MAJOR DISAPPOINTMENT: A LARGE-SCALE EXPERIMENT ON (NON-)PECUNIARY INFORMATION AND MAJOR CHOICE

Scott Carrell[a]*, Lester Lusher[b], Derek Rury[c]

[a]University of California, Davis, NBER, and IZA

[b]University of Hawaii at Manoa and IZA

[c]University of California, Davis

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Abstract

Studies suggest providing information to undergraduate students can influence their preference of major. To test the scalability of information treatments on actual major decisions, we conducted several large-scale field experiments across over 13,000 undergraduate students. Three treatment arms separately provided pecuniary, major satisfaction, and job-relatedness information. Despite nearly half of freshmen switching their major at some point during their undergraduate tenure, we find that our information treatments had no impact on major choice. These results hold for various subsamples, outcomes, and specifications. Our results suggest caution on the promise of information provision influencing major choice.

*Corresponding author: Scott Carrell, University of California Davis, Social Sciences and Humanities 1148, One Shields Ave, Davis, CA 95616 United States. Email: secarrell@ucdavis.edu; Lester Lusher, Email: lrlusher@hawaii.edu; Derek Rury, Email: drury@ucdavis.edu

1 Introduction

Selecting a major is one of the most important decisions an undergraduate student makes. Studies have shown that major choice impacts a student's subsequent occupation and earnings (Kinsler and Pavan, 2015; Kirkeboen et al., 2016). A deep literature has focused on identifying factors that influence major preference and choice, including the student's expectations on the pecuniary (Arcidiacono et al., 2012; Wiswall and Zafar, 2015a) and non-pecuniary (Beffy et al., 2012; Zafar, 2013; Wiswall and Zafar, 2018) returns to the major.

Despite the role of expected returns, and the presumed availability of relevant information, studies have identified significant discrepancies between student expectations and actual returns to major (Wiswall and Zafar, 2015b; Hastings et al., 2016). Smaller-scale studies have shown how correcting student beliefs on the pecuniary returns to major influences preferences of major (Arcidiacono et al., 2012; Zafar, 2013) and major choice (Conlon, 2019).

Given these findings, whether results from information treatments can be scaled-up is important for policy-making. In other education contexts, several studies on goal-setting, time-management, and returns to education have, among others, aimed to scale-up low-cost informational treatments, only to find null results (Dobronyi et al., 2019; Oreopoulos et al., 2019; Fryer Jr, 2016). These findings highlight the need to test the scalability of information provision on major choice.

This study bridges this gap by conducting two large-scale field experiments at the University of California, Davis, across over 13,000 student subjects. Treated students received one of three emails, each of which conveyed information for a long list of popular majors: 1) Average salary upon graduating (*pecuniary*), 2) average job satisfaction in initial jobs (*satisfaction*), and 3) portion of graduates who felt their job was related to their major (*relatedness*). The first experiment divulged information to a wide array of students, while the second experiment specifically targeted undeclared students.

First, we note that nearly half (46%) of freshmen switch their major before they graduate. Despite the malleable outcome, we find no evidence that our information treatments shifted major choice. When considering an indicator for switching major, we estimate small and statistically insignificant effects for each of the three treatment arms. When considering changes in major characteristics (e.g. change in wage in response to pecuniary treatment), the results further suggest a null effect. These results hold when including additional covariates, and for splits by class-standing and gender.

The remainder of this paper describes the experimental study, presents our results, then concludes by discussing our results in the context of prior studies.

2 Institutional Setting

Our study consists of two experimental phases. The first phase was implemented at the beginning of the fall 2017 quarter. More than 5,000 emails were sent out to a random sample of students. Treatment students received one of three possible emails (as described in the introduction), while control students either received a control email or no email. The total sample from Phase I consists of those who received an email (N=5,129) or no email (N=5,490). For Phase II, another batch of 2,995 emails were sent during the spring 2018 quarter to a random subset of undeclared students. All Phase II students received one of the three treatment emails or the control email.

Information found in the pecuniary treatment comes from the 2011-2015 ACS Integrated Public Use Microdata Series (IPUMS). Major groups and average wages were estimated following Conlon (2019), including restrictions on ages and hours worked per week.[1] To create the non-pecuniary information treatments, we exploited survey questions found in the 2010 NSCG public use data file. For the job-relatedness and satisfaction arms, respectively, we performed tabulations for the questions "To what extent was your work on your principal job related to your highest degree" and "How would you rate your overall satisfaction with your principal job you held during the week of October 1, 2010". Information treatments provided the distribution over our major groups for those who answered "closely related" and "very satisfied", respectively. Finally, control emails contained a short statement that highlighted the importance of a student's major choice. Data containing student characteristics were provided by the university. Email texts and the complete list of major groups can be found in the appendix.

