitment of a performing arts group with computer science classes?</p>
Economics	<p>Class Year: Freshman</p> <p>Intended Major: Economics</p> <p>Placement Test Results (if any):</p> <p>External Credit (if any): Econ 001 (waiver), Econ 002 (waiver), Math 104</p> <p>Comments/Concerns:</p> <p>I am not totally sure what I want to major in just yet, but economics is a strong contender. I took a year of economics in high school. I really enjoyed the class and</p>	<p>Class Year: Freshman</p> <p>Intended Major: Economics</p> <p>Placement Test Results (if any):</p> <p>External Credit (if any): Econ 001 (waiver), Econ 002 (waiver), Math 104</p> <p>Comments/Concerns:</p> <p>I am not totally sure what I want to major in just yet, but economics is a strong contender. I took a year of economics in high school. I</p>	<p>Class Year: Freshman</p> <p>Intended Major: Economics</p> <p>Placement Test Results (if any):</p> <p>External Credit (if any): Econ 001 (waiver), Econ 002 (waiver), Math 104</p> <p>Comments/Concerns:</p> <p>I am not totally sure what I want to major in just yet, but economics is a strong contender. I took a year of economics in high school. I</p>

<p>my teacher even wrote my Penn recommendation. My mom teaches economics at a local university, so I know I will have support from my parents. I also like the idea of eventually working in finance. I am planning on taking Math 114 this semester, but I am not sure what else to take. Do you have any suggestions? I want to stay away from classes that involve a lot of reading and writing.</p> <p>I also want to get involved on campus. I hope to get involved with the local Philadelphia community. I would enjoy working with local students. Are there any clubs that sound like what I am describing?</p>	<p>really enjoyed the class and my teacher even wrote my college recommendation letter. I also like the idea of eventually working in finance. I am planning on taking Math 114 this semester, but I am not sure what else to take. Do you have any suggestions? I want to stay away from classes that involve a lot of reading and writing.</p> <p>I also want to get involved on campus. I hope to get involved with the local Philadelphia community. I would enjoy working with local students. Are there any work-study jobs that sound like what I am describing?</p>	<p>really enjoyed the class and my teacher even wrote my Penn recommendation. I also like the idea of eventually working in finance. I am planning on taking Math 114 this semester, but I am not sure what else to take. Do you have any suggestions? I want to stay away from classes that involve a lot of reading and writing.</p> <p>I also want to get involved on campus. I hope to get involved with the local Philadelphia community. I would enjoy working with local students. Are there any clubs that sound like what I am describing?</p>
---	---	---

After each stimulus, the participant filled out the following questions (order and attention check randomized).



**Appendix C**

## Leadership Questionnaire

Enter the number of experiences that you have had during your time as an undergraduate that matches each of the descriptions below. If you have not had an experience that matches the description, enter "0".

Board member of a student club	<input type="text"/>
Teaching assistant	<input type="text"/>
Research assistant	<input type="text"/>
Resident assistant	<input type="text"/>
Student worker	<input type="text"/>
Athletic leader	<input type="text"/>
Greek life leader	<input type="text"/>
Other significant leadership experiences	<input type="text"/>
Head of a student club	<input type="text"/>

## Appendix D

### Summary of Results: Intelligence ANOVA

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Major	4	103	25.626	3.205	0.013*
Residuals	480	3837	7.995		

\*Statistically significant  $p < 0.05$

### Tukey multiple comparisons of means, 95% family-wise confidence level

	Difference	Lower 95% C.I.	Upper 95% C.I.	Adjusted p-value
Political Science – Pre-Med	-0.2990	-1.4107	0.8127	0.9479
Wharton – Pre-Med	-1.2371	-2.3488	-0.1254	0.0205*
Computer Science – Pre-Med	-0.5670	-1.6787	0.5447	0.6302
Economics – Pre-Med	-1.0515	-2.1632	0.0601	0.0738
Wharton – Political Science	-0.9381	-2.0498	0.1736	0.1432
Computer Science – Political Science	-0.2680	-1.3797	0.8437	0.9647
Economics – Political Science	-0.7526	-1.8643	0.3591	0.3441
Computer Science – Wharton	0.6701	-0.4416	1.7818	0.4659
Economics – Wharton	0.1856	-0.9261	1.2973	0.9910
Economics – Computer Science	-0.4845	-1.5962	0.6272	0.7552

