Nudges to Encourage Female and Minority Students to Enroll in Additional Economics Courses[1]

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Abstract

Economics continues to face problems of underrepresentation by gender, race, and their intersection. Only about 30% of all undergraduate economics degrees are completed by women and racial minority undergraduates major in economics at a rate one third of white students (see Lundberg, S., & Stern, 2019; Bayer and Wilcox, 2019). To address the gender problem, Li (2018) and Porter & Serra (2020) implemented email or alumni visit nudges and found that they substantially increased female enrollment in upper-level economics courses. In this paper we replicate their interventions with a new population of over 800 students at an urban regional public university. We estimate the effects of these interventions on enrollment in higher level economics courses with a two-by-two experimental design where each section received either just an email nudge, just an alumni visit, both an email and alumni visit, or neither. The estimated effects on enrollment in upper-level economics courses is similar in this new experiment to the replicated studies, though in some cases statistical significance is weaker. Similar to previous literature, we find women's enrollment increases with these interventions, but our finding that men's enrollment also increases is unique. Our work also extends the literature by providing new evidence that these interventions increase the likelihood that African American and Latinx students enroll in and complete additional upper-level economics courses. This experiment provides additional evidence that these low-cost nudges can help address underrepresentation of women and racial minorities in Economics, though with some caution surrounding combined effectiveness.

Introduction

The underrepresentation of female and minority students and professors in Economics at all levels of higher education is indisputable. Bayer and Wilcox (2019) report that in 2015 roughly 39,000 students across the U.S. completed an undergraduate degree in economics, but racial minorities or women major in economics at roughly one-third the rate of their white or male counterparts. Additionally, both Bayer and Washington (2020) and a 2018 report from the National Center for Science and Engineering Statistics report that roughly 10% of the economics degrees at the PhD level were awarded to Black, Latinx, and Native American individuals and this number has decreased (National Center for Science and Engineering Statistics 2018; Bayer & Washington 2020). In 2016 it was reported that only 24% of tenured or tenure-track economics professors were women (Bayer & Rouse 2016). This lack of representation is important because, nearly 30% of Black, Latinx, and Native American economists reported direct discrimination from either peers or colleagues during their undergraduate studies and careers (Bayer & Washington 2020). Additionally, these findings concluded that students felt they did not receive enough knowledge about the vast types of careers they could build with an economics degree and had wished for a mentorship program to assist them both throughout their undergraduate careers as well as in their early careers in the workforce.

To address this paradigm, economists have searched for effective strategies to encourage enrollment and persistence for underrepresented students. One such method is the use of nudge interventions in principles level courses to increase women's enrollment in economics (Li 2018; Porter & Serra 2020). Li (2018) sent an email nudge to female students who performed above the median on their mid-term exam, congratulating them and encouraging them to enroll in more economics courses. With minimal additional support, the female population in the major

increased almost 50%. The Porter & Serra (2020) experiment provided just two short visits from female alumni in principles classes, and it also nearly doubled women's enrollment in advanced Economics courses.

This study's contributions are that it replicates and expands these two previous experimental nudges to improve female representation in the Economics major and gain new insight into their effectiveness of these strategies for Black and Latinx/Hispanic students. We replicate the interventions from Li (2018) and Porter & Serra (2020) individually and test what happens when the interventions are combined at a large regional urban public institution.[2] Additionally, the analysis here draws a sample from a university population with larger representation of racial minorities, with only half of students identifying as white and over 30% of students identifying as either Black or Latinx/Hispanic.

Our results indicate that either of these interventions individually nearly doubles the chance that a woman or underrepresented minority student takes an upper-level economics class. The effects of the email nudge like that used by Li (2018), and alumni visit interventions from Porter & Serra (2020), individually have a significant and positive impact for women of similar magnitude as demonstrated in those previous studies. We also demonstrate that a program originally aimed at women (and mostly white women) is equally effective at increasing the participation of Black and Latinx/Hispanic students. We can detect these effects in part due to the statistical power of having a sample that is roughly one third Black or Latinx/Hispanic, while the previous studies had a mostly white student body. It is worth noting that most students received alumni visits from self-identified African American women, though our sample size is

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[2] We use the term replication in the sense that Hamermesh (2007) refers to as scientific replication where the same methods are used on a new population as opposed to pure replication which would use the same data.

too small to compare results by the race of the alumni and student. These are extremely low-cost interventions that represent an easy first step for Economics departments to reduce existing gender and racial gaps in their programs and in the field.

While each intervention is independently effective, when the two interventions are combined, there is consistently zero effect on student enrollment in future economics courses, though potentially some positive effects for racial minorities. We discuss in this conclusion how the lack of combined effects may be driven by women's responses to the combined intervention and that the visit from a very high achieving alumnus may dissuade some students from pursuing additional economics courses and with the information on their grades they could not live up the high performing standards of the star alumnus.

Literature Review

Evidence from two key studies shows that role models and nudge interventions can have a positive effect on female enrollment in economics (Porter & Serra 2020; Li 2018). Porter & Serra (2020) invited two successful female alumni from the university's economics program to meet with the current introductory economics students to discuss their experiences in the program as well as their careers after college for about 15 minutes. The role model intervention nearly doubled women's enrollment in upper-level economics courses, with around 20% completing an advanced economics courses in comparison to 11% in a control group (Porter & Serra 2020).

Porter & Serra (2020) built off previous role model studies, such as Hale and Regev (2014) who reported that greater proportions of female faculty in highly acclaimed institutions resulted in a greater proportion of women completing PhD's. Recent findings (González-Pérez et

al. 2020) have also demonstrated successful role model interventions at the secondary education level rather than at the collegiate level. In their study, diverse female experts in STEM careers spoke to girls in middle school and early high school about their experiences in the field and provided encouragement for young girls regarding their potential. As a result, the young girls' interest in STEM fields and anticipated success in the field grew significantly, reducing preconceived notions attached to gender stereotypes (González-Pérez et al. 2020). Additionally, Patnaik et al. (2023) found that female speakers influenced more female students to enroll in intermediate economics courses, the same being said for males.