2.1 Summary Statistics and Balance Tests

In the appendix, Table A1 and Table A2 present summary statistics from Phase I and Phase II, respectively. Of note, 46% of freshmen change their major at some point.[2] The remaining three outcomes from Table A1 are indicators for whether the student switched a major and whether their new major was of higher salary/satisfaction/job-relatedness. Since Phase II consists of undeclared students, the considered outcomes strictly vary by the student's eventual major.

Table A3 and Table A4 present balance tests from both phases. Each column consists of a single regression of an indicator for treatment on the full vector of student controls. We also present tests of joint significance at the bottom of each table. Across both phases and each treatment, we find no evidence that

[1] We restricted to ages between 29 and 51, and hours worked between 29 and 81 per week, with at least 40 hours worked in the past year.

[2] "Change major" includes any students who add a second major, or switch their second major.

the treatment was unbalanced across students.

3 Results

We start with Table 1 which presents our main results from Phase I. For ease of comparison across the two phases, we opt to group the Phase I control email and no email students together.[3] We also separately estimate treatment effects by class-standing, with the assumption that treatment should have a stronger impact on lower classmen. Each panel-column presents results from a regression of an indicator outcome on the three treatment email indicators. Overall, we find no evidence that treatments influenced major choice. From column (2) for freshmen, which includes a full vector of controls, we estimate statistically insignificant treatment effects of 2.6, 4.3, and -1.7 percentage points in response to pecuniary, satisfaction, and relatedness treatments, respectively.

In columns (3) through (8), we further consider which types of majors the students switched into. For instance, in columns (3) and (4), we consider whether the student switched into a major with a higher average salary. Here, we may expect to see an effect in response to the pecuniary treatment; instead, we find statistically insignificant negative effects. The remaining columns reveal a similar story, where satisfaction and job-relatedness treatments do not appear to lead to switching into majors with higher satisfaction and job-relatedness levels, respectively. These results are robust across student class standing.

Numerous studies have found substantial differences in preferences of major and occupation by gender, and thus one may expect the roles of pecuniary and non-pecuniary information to differentially affect women versus men. In Table 2, we consider various subsamples (gender by class-standing) to investigate for the possibility of a differential response by gender. Again, we find little effect of our treatment across outcomes. The lone exception is for our satisfaction treatment on women, which suggests positive and statistically significant switching rates. Columns (7) and (8) weakly suggest that this switching is toward majors with higher job-relatedness scores. This result does not hold, however, when we focus strictly on female freshmen and sophomores, suggesting the result is likely spurious.

Finally, in Table 3 we investigate our Phase II experiment on undeclared students. Again, we find no evidence that our treatment induced students to choose majors of their corresponding categories (e.g. pecuniary treatment and major earnings). We also find no evidence of a gender differential response in the second and third panels; in fact, if anything, the evidence suggests our treatment is associated with declaring majors of *lower* satisfaction and job-relatedness for female students.[4]

[3] In appendix Table A5, we find no meaningful differences in behavior between Phase I control email and no email students.

[4] Unreported, applying a simple Bonferroni correction for multiple hypotheses testing to the p-values eliminates statistical sig-

4 Discussion and Conclusion

In this study, we test the scalability of pecuniary and non-pecuniary information on student's actual major choice by conducting two large-scale field experiments across over 13,000 students. By and large, our interventions had no impact on student major choice.

We consider a few possibilities to explain these results. First, it is possible that the survey results from prior studies on stated preferences for majors may be the result of experimenter bias; in these settings, it may be that when students learn about alternative majors with higher earnings, they are expected to state that they have a stronger preference for the higher earning major. Second, previous studies are based on self-selected (into an experiment) samples and consequently may lack external validity. Lastly, our intervention is a much lighter touch compared to previous studies that found changes in major (Conlon, 2019). Thus, it may be that students are misinformed about the returns to various majors, and that processing correct information would change their major, but that a light-touch intervention such as an information email is not enough to influence the student.

nificance for a majority of the estimates.