\*Statistically significant  $p < 0.05$

### Summary of Results: Likelihood to Succeed ANOVA

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
Major	4	109	27.167	3.626	0.00635**
Residuals	480	3597	7.493		

\*\*Statistically significant  $p < 0.01$

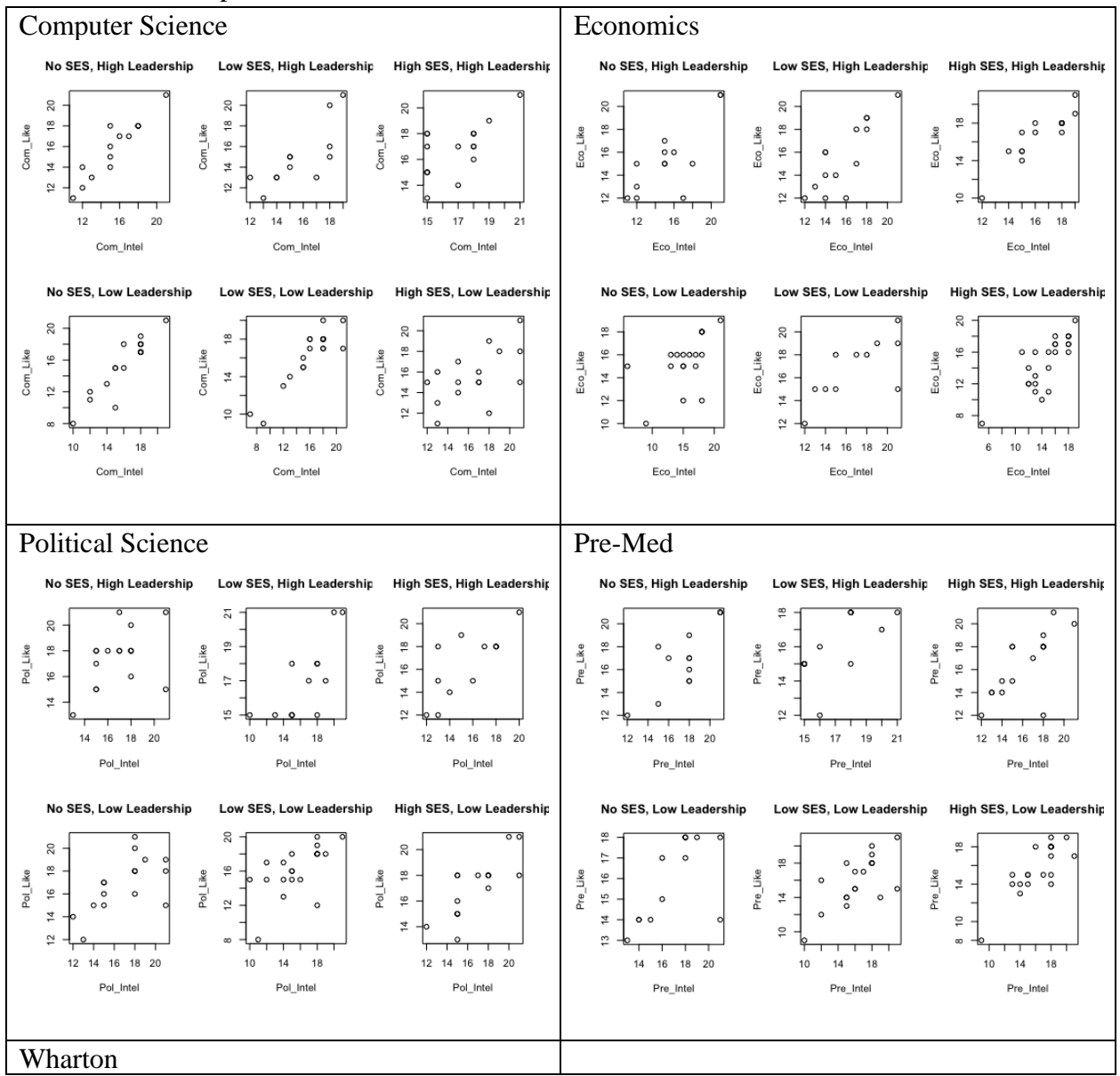
### Tukey multiple comparisons of means, 95% family-wise confidence level