Li (2018) illustrated that encouraging email nudges, in combination with information on potential careers in economics, and mentor meetings, resulted in a doubling of the number of women enrolling in intermediate economics courses. (2018). Li's nudge was an email to congratulate women who had scored higher than the median grade on their exam. The email told students their relative rank in the class and encouraged them based on their score to consider taking more economics classes. The intervention had the strongest influence on women who were already achieving high grades in their principle's courses. This contrasts with Porter and Serra's (2020) findings which indicate the effects of the role model interventions had no noticeable effect on high performing female students. However, Porter and Serra indicate this could be due to limitations associated with the smaller sample size in their study.

Other studies have used email nudges to improve performance or increase participation. For example, Smith et al. (2017) concluded that grade nudges at the beginning and throughout the semester better informed students of their present standing in the course and incentivized them to either continue their good work or seek help to improve. Additionally, (Carrell & Kurlaender 2020) found that students are more motivated in class when their professor reaches

out directly to discuss their current academic performance and offer support. It is important to note that nudges must be carefully tailored to attract a certain outcome. For example, in Pugatch & Schroeder's study (2020) various nudge interventions were implemented, including information regarding the university's economics department, salary potential, career resources, and a video displaying positive feedback from former and current students in the program. The motivation for this study was to increase gender diversity in economics. However, the results concluded no change in female enrollment, but roughly a 3% increase in male enrollment (Pugatch & Schroeder 2020). It was posited that this could be due to female students being more receptive to nudges designed for increased direct engagement.

A student's grade in their introductory economic course can greatly influence their decision to enroll in an intermediate course and pursue the major as well. It has been shown that women's performance at the same institution in economics courses is lower relative to their grades in other courses at the same institution (Gitter & Groves 2021), and this could deter them from enrolling in another economics course. Consistent with these findings is also the work of Emerson et al. (2012), and Rask & Tiefenthaler (2008) who found that women tend to pursue economics as a major if they achieve a relatively high grade in their introductory course and are confident that they will continue to perform well in future economics courses. Emerson et al. also conclude that students' relative perception of their academic performance is extremely relevant when deciding whether to take further economics courses (2012). Therefore, an effective nudge could involve seeking out students who are performing above average in their introductory courses and encouraging them to take more economics courses.

Experimental Design and Setting

The sample used for this study consisted of students enrolled in a semester long Principles of Microeconomics course at a large regional urban public university in the Mid-Atlantic region of the United States. This university is diverse with over 50% of the current student body identifying as non-white as of 2023. In 2019 when this experiment was conducted, the institution reported 33.3% of undergraduates were underrepresented minorities which include African American/Black, Hispanic/Latinx, Native American and Hawaiian individuals; and 12.2% of students identified as either Asian or multiracial[3].

It is common for Principles of Microeconomics to be the first economics course students take at this institution because of its lower course number. Also, students hoping to enter majors in the College of Business, which is roughly 10% of the 20,000 undergraduates at this university, are required to complete Principles of Microeconomics (ECON 201), Principles of Macroeconomics (ECON 202), and Statistics for Business and Economics (ECON 205) as well as four additional introductory level business related classes, earning a C or better in each course and averaging a B- across all seven classes. The class sizes for the economics courses range from 30 to 112 students per section with three of the 18 sections offered containing between 100 and 112 students and the remaining sections between 30 and 44 students.

The experiment was carried out in a two-by-two, stratified by instructor design, where each section received either one, both, or neither intervention. Across the 18 sections of the Principles of Microeconomics course, four were assigned the grade-related email nudge in which

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[3] Statistics regarding racial demographics were provided by the Office of Institutional Research at the university. Racial categories are self-defined and unable to address complexities such as Latinx students of African descent or subgroup population within Asian identities (e.g. Indian or Chinese)

students who scored above the median on the midterm exam were given congratulations and encouragement to enroll in additional economics courses. All students in the email intervention group received an informational email with their grade on the first midterm exam in percentile terms and we can confirm that over 70% of students opened this email and were made aware of the message. Four sections, received visits from two female alumni who each spoke with students for roughly 15 minutes about their experiences as a student and how their coursework relates to their current job.[4]   An additional four sections received both interventions and the remaining six sections served as control groups.

These interventions took place in Fall 2019, and students made class enrollment decisions for Spring 2020 unaffected by the pandemic that would come in the early months of the Spring 2020 semester. The Fall 2020 and Spring 2021 semesters were completed by students entirely online at this university given the circumstances of the pandemic. The data was collected in late 2022 after students had returned to campus.

The experimental stratification is based on faculty and on class size. Eight faculty taught the eighteen sections for the semester, with the number of sections taught by each faculty ranging from one to five. To stratify the sample, we first selected the three instructors who taught the greatest number of sections - three, four, or five. The instructors who taught five or four sections were randomly assigned one section to each experimental group, only the email, only the visit, both the email and visit, and the remaining sections were control sections. One other instructor taught two sections, while the rest taught only one. Stratification groups were created based on class size (creating one group for the three large section classes) and times of day to ensure a

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[4] 2 sections in the alumni group received visits from African American female alumni and the remaining two sections received 1 visit from an African American female and 1 visit from another female alumni. Given the sample size we do not estimate the specific effect of African American visits.

similar number of sections in each group. We show in Appendix B that the stratification resulted in a balanced sample between groups across gender, race, number of credits completed and performance in other courses. The panel is only unbalanced in terms of the percentage of students in large sections, but a robustness check using only fifteen sections with under fifty students yields similar results and is presented in Appendix D.