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5 Tables

Table 1: Main results - Phase I

	Change major		Switch to higher salary major		Switch to higher satis. major		Switch to more job-related major	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample: Freshmen								
Pecuniary treat	0.020	0.026	-0.054*	-0.025	-0.078**	-0.070**	-0.008	-0.001
	(0.037)	(0.039)	(0.030)	(0.032)	(0.031)	(0.034)	(0.027)	(0.030)
Satisfaction treat	0.053	0.043	0.026	0.018	0.009	0.005	-0.031	-0.047
	(0.037)	(0.039)	(0.029)	(0.030)	(0.031)	(0.033)	(0.027)	(0.029)
Job-relatedness treat	-0.033	-0.017	0.026	0.050	0.015	0.023	0.025	0.031
	(0.038)	(0.040)	(0.030)	(0.031)	(0.031)	(0.034)	(0.027)	(0.029)
Observations	1733	1688	1242	1191	1242	1191	1242	1191
Sample: Sophomores								
Pecuniary treat	-0.003	-0.010	-0.042	-0.044	0.015	0.009	-0.011	-0.005
	(0.038)	(0.039)	(0.029)	(0.031)	(0.029)	(0.031)	(0.029)	(0.031)
Satisfaction treat	0.024	0.024	0.007	0.011	0.014	0.027	0.016	0.015
	(0.037)	(0.038)	(0.028)	(0.030)	(0.028)	(0.030)	(0.027)	(0.030)
Job-relatedness treat	-0.028	0.001	-0.049*	-0.059**	-0.011	-0.012	-0.003	-0.004
	(0.036)	(0.038)	(0.027)	(0.030)	(0.027)	(0.030)	(0.027)	(0.030)
Observations	1565	1516	1210	1156	1210	1156	1210	1156
Sample: Juniors								
Pecuniary treat	0.049	0.044	-0.041	-0.051*	-0.041	-0.049	-0.040	-0.036
	(0.033)	(0.036)	(0.026)	(0.030)	(0.029)	(0.032)	(0.028)	(0.032)
Satisfaction treat	-0.021	0.011	0.008	-0.017	0.041	0.020	0.042	0.028
	(0.034)	(0.037)	(0.026)	(0.030)	(0.029)	(0.032)	(0.028)	(0.033)
Job-relatedness treat	0.023	0.029	-0.021	-0.025	-0.029	-0.030	0.018	0.010
	(0.032)	(0.034)	(0.025)	(0.028)	(0.028)	(0.030)	(0.028)	(0.031)
Observations	1263	1213	1044	988	1044	988	1044	988
Sample: Seniors+								
Pecuniary treat	0.013	-0.006	0.027*	0.022	0.028*	0.019	-0.000	-0.015
	(0.023)	(0.024)	(0.016)	(0.017)	(0.016)	(0.017)	(0.017)	(0.017)
Satisfaction treat	0.012	0.015	0.004	0.008	0.004	0.010	0.009	0.010
	(0.022)	(0.023)	(0.015)	(0.016)	(0.015)	(0.016)	(0.016)	(0.016)
Job-relatedness treat	-0.029	-0.034	-0.006	-0.003	-0.009	-0.008	-0.013	-0.020
	(0.022)	(0.023)	(0.016)	(0.017)	(0.016)	(0.017)	(0.017)	(0.017)
Observations	2661	2635	2246	2210	2246	2210	2246	2210
Controls		X		X		X		X

Notes: Each column-panel presents results from a single regression. One, two, and three asterisks indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 2: Results by gender - Phase I