	Difference	Lower 95% C.I.	Upper 95% C.I.	Adjusted p-value
Political Science – Pre-Med	0.6289	-0.4474	1.7051	0.4981
Wharton – Pre-Med	0.6186	-0.4577	1.6948	0.5150
Computer Science – Pre-Med	-0.3299	-1.4061	0.7464	0.9182
Economics – Pre-Med	-0.5155	-1.5917	0.5608	0.6842
Wharton – Political Science	-0.0103	-1.0866	1.0659	1.0000
Computer Science – Political Science	-0.9588	-2.0350	0.1175	0.1068
Economics – Political Science	-1.1443	-2.2206	-0.0681	0.0307*
Computer Science – Wharton	-0.9485	-2.0247	0.1278	0.1135
Economics – Wharton	-1.1340	-2.2103	-0.0578	0.0332*
Economics – Computer Science	-0.1856	-1.2618	0.8907	0.9898

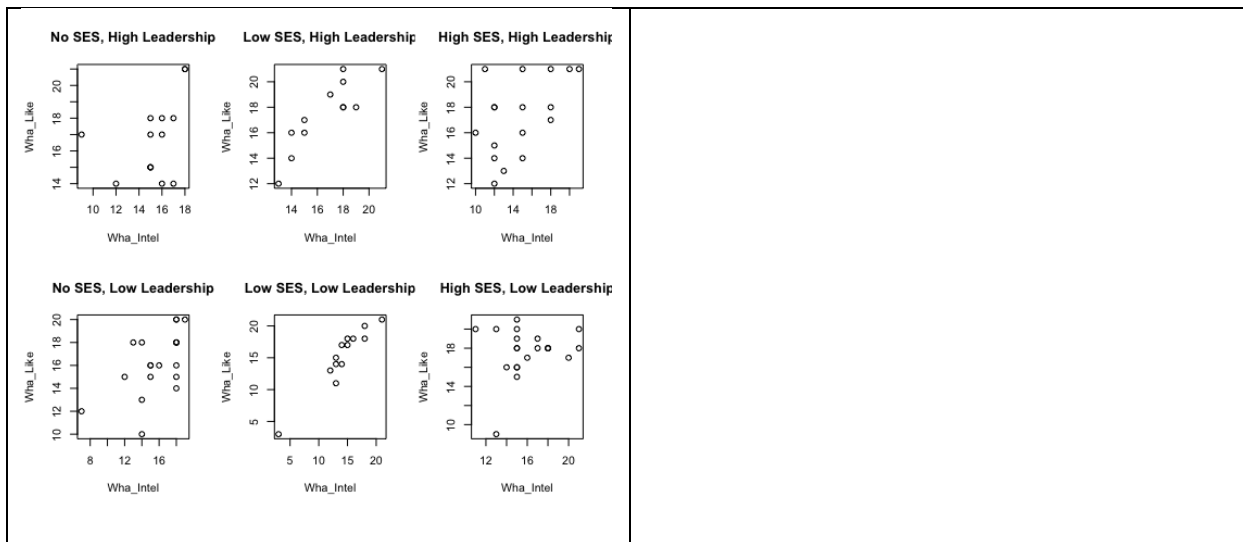
\*Statistically significant  $p < 0.05$

# Appendix E

## MANOVA Assumptions







## Appendix F

### Question-by-Question Analysis

The following table shows the p-values of the MANOVA with the independent variables as hypothetical student SES and leadership group, and the dependent variables as Likert ratings of the following questions:

- "The student is intelligent"
- "The student will succeed in the future"
- "The student will achieve his/her goals"
- "The student is bright"
- "The student will do well in life"
- "The student is smart"

Major	IV	<i>Df</i>	Pillai's Trace	Approx. <i>F</i>	Num. <i>Df</i>	Den. <i>Df</i>	Pr (> <i>F</i> )
Computer Science	SES	2	0.152	1.204	12	176	0.284
	Leadership Group	1	0.030	0.455	6	87	0.840
	Residuals	92					
Economics	SES	2	0.102	0.786	12	176	0.664
	Leadership Group	1	0.024	0.358	6	87	0.903
	Residuals	92					
Political Science	SES	2	0.179	1.445	12	176	0.150
	Leadership Group	1	0.024	0.353	6	87	0.906
	Residuals	92					
Pre-Med	SES	2	0.096	0.743	12	176	0.708
	Leadership Group	1	0.096	1.542	6	87	0.174
	Residuals	92					
Wharton	SES	2	0.170	1.36	12	176	0.187
	Leadership Group	1	0.150	2.56	6	87	0.025*
	Residuals	92					

\*Statistically significant  $p < 0.05$