Descriptive Statistics

The main analysis uses data on 838 students who completed the Principles of Microeconomics courses with a letter grade inclusive of those who failed in the semester the experiment took place. Those descriptive statistics appear in Table 1.[5] This grade data was first collected at the end of Fall 2019 and course enrollment in upper-level economics courses was retrieved in late 2022.

The main outcome of interest is if students persisted in economics and either enrolled in or completed an upper-level economics course (either a 300 or 400 level see description below) prior to graduation. At the university of interest there are three introductory level courses (Micro, Macro and Stats), of which the microeconomics course where the data was collected was one.[6] Upon completion of all three introductory classes, students can enroll in 300- level classes that include intermediate Microeconomics, Macroeconomics and Statistics as well as field courses such as International Economics, Development Economics, Labor Economics, Sports Economics, or Money & Banking. Economics minors take any four of these 300 level classes

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[5] We do not include students who withdrew from the course. In the Appendix B we show that intervention had no observable effect of the percentage of students who withdrew from the class and that the exclusion of these students has no substantial effect on the key results.

[6] To major in Business fields such as Marketing, Finance, or Management a student must take all three introductory courses. It is worth noting that these majors serve roughly 2,000 students roughly one-tenth of the undergraduate population, while the Economics major was closer to 200 students at the time of the experiment.

and those choosing to major in economics must complete intermediate Microeconomics, Macroeconomics and Statistics as well as three other 300-level electives and two 400-level courses typically geared toward majors and include classes in Econometrics, Game Theory, or advanced field courses requiring knowledge of intermediate level concepts.

We measure participation in upper-level classes as whether the student has enrolled in and completed any 300 or 400 level economics courses (*Any300, Any400*). In the sample, there is a 10% probability that a student will enroll in a 300-level course and roughly a 1% probability that a student will enroll in a 400-level class (see Table 1 below). Our third variable measures if a student successfully completed all three introductory economics courses (*Allintrostaken*), which 28% of the students in the sample did. The reason for the stark contrast in these probabilities could be attributed to this university system requiring the three intro economics courses as prerequisites for majors in the business college such as Accounting, Marketing, Finance, and Management. The final two dependent variables are *Econcourses* and *Grade4* indicating the number of economic courses a student has taken in succeeding semesters and the student's grade on a 4.0 scale in the course. Table 1 shows students completed on average 1.25 additional courses and the average grade was a 2.47 on a 4.0 scale (roughly between a C+, 2.33, and B-, 2.67).

The main independent variables reflect the three experimental groups in comparison to the control group: $Visitonly, Emailonly, \& EmailxVisit$. *Visitonly* is a variable indicating if the student was in a section that only received visits from the two female alumni who spoke to their class about their time at the university and their economics career thereafter. *Emailonly* is a dummy variable indicating if students received only an email nudge as described above and no alumni visits. It should be noted that while every student in this intervention group received an

email, those who scored above the median on an exam received additional encouragement to consider majoring in economics[7]. The variable $EmailxVisit$ is for students who received both treatments, the email and the visit. In our sample, 24.1% of students received only the email, 18.1% of students received alumni visits, and 25.2% of students received both. As mentioned above these differences reflect variation in class sizes.

The sample is roughly 50% white, 26% African American/Black and 8% Hispanic/Latinx. Race information is self-reported and based on the categories provided by the university (See Table 1 below). Women are underrepresented in the sample compared to the undergraduate population at the university as a whole with only 39% of the sample identifying as female, compared to 55% of the university population.

Class sizes varied substantially with fifteen of the sections having under 40 students and three sections having close to 100. As indicated in table 1, roughly 32% of the sample was enrolled in a course section with over 50 students and it is possible that students in large classes do not receive the same assistance or feel comfortable taking the initiative during class sessions to speak up, and this could impact their performance in the course. Students in their first year perform worse grade wise (Gitter & Groves, 2021), though have more opportunities to take additional credits. Based on credits completed, roughly 29% of students were in their first year. Given that the measurement of credits can also include transfer credits such as college credits earned during high school, they may also be an indication of a student with a higher aptitude and/or college experience.

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[7] Please refer to appendix A to view the two differing email messages sent to students who scored above and below the median.

Table 1: Descriptive Stats

Outcome Variables	Mean (SD)	Control Variables	Mean
Any300	9.9 %	Female	39.1 %
Any400	1.4 %	Asian	5.9 %
All Intros Taken	27.9 %	Black	26.2 %
Econ Courses	1.25 (1.5)	Hispanic	8.4 %
Grade4	2.47 (1.0)	Other	5.4 %
Experimental Groups		White	49.2 %
Email Only	24.2 %	First Year	28.9 %
Visit Only	18.1 %	Second Year	17.7 %
EmailxVisit	25.2 %	Large50	32.4 %

* N = 838. All variables except Econ Courses and Grade 4 are binary.
Omitted categories are control group, male students, white students,
students third year or higher, and those in small courses

The unadjusted effects of the experiments shown below in Table 2 suggest that receiving just an email or an alumni visit increased the chance of persisting in the major and taking a 400-level class. The single intervention groups (email only or visit only) had roughly 2.5% probability of students taking 400-level courses, compared to 0.4% for the control group and this effect was statistically significant with a t-test. Students who received one intervention were more likely to take a 300-level course, but the difference is not statistically significant. The effects on grades are mixed, though this could be due to the substantial variation by professor in average grades. The combination of both alumni visits and email nudges had the largest effect on students taking all introductory courses. Students in the control group had a 28.7% probability of enrolling in all introductory three courses for business and economics. However, students who received both the email and alumni visit had a 32.4% probability of enrolling in all three of these introductory courses.