	Change major		Switch to higher salary major		Switch to higher satis. major		Switch to more job-related major	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample: All male students								
Pecuniary treat	0.009	0.008	-0.019	-0.022	-0.013	-0.015	-0.020	-0.021
	(0.019)	(0.019)	(0.013)	(0.013)	(0.014)	(0.014)	(0.013)	(0.013)
Satisfaction treat	0.015	0.011	-0.004	-0.008	0.009	0.004	-0.009	-0.013
	(0.018)	(0.018)	(0.012)	(0.012)	(0.013)	(0.013)	(0.012)	(0.012)
Job-relatedness treat	-0.001	-0.001	-0.009	-0.011	-0.000	0.000	0.011	0.009
	(0.019)	(0.019)	(0.013)	(0.013)	(0.014)	(0.014)	(0.013)	(0.013)
Observations	4522	4522	3862	3859	3862	3859	3862	3859
Sample: All female students								
Pecuniary treat	0.010	0.012	-0.013	-0.010	-0.012	-0.012	-0.010	-0.006
	(0.017)	(0.017)	(0.011)	(0.011)	(0.012)	(0.012)	(0.012)	(0.012)
Satisfaction treat	0.033*	0.035**	0.017	0.017	0.011	0.012	0.023*	0.021*
	(0.017)	(0.017)	(0.011)	(0.011)	(0.012)	(0.012)	(0.012)	(0.012)
Job-relatedness treat	-0.021	-0.018	-0.014	-0.012	-0.014	-0.013	-0.007	-0.005
	(0.017)	(0.017)	(0.011)	(0.011)	(0.012)	(0.012)	(0.012)	(0.012)
Observations	6095	6095	4869	4865	4869	4865	4869	4865
Sample: Male fresh+soph								
Pecuniary treat	-0.004	0.031	-0.045	-0.035	-0.026	-0.028	-0.008	-0.002
	(0.044)	(0.044)	(0.034)	(0.037)	(0.035)	(0.037)	(0.031)	(0.033)
Satisfaction treat	0.039	0.042	-0.005	-0.024	0.004	-0.018	-0.036	-0.054*
	(0.042)	(0.042)	(0.033)	(0.035)	(0.033)	(0.035)	(0.030)	(0.031)
Job-relatedness treat	0.000	0.024	-0.005	-0.004	-0.003	-0.001	0.017	0.003
	(0.042)	(0.042)	(0.033)	(0.035)	(0.033)	(0.035)	(0.030)	(0.031)
Observations	1267	1253	1003	982	1003	982	1003	982
Sample: Female fresh+soph								
Pecuniary treat	0.026	0.018	-0.050*	-0.036	-0.037	-0.030	-0.010	0.000
	(0.034)	(0.035)	(0.026)	(0.026)	(0.027)	(0.028)	(0.026)	(0.026)
Satisfaction treat	0.044	0.044	0.032	0.036	0.015	0.027	0.014	0.011
	(0.035)	(0.035)	(0.026)	(0.026)	(0.027)	(0.028)	(0.025)	(0.026)
Job-relatedness treat	-0.054	-0.039	-0.020	-0.011	0.002	0.015	0.006	0.008
	(0.034)	(0.035)	(0.025)	(0.026)	(0.027)	(0.028)	(0.025)	(0.026)
Observations	2029	2009	1448	1427	1448	1427	1448	1427
Controls		X		X		X		X

Notes: Each column-panel presents results from a single regression. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 3: Main results - Phase II - Experiment with undeclared students

	Salary of major		Satisfaction of major		Job-relatedness of major	
	(1)	(2)	(3)	(4)	(5)	(6)
Sample: All undeclared students						
Pecuniary treat	-1029.266	-776.783	-0.004*	-0.004	-0.009*	-0.009
	(758.793)	(717.366)	(0.003)	(0.003)	(0.005)	(0.005)
Satisfaction treat	-1010.033	-930.810	-0.006**	-0.007***	-0.010*	-0.010*
	(775.296)	(737.737)	(0.003)	(0.003)	(0.006)	(0.006)
Job-relatedness treat	-722.810	-528.504	-0.003	-0.003	-0.004	-0.002
	(768.206)	(727.469)	(0.003)	(0.003)	(0.006)	(0.005)
Observations	2498	2473	2498	2473	2498	2473
Sample: Undeclared male						
Pecuniary treat	-28.708	396.897	0.000	0.001	0.002	0.008
	(1327.805)	(1342.956)	(0.005)	(0.005)	(0.011)	(0.012)
Satisfaction treat	-1236.458	-1274.819	-0.002	-0.002	-0.008	-0.005
	(1353.546)	(1392.885)	(0.005)	(0.005)	(0.011)	(0.012)
Job-relatedness treat	-807.611	-716.909	0.003	0.004	0.011	0.017
	(1319.027)	(1325.037)	(0.005)	(0.005)	(0.011)	(0.011)
Observations	804	790	804	790	804	790
Sample: Undeclared female						
Pecuniary treat	-1444.067	-1272.676	-0.007**	-0.006**	-0.014**	-0.015***
	(910.871)	(847.789)	(0.003)	(0.003)	(0.006)	(0.006)
Satisfaction treat	-891.206	-768.007	-0.008***	-0.009***	-0.011*	-0.011*
	(931.154)	(869.908)	(0.003)	(0.003)	(0.006)	(0.006)
Job-relatedness treat	-794.353	-392.711	-0.006**	-0.006*	-0.013**	-0.010*
	(931.154)	(871.583)	(0.003)	(0.003)	(0.006)	(0.006)
Observations	1690	1683	1690	1683	1690	1683
Controls		X		X		X

Notes: Each column-panel presents results from a single regression. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Appendix 1: Additional Tables

Table A1: Summary statistics - Phase I - Experiment with random sample of students