Table 2: Mean Outcomes by Intervention

Experimental Group	Any 300	Any 400	Econ courses	All intros taken	Grade4
Control	9.6%	0.4%	1.238	28.7%	2.378
Just Email	13.0%	2.3%***	1.379	25.4%	2.292
Just Visit	13.8%	2.5%***	1.369	27.5%	2.729***
Visit & Email	6.4%	1.4%***	1.260	32.4%	2.539

Econometric Frameworks of Interest

The effects of the experiment are measured using an econometric model detailed below for five outcomes. The two main outcomes are used: *Any300,* and *Any400,* with one indicating the student has completed any three hundred level course or any four hundred level course, and zero if they have not. To compare these results to previous studies (Li, 2018 and Porter and Serra, 2020) we focus on *Any300 and Any400.* The subscript (s) indicates the section, (i) is for a unique individual student, and (j) is for a unique professor.

We also measure if the student has taken all three introductory economics courses, where *AllIntros* is a binary indicator which equals one if the student completed Macroeconomic Principles as well as Statistics in addition to the Microeconomic Principles course. The final two variables measure the number of economics courses taken in total, $EconCourses_i$ (number of additional economics courses taken) and the grade in the microeconomics class of interest, *Grade4* (grade in the course on 4.0 scale).

The main independent variables of interest are the three experimental groups: *Visitonly, Emailonly, and EmailxVisit* compared to the omitted control group. Demographic binary controls are added to the model pertaining to gender (*Female*) and race (*Asian, Black, Hispanic,*

& *Other*) with white students being the omitted comparison group.[8] Additional controls include a student's credit standing (*Firstyear, Secondyear*), and section class size (*Large50*).

The regressions also include professor fixed effects. Stratification ensured that no two sections of the professor were assigned the same treatment, except one professor with five sections who was allocated two control sections. Professors at this university do have the liberty of choosing their own materials, curriculum, and general resources in the classroom so we clustered at the section level to account for variation in course sections and because the experiment was randomized at the section level.

$$Y_i = \beta_0 + \beta_1 Emailonly_{is} + \beta_2 Visitonly_{is} + \beta_3 EmailxVisit_{is} + \beta_4 Female_i + \beta_5 Asian_s \\ + \beta_6 Black_s + \beta_7 Hispanic_s + \beta_8 Other_s + \beta_9 Firstyear_s + \beta_{10} Secondyear_s \\ + \beta_{11} Large50 + \propto_j \sum_{n=1}^{n-1} Professor_j + \mathcal{E}$$

We run subgroup analysis to measure the effects of the experiment for subgroups by performance on the first exam (above/below median), gender, and race. For race, we limit the sample to Latinx/Hispanic, and Black students as they are underrepresented racial minorities discussed in the literature above. As an additional analysis, we test the probability of a student withdrawing from the course and run additional OLS models, testing whether the interventions influenced withdrawal rates (see Appendix C). Withdraw rates were minimal with only 23 students out of 862 earning a W grade, and we were able to conclude that the experiment had no measurable influence on withdraw rate. Including students who withdrew does not change the

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[8] All students in this sample identified as Male or Female, in other data from the institution we have observed non-binary or other gender identities. For this paper we use only two genders and use this footnote to recognize that like our gender data is limited.

core results as shown in Appendix C. Finally, in Appendix D we perform a robustness check where we drop one instructor from the sample and rerun the analysis, and the results are largely unchanged though not statistically significant when two professors with a larger number of students are omitted. We also find similar results when we re-estimate the models using only the population in the 15 of 18 sections with fewer than 50 students, where the other three have over 100.

Results

Pooled Sample

The core result is that interventions when used individually increased the likelihood of enrolling in and completing upper-level economics courses compared to the control group, however the group that received both interventions had limited effects as seen in Table 4 below. The email only and alumni only interventions are both estimated to increase the probability of a student taking a 300-level Economics course by roughly 7 and 8 percentage points, compared to 9% in the control groups, though the coefficients are only significant at the 10% level. These results are consisted with Li (2018) and Porter & Serra's (2020) findings of increases between 50 to 100% of participation in higher level courses. The results for the effects on students taking 400 level courses are significant at the 5% level with the email only and visit only increasing the chance a student takes a 400-level course by 2.9 percentage points and 3.5 percentage points and significant at the 5% level, compared to a mean in the control group of 0.4%.

Sections with students who received both interventions had no statistically significant effects on upper- level courses (*Any300 or Any400*) compared to the control group. Additionally, the F-Test suggests that email only and visit only interventions increased the chance of taking a 300-level course over the group with both interventions by a statistically

significant amount. We discuss potential reasons for the ineffectiveness of the combined interventions in the conclusion.

Examining the other outcomes shows the students in the email only intervention group took roughly 0.36 more courses than the control group, which averaged 1.24 additional courses. Grades in both the email only and visit only increased by just over 0.25 on 4.0 scale compared to the control group which is roughly equivalent to increasing from a C+ (2.33) to a B- (2.67). However, we cannot reject that these effects sizes are the same as the group that received both interventions.

Table 4: Main Regression Pooled Sample

	(1) Any300	(2) Any400	(3) All Intro	(4) Econ courses	(5) Grade 4
Email Only	.078*	.035**	-.018	.362*	.269**
	(.04)	(.016)	(.059)	(.21)	(.122)
Visit Only	.067*	.029**	-.026	.25	.26**
	(.036)	(.014)	(.053)	(.187)	(.109)
Both Email & Visit	-.011	.013	.026	.124	.034
	(.04)	(.016)	(.06)	(.211)	(.123)
F-Test#	ES & VS	X	X	X	X
Female	-.022	-.015*	-.121***	-.295***	.115*
	(.022)	(.009)	(.032)	(.114)	(.066)
Asian	.037	.01	.004	.269	-.132
	(.043)	(.017)	(.064)	(.228)	(.133)
Black	-.036	0	.004	-.054	-.368***
	(.025)	(.01)	(.037)	(.132)	(.077)
Hispanic	.054	.034**	-.007	.22	-.146
	(.039)	(.015)	(.058)	(.206)	(.12)
Other	.001	.01	.089	.308	-.309**
	(.046)	(.018)	(.069)	(.244)	(.142)
First year	-.098***	-.021**	.134***	-.11	-.28***
	(.025)	(.01)	(.038)	(.133)	(.078)
Second year	-.059**	-.015	.024	-.176	.125
	(.029)	(.011)	(.043)	(.152)	(.089)
Large50	-.155**	-.038	-.059	-.533	-1.298***
	(.076)	(.03)	(.113)	(.398)	(.232)
Constant	.175***	.014	.241***	1.317***	2.692***
	(.056)	(.022)	(.083)	(.293)	(.171)
Observations	838	838	838	838	838
R-squared	.047	.027	.048	.026	.184
Control Group Mean	9.6%	0.4%	28.7%	1.238	2.378

Standard errors are in parentheses, clustered at the section level. Includes Instructor fixed effects, but omitted for space.
*** $p<.01$, ** $p<.05$, * $p<.1$
 # ES or VS indicates email only or visit only is greater than both using a F-test at the 5% level. X indicates no significant differences

Grades as a Potential Mechanism

   The results of an additional regression below suggest that even controlling for grades the email and visit only intervention groups saw increased enrollment in higher level courses compared to the control group (See Table 5 below). Specifically, to test if higher grades are leading to the increases in enrollment in 300 or 400-level Economics classes we include two controls for grade (*AGrade* and *BGrade*), which equal 1 if the student received an A or A- in the class or a B, B+, or B- in the course, with those receiving a C+ or lower as the comparison group. As expected, students with higher grades were more likely to take 300 level courses and students who earned an A are more likely to take 400 level courses than the comparison group.

   The increases for the email and visit only groups for 400 level classes are similar to those without controls for grades. The point estimates for 300 level classes are smaller and in the case of visit only no longer statistically significant. These results suggest that the interventions when used on their own increase enrollment through pathways other than grades.

Table 5: Pooled Sample with Controls for Course Grade

	(1) Any300	(2) Any400	(3) Allintro	(4) Econ courses
AGrade	.137***	.04***	.034	.574***
	(.031)	(.013)	(.047)	(.166)
BGrade	.064***	.015	.065*	.435***
	(.024)	(.01)	(.036)	(.127)
Email Only	.066*	.032**	-.023	.307
	(.039)	(.016)	(.059)	(.208)
Visit Only	.056	.025*	-.026	.211
	(.035)	(.014)	(.053)	(.186)
Both Email & Visit	-.009	.013	.029	.141
	(.04)	(.016)	(.06)	(.209)
F-Test#	X	X	X	X
Female	-.028	-.017**	-.126***	-.331***
	(.021)	(.009)	(.032)	(.113)
Asian	.038	.01	.006	.275
	(.043)	(.017)	(.064)	(.226)
Black	-.025	.003	.007	--.002
	(.025)	(.01)	(.038)	(.132)
Hispanic	.055	.034**	-.003	.237
	(.039)	(.015)	(.058)	(.204)
Other	.01	.013	.095	.36
	(.046)	(.018)	(.069)	(.242)
First year	-.084***	-.017*	.139***	-.043
	(.025)	(.01)	(.038)	(.133)
Second year	-.063**	-.016	.022	-.194
	(.028)	(.011)	(.043)	(.15)
Large50	-.127*	-.031	-.04	-.373
	(.075)	(.03)	(.113)	(.396)
Constant	.136**	.003	.216**	1.103***
	(.056)	(.022)	(.084)	(.295)
Observations	838	838	838	838
	.07	.039	.052	.046

Standard errors are in parentheses, clustered at the section level. Includes Instructor fixed effects, but omitted for space.

*** p<.01, ** p<.05, * p<.1

\# ES or VS indicates Email only or visit only is greater than both using a F-test at the 5% level. X indicates no significant differences

Above and Below Median Grades: First Exam

We demonstrate the effectiveness of the encouraging email to students who scored above the median on the first midterm exam, as the results below indicate the email only intervention increased completion of upper-level course substantially more for students who scored above the median. For the subsample of students scoring above the median on the midterm we estimate the email only intervention increased completion of 300-level courses by 16.9 percentage points compared to a mean in the control group of 11.9, see Table 6 below. For the subsample, the visit only intervention also increased the chance of taking 300-level courses by 9.8 percentage points. Similarly, the visit only group took 0.7 more economics courses compared to a mean of 1.39 in the control group. Again, the combination of both interventions does not show an effect on any outcome compared to the control group. Though an F-test does not show statistically significant difference at the 5% level between experimental groups, except on grades.

On the other hand, students who scored at or below the median do not show any difference between the control and experimental group in any measure of economics courses taken, though there are weak results on grades (see Table 7). This is expected as the email intervention only provided information on the students' exam scores. These students are also less likely to take additional economics courses, for example in the control group 6.7 of students scoring at or below the median take a 300-level course compared to 13.7 of those above the median.

Table 6: Regression for Only Students Scoring Above the Median on First Midterm

	(1) Any300	(2) Any400	(3) All Intro	(4) Econ courses	(5) Grade 4
Email only	.169***	.041	.023	.715**	.268**
	(.062)	(.025)	(.085)	(.302)	(.134)
Visit only	.098*	.034	-.049	.248	.338***
	(.058)	(.023)	(.078)	(.279)	(.124)
Both Email & Visit	.059	.029	.006	.27	-.01
	(.064)	(.026)	(.087)	(.31)	(.138)
F-Test#	X	X	X	X	ES,VS
Female	0	-.017	-.094**	-.082	.181**
	(.035)	(.014)	(.048)	(.17)	(.076)
Asian	-.044	-.014	-.054	-.247	-.047
	(.064)	(.026)	(.086)	(.309)	(.137)
Black	-.046	.002	.021	.048	-.256***
	(.045)	(.018)	(.06)	(.216)	(.096)
Hispanic	.024	.042*	.013	.402	-.246*
	(.062)	(.025)	(.084)	(.299)	(.133)
Other	.04	.021	.055	.514	-.236
	(.075)	(.03)	(.102)	(.364)	(.162)
First year	-.118***	-.024	.164***	-.1	-.115
	(.043)	(.017)	(.059)	(.21)	(.093)
Second year	-.07	-.029	.086	-.194	.112
	(.044)	(.017)	(.059)	(.211)	(.094)
Large50	-.131	-.049	-.141	-.593	-1.167***
	(.098)	(.039)	(.133)	(.475)	(.211)
Constant	.082	.019	.303***	1.143***	2.884***
	(.07)	(.028)	(.094)	(.337)	(.15)
Observations	427	427	427	427	427
R-Squared	.05	.035	.048	.03	.284
Control Group Mean	11.9%	0.7%	29.1%	1.31	2.76