	Freshmen		Sophomores		Juniors		Seniors+		Transfer/Other	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Gender:										
-Female	0.60	0.49	0.63	0.48	0.62	0.49	0.60	0.49	0.49	0.50
-Male	0.39	0.49	0.37	0.48	0.38	0.49	0.40	0.49	0.51	0.50
-Non-binary	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
International student	0.22	0.41	0.16	0.37	0.24	0.42	0.12	0.32	0.14	0.34
First-generation college	0.40	0.49	0.38	0.49	0.39	0.49	0.40	0.49	0.52	0.50
Ethnicity:										
-African-Am / Black	0.03	0.18	0.03	0.17	0.02	0.15	0.03	0.18	0.04	0.20
-Chinese	0.25	0.43	0.23	0.42	0.30	0.46	0.25	0.43	0.19	0.40
-East Indian / Pakistani	0.08	0.27	0.09	0.28	0.08	0.27	0.06	0.24	0.05	0.23
-Filipino	0.05	0.21	0.05	0.22	0.04	0.20	0.04	0.20	0.05	0.21
-Japanese	0.01	0.10	0.01	0.12	0.02	0.14	0.02	0.14	0.01	0.11
-Korean	0.02	0.14	0.03	0.16	0.03	0.16	0.03	0.17	0.02	0.15
-Latino / Other Spanish	0.04	0.19	0.04	0.20	0.04	0.20	0.05	0.21	0.06	0.23
-Mexican-Am / Mexican / Chicano	0.21	0.41	0.17	0.37	0.14	0.35	0.14	0.35	0.15	0.36
-Other	0.05	0.22	0.05	0.23	0.05	0.22	0.05	0.21	0.06	0.24
-Vietnamese	0.05	0.21	0.04	0.20	0.06	0.24	0.05	0.23	0.05	0.23
-White	0.21	0.41	0.25	0.43	0.21	0.41	0.27	0.44	0.30	0.46
Admission college:										
-Agricultural Sciences	0.18	0.38	0.19	0.39	0.17	0.38	0.21	0.41	0.25	0.43
-Biological Sciences	0.25	0.43	0.24	0.43	0.26	0.44	0.26	0.44	0.10	0.30
-Engineering	0.19	0.40	0.16	0.37	0.14	0.35	0.16	0.37	0.06	0.24
-Letters and Sciences	0.37	0.48	0.41	0.49	0.43	0.50	0.36	0.48	0.59	0.49
Weighted admission GPA	3.99	0.25	3.99	0.25	4.00	0.23	3.97	0.25	3.39	0.30
Outcomes:										
-Switch major	0.46	0.50	0.32	0.47	0.16	0.37	0.16	0.37	0.12	0.32
-Switch to higher salary major	0.13	0.33	0.11	0.32	0.08	0.26	0.06	0.24	0.03	0.18
-Switch to higher satis. major	0.14	0.35	0.11	0.31	0.09	0.29	0.06	0.24	0.04	0.20
-Switch to more job related major	0.11	0.31	0.11	0.31	0.09	0.29	0.07	0.25	0.04	0.20
Observations	1733		1565		1263		2661		3397	

Notes: Observations are unique at the student level.

Table A2: Summary statistics - Phase II - Experiment with all undeclared students

	Freshmen		Sophomores+	
	Mean	SD	Mean	SD
Gender:				
-Female	0.67	0.47	0.68	0.47
-Male	0.32	0.47	0.32	0.47
-Non-binary	0.00	0.05	0.00	0.00
International student	0.24	0.43	0.17	0.38
First-generation college	0.41	0.49	0.44	0.50
Ethnicity:				
-African-Am / Black	0.04	0.19	0.05	0.22
-Chinese	0.28	0.45	0.20	0.40
-East Indian / Pakistani	0.05	0.23	0.05	0.21
-Filipino	0.06	0.23	0.04	0.20
-Japanese	0.02	0.13	0.02	0.13
-Korean	0.02	0.15	0.03	0.16
-Latino / Other Spanish	0.05	0.22	0.05	0.23
-Mexican-Am / Mexican / Chicano	0.19	0.39	0.24	0.43
-Other	0.04	0.20	0.04	0.20
-Vietnamese	0.04	0.20	0.04	0.21
-White	0.20	0.40	0.24	0.43
Admission college:				
-Agricultural Sciences	0.24	0.43	0.24	0.43
-Biological Sciences	0.27	0.44	0.27	0.44
-Letters and Sciences	0.49	0.50	0.49	0.50
Weighted admission GPA	3.98	0.24	3.93	0.25
Outcomes:				
-Avg. salary of major	64747.83	13120.34	62178.46	13829.12
-Satisfaction of major	0.67	0.04	0.67	0.05
-Job-relatedness of of major	0.32	0.10	0.30	0.09
Observations	1821		1174	

Notes: Observations are unique at the student level.

Table A3: Balance test of treatment assignment - Phase 1 - Experiment with random sample of students

	Full Sample	Freshmen+Sophomores				
	No email	No email	Control email	Pecuniary	Satisfaction	Relatedness
Gender:						
-Male	-0.002	-0.005	-0.003	-0.001	0.013	-0.004
	(0.010)	(0.019)	(0.012)	(0.012)	(0.013)	(0.013)
-Non-binary	-0.513	-0.521	0.407*	0.389*	-0.146	-0.129
	(0.354)	(0.354)	(0.227)	(0.228)	(0.231)	(0.233)
International student	0.019	0.033	-0.017	-0.018	-0.014	0.016
	(0.015)	(0.028)	(0.018)	(0.018)	(0.018)	(0.018)
First-generation college	0.009	0.033	-0.022*	0.008	-0.028**	0.009
	(0.011)	(0.021)	(0.013)	(0.013)	(0.013)	(0.013)
Ethnicity:						
-Chinese	-0.045	-0.045	0.000	0.078**	0.009	-0.043
	(0.029)	(0.054)	(0.035)	(0.035)	(0.035)	(0.036)
-East Indian / Pakistani	-0.006	-0.021	-0.010	0.074**	-0.015	-0.028
	(0.032)	(0.059)	(0.038)	(0.038)	(0.038)	(0.038)
-Filipino	0.013	0.042	-0.025	0.041	0.008	-0.065
	(0.035)	(0.064)	(0.041)	(0.041)	(0.042)	(0.042)
-Japanese	-0.027	0.028	0.009	0.049	-0.009	-0.077
	(0.048)	(0.095)	(0.061)	(0.061)	(0.062)	(0.062)
-Korean	-0.002	0.039	0.064	0.081*	-0.089*	-0.095*
	(0.040)	(0.076)	(0.049)	(0.049)	(0.050)	(0.050)
-Latino / Other Spanish	-0.015	-0.059	0.043	0.031	0.016	-0.030
	(0.034)	(0.066)	(0.042)	(0.042)	(0.043)	(0.043)
-Mexican-Am / Mexican / Chicano	-0.030	-0.051	0.023	0.056	-0.008	-0.019
	(0.029)	(0.054)	(0.034)	(0.035)	(0.035)	(0.035)
-Other	-0.060*	-0.063	-0.004	0.109***	-0.028	-0.013
	(0.034)	(0.063)	(0.040)	(0.040)	(0.041)	(0.041)
-Vietnamese	-0.036	-0.063	0.010	0.112***	-0.018	-0.041
	(0.034)	(0.065)	(0.041)	(0.042)	(0.042)	(0.042)
-White	-0.015	-0.003	0.011	0.049	-0.015	-0.043
	(0.028)	(0.054)	(0.034)	(0.035)	(0.035)	(0.035)
Admission college:						
-Biological Sciences	0.000	-0.015	0.036**	0.032*	-0.029	-0.024
	(0.015)	(0.027)	(0.017)	(0.017)	(0.018)	(0.018)
-Engineering	-0.009	-0.002	0.004	0.002	-0.034*	0.031
	(0.018)	(0.030)	(0.019)	(0.020)	(0.020)	(0.020)
-Letters and Sciences	-0.003	-0.004	-0.001	0.005	-0.003	0.003
	(0.013)	(0.025)	(0.016)	(0.016)	(0.016)	(0.016)
Weighted admission GPA	0.017	0.020	0.005	-0.003	-0.031	0.008
	(0.014)	(0.038)	(0.025)	(0.025)	(0.025)	(0.025)
Observations	10619	3298	3298	3298	3298	3298
Mean of outcome	0.517	0.517	0.116	0.118	0.121	0.123
p-value (joint significance)	0.583	0.857	0.281	0.168	0.214	0.352

Notes: Observations are unique at the student level. Each column presents results from a single regression. "No email" is an indicator for the student not receiving an email. "Control email", "Pecuniary", "Satisfaction", and "Relatedness" are indicators for whether the student received the control email or pecuniary, satisfaction, or relatedness information, respectively. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table A4: Balance test of treatment assignment - Phase II - Experiment with all undeclared students