Standard errors are in parentheses, clustered at the section level
*** p<.01, ** p<.05, * p<.1
ES = Email only is greater than both, VS = visit only is greater than both using a F-test at the 5% level

Table 7: Regression for Only Students Scoring Below the Median on First Midterm

	(1) Any300	(2) Any400	(3) All Intro	(4) Econ courses	(5) Grade 4
Email only	-.016	.031	-.056	.002	.365**
	(.049)	(.019)	(.084)	(.293)	(.165)
Visit only	.045	.027	.011	.321	.261*
	(.043)	(.017)	(.073)	(.256)	(.144)
Both Email & Visit	-.078	-.004	.052	-.025	.172
	(.049)	(.019)	(.083)	(.291)	(.164)
F-Test#	X	X	X	X	X
Female	-.038	-.011	-.142***	-.504***	.193**
	(.027)	(.011)	(.046)	(.16)	(.09)
Asian	.136**	.043*	.108	1.005***	-.27
	(.058)	(.023)	(.099)	(.346)	(.195)
Black	0	.001	-.003	-.058	-.102
	(.03)	(.012)	(.051)	(.177)	(.1)
Hispanic	.101**	.026	-.039	.07	.024
	(.05)	(.019)	(.085)	(.296)	(.167)
Other	-.02	-.006	.122	.17	-.232
	(.057)	(.022)	(.097)	(.339)	(.191)
First year	-.068**	-.016	.117**	-.109	-.063
	(.03)	(.012)	(.052)	(.181)	(.102)
Second year	-.046	.004	-.068	-.19	.11
	(.038)	(.015)	(.065)	(.226)	(.128)
Large50	-.053	-.035	-.163	-.613	-1.784***
	(.094)	(.037)	(.16)	(.557)	(.314)
Constant	.105	.012	.324***	1.486***	2.191***
	(.068)	(.026)	(.115)	(.402)	(.227)
Observations	400	400	400	400	400
R-Squared	.08	.046	.077	.069	.221
Control Group Means	6.9%	0.0%	28.2%	1.15	1.93

Standard errors are in parentheses, clustered at the section level
*** p<.01, ** p<.05, * p<.1
ES = Email only is greater than both, VS = visit only is greater than both using a F-test at the 5% level

Female and Male Only Population

Both female and male students in the visit only and email only groups had higher enrollments in upper-level economics courses compared to the control group, though the statistical significance is weaker (see Tables 8 and 9 below). We also find the interventions appeared to have stronger increases for women for 300-level classes and for men for 400-level courses. Finally, the negative or null effects of combining the interventions is more pronounced for women, which we discuss further in the conclusion.

For female students being in the visit only group increased the chance of taking a 300-level class by 10 percentage points (significant at the 10% level), while the point estimate is similar for email only intervention, it is not statistically significantly different from zero. This is substantial compared to a mean in the control group of 6.1%. The coefficient for the female subsample on both intervention group is negative compared to the control group. F-tests suggest that the email only and visit only groups had estimated greater rates of participation in 300 level classes compared to those that received both interventions. In terms of other measures, the number of additional economics courses increased by 0.4 courses for the visit only group (significant at the 10% level). The interventions either on their own or in unison did not increase the likelihood of enrolling in a 400-level course for women.

For male students the email only group saw an increase likelihood of taking a 400-level class by 5.4 percentage points and the visit only group by 3.7 points compared to the control group, significant at the 5 and 10 % level. Unlike the female only group these increases for the visit only and email only are not different from the group that received both interventions. We also do not observe an increase in intermediate 300 level classes for male students, while we do for female students.

Table 8: Female Only Population

	(1) Any300	(2) Any400	(3) All Intro	(4) Econ courses	(5) Grade 4
Email only	.101	-.002	.076	.44	.311
	(.064)	(.017)	(.089)	(.288)	(.2)
Visit only	.109*	.016	.041	.455*	.129
	(.058)	(.015)	(.08)	(.258)	(.179)
Both Email & Visit	-.068	0	.085	.115	-.084
	(.066)	(.018)	(.091)	(.296)	(.205)
	ESVS	X	X	X	X
Asian	.017	-.011	-.023	.125	.056
	(.061)	(.016)	(.084)	(.272)	(.188)
Black	-.001	-.009	-.011	-.067	-.353***
	(.038)	(.01)	(.052)	(.169)	(.117)
Hispanic	.069	-.011	-.098	.002	-.134
	(.063)	(.017)	(.087)	(.283)	(.196)
Other	-.024	-.012	.21*	.304	-.278
	(.078)	(.021)	(.107)	(.348)	(.241)
First year	-.086**	-.007	.19***	.065	-.114
	(.042)	(.011)	(.058)	(.189)	(.131)
Second year	-.017	-.009	.002	-.07	.317**
	(.043)	(.012)	(.059)	(.193)	(.134)
Large50	-.113	0	-.11	-.047	-1.174***
	(.109)	(.029)	(.15)	(.489)	(.338)
Constant	.109	.009	.132	1.073***	2.694***
	(.07)	(.019)	(.097)	(.314)	(.217)
Observations	336	336	336	336	336
R-squared	.07	.025	.075	.036	.168
Control Group Mean	6.1%	0.0%	20.0%	0.97	2.44

Standard errors are in parentheses, clustered at the section level
*** p<.01, ** p<.05, * p<.1
ES = Email only is greater than both, VS = visit only is greater than both using a F-test at the 5% level

Table 9: Male Only Population

	(1) Any300	(2) Any400	(3) All Intro	(4) Econ courses	(5) Grade 4
Email only	.073	.054**	-.062	.326	.253
	(.051)	(.023)	(.08)	(.292)	(.157)
Visit only	.036	.037*	-.047	.138	.338**
	(.046)	(.021)	(.072)	(.264)	(.142)
Both Email & Visit	.019	.021	.013	.155	.098
	(.052)	(.024)	(.081)	(.294)	(.158)
	X	X	X	X	X
Asian	.067	.028	.024	.412	-.282
	(.062)	(.028)	(.096)	(.35)	(.188)
Black	-.055	.003	.009	-.048	-.357***
	(.034)	(.016)	(.053)	(.194)	(.104)
Hispanic	.045	.06***	.033	.327	-.193
	(.05)	(.023)	(.079)	(.287)	(.154)
Other	.014	.021	.014	.331	-.359**
	(.059)	(.027)	(.091)	(.334)	(.179)
First year	-.103***	-.026*	.101**	-.178	-.376***
	(.032)	(.015)	(.05)	(.184)	(.099)
Second year	-.085**	-.022	.036	-.269	-.016
	(.04)	(.018)	(.062)	(.226)	(.121)
Large50	-.132*	-.057*	-.171	-.952**	-1.033***
	(.069)	(.032)	(.108)	(.395)	(.212)
Constant	.14**	.006	.38***	1.406***	2.424***
	(.062)	(.028)	(.097)	(.352)	(.189)
Observations	502	502	502	502	502
Control Group Mean	12.0%	0.6%	34.7%	1.42	2.33
R-squared	.057	.04	.021	.029	.212

Standard errors are in parentheses, clustered at the section level
*** $p<.01$, ** $p<.05$, * $p<.1$
ES = Email only is greater than both, VS = visit only is greater than both using a F-test at the 5% level

African American/Black and Latinx/Hispanic Population

African American/Black and Latinx/Hispanic students in the email only and visit only groups had higher enrollment than the control group in upper-level economic courses, see Table 10 below. The visit only group saw an increase in the chance of taking a 300-level class by 13.5 percentage points compared to the control group. It is worth emphasizing here that at least one of the two visits was from a female African American alumna. Unlike other subgroups analyses the group, for African Americans and Latinx students that receive both interventions the chance these students would take all three introductory classes increased 26.7 percentage points compared to the control group, while the visit only had an 18 percentage points increase compared to the control group. The effect sizes are large for more Economics courses too with the email only and both groups seeing increase of over 0.55 more economics courses compared to the control, and the visit only group seeing a 0.75 course increase.

Table 10: African American/Black and Latinx/Hispanic Populations

	(1) Any300	(2) Any400	(3) All Intro	(4) Econ Courses	(5) Grade4
Email only	.07	.033	.039	.574*	.204
	(.064)	(.03)	(.101)	(.338)	(.205)
Visit only	.135**	.038	.181*	.748**	.346*
	(.059)	(.028)	(.093)	(.312)	(.189)
Both Email & Visit	.012	.01	.267***	.563*	.006
	(.064)	(.03)	(.101)	(.341)	(.206)
	ES	X	X	X	X
Female	.02	-.031*	-.174***	-.357*	.091
	(.035)	(.016)	(.055)	(.185)	(.112)
Black	-.086**	-.037*	-.01	-.302	-.241*
	(.04)	(.019)	(.063)	(.212)	(.128)
First year	-.039	-.021	.051	-.035	.06
	(.04)	(.019)	(.063)	(.213)	(.129)
Second year	-.051	-.03	-.03	-.337	.178
	(.048)	(.023)	(.077)	(.257)	(.156)
Large50	-.133	-.046	-.214	-1.137*	-1.784***
	(.118)	(.056)	(.186)	(.627)	(.38)
Constant	.142	.065	.403***	1.711***	2.433***
	(.091)	(.043)	(.144)	(.483)	(.293)
Observations	281	281	281	281	281
R-squared	.096	.064	.092	.092	.309
Control Group Mean	3.4%	0.0%	21.8%	0.94	2.21

Standard errors are in parentheses, clustered at the section level
*** $p<.01$, ** $p<.05$, * $p<.1$*
ES = Email only is greater than both, VS = visit only is greater than both using a F-test at the 5% level

Robustness Tests

We run two main robustness tests, with results shown in the Appendixes. First, we find

no impact of interventions on withdrawal rates, and including students who withdrew shows

similar results on future enrollment in economics courses (Appendix C). In Appendix D we rerun

the model eight time for *Any300* and *Any 400* level courses taken dropping one professor each time and the results are still significant with similar magnitude and sign in 12 and 14 of the 16 iterations (eight professors and comparison of email only or visit only to the control group) and only small changes in point estimates in those without statistical significance. We also rerun the model excluding the three large courses and find similar results to the full pooled sample for the key outcomes.

Conclusion

This study provides three key contributions. First, we were able to replicate the findings of Li (2018) and Porter & Sera (2020) showing that simple interventions increase enrollment in upper-level economics courses. Second, we can show that these same simple interventions also increase the participation of Black and Hispanic/Latinx student in Economics, while previous studies lacked the sample size to do so. Third, we show that the interventions mostly do not work when combined, and in fact there are many null results for the combined impacts, though with the important exception of increasing participation of underrepresented minority students.