	Undeclared undergraduates			
	Control email	Pecuniary	Satisfaction	Relatedness
Gender:				
-Male	-0.024	0.002	0.011	0.011
	(0.017)	(0.018)	(0.017)	(0.018)
-Non-binary	0.152	-0.066	-0.223	0.137
	(0.190)	(0.197)	(0.192)	(0.197)
International student	0.018	-0.035	-0.006	0.024
	(0.025)	(0.026)	(0.025)	(0.025)
First-generation college	-0.018	-0.020	-0.029	0.067***
	(0.018)	(0.019)	(0.018)	(0.019)
Ethnicity:				
-Chinese	-0.022	0.036	0.012	-0.025
	(0.044)	(0.045)	(0.044)	(0.045)
-East Indian / Pakistani	-0.032	0.051	0.012	-0.031
	(0.052)	(0.054)	(0.052)	(0.054)
-Filipino	-0.059	0.003	0.068	-0.013
	(0.052)	(0.054)	(0.053)	(0.054)
-Japanese	-0.002	-0.018	-0.003	0.022
	(0.072)	(0.074)	(0.073)	(0.074)
-Korean	-0.002	0.007	0.036	-0.042
	(0.063)	(0.065)	(0.064)	(0.065)
-Latino / Other Spanish	-0.023	-0.037	0.077	-0.017
	(0.051)	(0.053)	(0.052)	(0.053)
-Mexican-Am / Mexican / Chicano	-0.042	0.045	0.052	-0.055
	(0.042)	(0.044)	(0.043)	(0.044)
-Other	0.017	-0.009	0.063	-0.071
	(0.054)	(0.056)	(0.055)	(0.056)
-Vietnamese	0.039	-0.008	-0.020	-0.010
	(0.054)	(0.056)	(0.055)	(0.056)
-White	-0.033	0.054	-0.017	-0.004
	(0.042)	(0.044)	(0.043)	(0.044)
Admission college:				
-Biological Sciences	-0.003	0.029	-0.028	0.003
	(0.022)	(0.023)	(0.022)	(0.023)
-Letters and Sciences	-0.006	-0.001	-0.020	0.027
	(0.020)	(0.020)	(0.020)	(0.020)
Weighted admission GPA	-0.014	-0.110***	0.107***	0.017
	(0.034)	(0.035)	(0.034)	(0.035)
Observations	2995	2995	2995	2995
Mean of outcome	0.234	0.261	0.244	0.260
p-value (joint significance)	0.842	0.156	0.046	0.369

Notes: Observations are unique at the student level. Each column presents results from a single regression. “Control email”, ”Pecuniary”, ”Satisfaction”, and ”Relatedness” are indicators for whether the student received the control email or pecuniary, satisfaction, or relatedness information, respectively. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Table A5: Results from Phase I - separating no email from control email

	Change major		Switch to higher salary major		Switch to higher satis. major		Switch to more job-related major	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample: Freshmen								
Pecuniary treat	0.042	0.030	-0.051	-0.040	-0.080*	-0.093**	-0.025	-0.027
	(0.049)	(0.051)	(0.039)	(0.042)	(0.041)	(0.045)	(0.036)	(0.039)
Satisfaction treat	0.074	0.046	0.029	0.003	0.006	-0.019	-0.048	-0.073*
	(0.049)	(0.051)	(0.039)	(0.041)	(0.041)	(0.044)	(0.036)	(0.039)
Job-relatedness treat	-0.011	-0.014	0.028	0.035	0.012	-0.001	0.008	0.004
	(0.050)	(0.052)	(0.039)	(0.042)	(0.041)	(0.045)	(0.036)	(0.039)
No email	0.026	0.004	0.003	-0.018	-0.003	-0.029	-0.020	-0.032
	(0.039)	(0.041)	(0.031)	(0.033)	(0.033)	(0.036)	(0.029)	(0.031)
Observations	1733	1688	1242	1191	1242	1191	1242	1191
Sample: Sophomores								
Pecuniary treat	0.017	0.031	0.019	0.003	0.071*	0.056	0.049	0.057
	(0.049)	(0.051)	(0.039)	(0.042)	(0.039)	(0.043)	(0.038)	(0.042)
Satisfaction treat	0.043	0.065	0.068*	0.058	0.069*	0.074*	0.077**	0.077*
	(0.048)	(0.051)	(0.038)	(0.042)	(0.038)	(0.042)	(0.037)	(0.041)
Job-relatedness treat	-0.008	0.042	0.012	-0.013	0.044	0.034	0.058	0.057
	(0.047)	(0.050)	(0.037)	(0.041)	(0.037)	(0.042)	(0.036)	(0.041)
No email	0.024	0.050	0.073**	0.056	0.067**	0.055	0.073**	0.074**
	(0.038)	(0.040)	(0.030)	(0.034)	(0.030)	(0.035)	(0.030)	(0.034)
Observations	1565	1516	1210	1156	1210	1156	1210	1156
Sample: Juniors								
Pecuniary treat	0.019	0.018	-0.029	-0.036	-0.047	-0.061	-0.046	-0.049
	(0.042)	(0.046)	(0.034)	(0.040)	(0.038)	(0.043)	(0.038)	(0.043)
Satisfaction treat	-0.050	-0.014	0.021	-0.003	0.035	0.008	0.035	0.016
	(0.043)	(0.047)	(0.034)	(0.039)	(0.038)	(0.042)	(0.038)	(0.042)
Job-relatedness treat	-0.006	0.004	-0.008	-0.011	-0.035	-0.042	0.012	-0.003
	(0.042)	(0.045)	(0.034)	(0.038)	(0.037)	(0.041)	(0.037)	(0.041)
No email	-0.036	-0.032	0.015	0.018	-0.007	-0.015	-0.007	-0.015
	(0.033)	(0.036)	(0.027)	(0.031)	(0.030)	(0.034)	(0.030)	(0.034)
Observations	1263	1213	1044	988	1044	988	1044	988
Sample: Seniors+								
Pecuniary treat	0.004	-0.019	0.035*	0.025	0.035*	0.025	-0.011	-0.030
	(0.029)	(0.031)	(0.021)	(0.022)	(0.021)	(0.022)	(0.022)	(0.023)
Satisfaction treat	0.003	0.002	0.012	0.011	0.012	0.016	-0.002	-0.005
	(0.029)	(0.030)	(0.020)	(0.022)	(0.020)	(0.021)	(0.021)	(0.022)
Job-relatedness treat	-0.037	-0.047	0.003	-0.000	-0.001	-0.002	-0.025	-0.036
	(0.029)	(0.030)	(0.021)	(0.022)	(0.021)	(0.022)	(0.022)	(0.023)
No email	-0.011	-0.016	0.010	0.004	0.009	0.007	-0.014	-0.019
	(0.023)	(0.024)	(0.017)	(0.017)	(0.016)	(0.017)	(0.017)	(0.018)
Observations	2661	2635	2246	2210	2246	2210	2246	2210
Controls		X		X		X		X

Notes: Observations are unique at the student level. Each column presents results from a single regression. "No email" is an indicator for the student not receiving an email. *, **, and *** indicate statistical significance at the 10, 5, and 1 percent levels, respectively.

Appendix 2: Email text

I hope this email finds you well. I am part of a research team here at UC Davis. Choosing a college major can have a large impact on the life of a student, even long after they graduate. Studies find, however, that students often lack important information about college majors when making that decision.

[Insert treatment text]

We hope you feel well informed about your college major decision and that you choose the major that fits you best. Thank you for your time.

[Pecuniary treatment text] Did you know that how much you earn after graduating can depend on your major field in college? Here is a list of average yearly earnings for California wage earners by their college major:

- Computer Engineering - $97,000
- Computer Science - $91,000
- Chemical Engineering - $78,000
- Economics - $75,000
- Biology - $73,000
- Chemistry - $70,000
- Political Science - $66,000
- Civil Engineering - $64,000
- Mechanical Engineering - $61,000
- Mathematics - $59,000
- Business - $58,000
- Communication - $54,000
- History - $50,000
- Journalism - $49,000

- Psychology - $45,000
- English - $44,000
- Foreign Language $41,000
- Sociology - $41,000
- Education - $23,000

[Satisfaction treatment text] Did you know that job satisfaction after graduation can depend on your major field in college? Here is a list of what percentage college graduates said they are satisfied at their job, by their major field in college:

- Computer Engineering - 82%
- Computer Science - 78%
- Communication - 76%
- Civil Engineering - 76%
- Mechanical Engineering - 76%
- Chemical Engineering - 75%
- Journalism - 70%
- Business - 70%
- Economics - 68%
- Political Science - 67%
- Chemistry - 67%
- Biology - 66%
- History - 65%
- Psychology - 64%

- English - 63%
- Education - 63%
- Mathematics -63%
- Foreign Language - 60%
- Sociology - 60%

[Job-relatedness treatment text] Did you know that jobs students get after college are sometimes not related to their major field in college? Here is a list of what percentage college graduates said their job is "highly related" to their major field:

- Computer Engineering - 62%
- Civil Engineering - 60%
- Computer Science 57%
- Mechanical Engineering - 51%
- Chemistry - 51%
- Chemical Engineering - 45%
- Education - 40%
- Biology - 36%
- Mathematics - 35%
- Communication - 33%
- Journalism - 31%
- Business - 30%
- History - 30%
- Economics - 25%

- Foreign Language 23%
- Psychology - 23%
- English - 23%
- Sociology - 19%
- Political Science - 16%