The lack of effect of the combination of the two interventions is puzzling, though the results do offer some potential explanations. Women experienced the largest difference between the groups that receive only one intervention and those that received both. Perhaps, for women the role models appear too aspirational when combined with grade information. Additionally, for students who scored below median on the exam, some may have viewed the grade-related email alert as a wake-up call to improve their academic performance, while others may have taken it as a purely discouraging signal to pursue another path, which consistent with the lack of results for visits for those below the median. Therefore, an interesting adjustment to the email nudge could involve sending motivating messages and resources to students struggling in the course, while

also encouraging high performing students to major in economics.

An interesting research question remains about how gender and race affect how students interpret their abilities in economics. Avilova & Goldin (2018) found that women who earned a B or B+ in intro to economics were less likely to major in the field compared to men with the same grades. This matches our own data where women earning a B-, B, or B+ were almost half as likely to take a 300- level course as men, but with substantially smaller difference for students earning an A or A-. The results indicating little to no effect on women who received the combined interventions could be consistent with past research positing that women refrain from majoring in Economics unless they receive a strong signal they will excel. On the other hand, we found that racial minorities who received the combination of interventions were more likely to enroll in additional Economics courses. Future research could carefully consider how to craft messages to diverse groups, such as evaluating whether it would be ideal to include percentile rank in the grade-related email nudges.

One limitation to external validity is that these interventions were implemented in the Fall of 2019, right before the Covid-19 pandemic resulted in a rapid transition to online schooling for three to four semesters for some students. The online schooling format could have had a significant impact on students' experiences in their economics courses taken during this period and dissuaded them from further pursuing the major. A second limitation is that we do not have a large enough sample to analyze whether the African American and white alumni had a greater impact on students who were of the same racial background as themselves. In future replications of this study at scale, it would be a meaningful model to consider.

Economics departments seeking to increase enrollment in a diverse manner could implement grade-related email nudges emails and alumni visits with small time costs and huge

benefits. Our results suggest these interventions nearly double the number of women and underrepresented racial minority students participating in advanced economic courses. In terms of costs, it took about five hours during the semester to implement these interventions on over 600 students in the sample population. We estimate these interventions could increase the number of students taking advanced courses in economics by more than 80 students per semester (or about 10 percentage points) at a school like the one studied for this example. Recent work shows there are tremendous returns to majoring in Economics, as much as 20,000 dollars per year in annual salary (Bleemer & Mehta 2022). These returns will outweigh the hours of faculty, administrative, and alumni time. On a cost benefit scale, the estimated effect for one student potentially switching their major to economics would outweigh the program's cost. Additional benefits other than salary could include the increased likelihood of graduating or reducing the number of years to graduation due to higher grades and a reduction in the need to retake courses. We also show these interventions improve representation of women, Black and Latinx/Hispanic students, a value more difficult to quantify in dollars. In short, these interventions should be considered an excellent first option for any department seeking to increase enrollment or more specifically to increase participation students from underrepresented groups (i.e. women and racial minorities).

Finally, we note the average grade in the course is a 2.4, which is well below the university average for courses. Nearly 20% of students fail or withdraw from Microeconomic Principles course. These interventions individually did raise grades; however, large portions of the students are still not succeeding. The university where this intervention took place is using these interventions in combination with a supplemental instruction program and mentoring,

which could potentially together lead to greater success for all, though that program remains to be tested.

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Appendix A: Email message

1) The format of the email message sent to students who scored above the median on the midterm exam offers insights into their current grade in the course as well as what their percentile ranking is compared to peers in their course section. Based on this information, the email message encourages the student to consider exploring a major in economics and directing them towards specific faculty for any questions they might have. The direct transcript is as follows:

"Dear [Students Name],

To help students enrolled in Econ 201 better understand their performance and standing in this course, we are providing you a summary of your current grade. Your current grade of a(n) ZZZZZ currently ranks you above the YYYYYY percentile. In other words, you **OUTPERFORMED** more than **YYYYYY** percent of your classmates. Congratulations! Based on your **strong performance** in class and on behalf of the Department of Economics, we would like to encourage you to **consider majoring in economics**. If you would like to explore this opportunity or have any questions about majoring in economics, please feel free to contact one of us directly or talk with your instructor.

The grade percentile distribution for your class is as follows:

	95th Percentile	90th Percentile	75th Percentile	50th Percentile	25th Percentile	10th Percentile
Current Grade	94.1%	87.6%	84.5%	79.7%	67.8%	61.8%

Sincerely,

Dr. [ ], Professor of Economics

Dr. [ ], Associate Professor of Economics

2) The format of the email message sent to students who scored below the median on the midterm exam gives insights into their current grade in the course as well as what their percentile ranking is compared to their peers in their course section. Based on this information, the email message encourages students to reach out to their professor or the faculty contacts listed in the email if they have any questions about their course standing. The direct transcript is as follows:

"Dear [Students Name],

To help students enrolled in Econ 201 better understand their performance and standing in this course, we are providing you a summary of your current grade. Your current grade of a(n)ZZZZZ would place you in the YYYYYY percentile of the grade distribution. For example, a student scoring 88% would be between the 90th and 95th percentile meaning their score would be higher than 90% of the students enrolled. If you have questions regarding how to understand the grade distribution, please feel free to contact one of us directly or talk with your instructor.

The grade percentile distribution for your class is as follows:

	95th Percentile	90th Percentile	75th Percentile	50th Percentile	25th Percentile	10th Percentile
Current Grade	94.1%	87.6%	84.5%	79.7%	67.8%	61.8%

Sincerely,

Dr. [ ], Professor of Economics

Dr. [ ], Associate Professor of Economics

It is important to note the percentages in the tables above were adjusted for each class section with the correct distribution. The grade distribution shown above is from a unique class section in this sample.

Appendix B: Balance Test

The experimental design created four groups: control, email only, visit only, and both (visit and email). Below are the demographic descriptive statistics by gender, race, class year, class size, and GPA in all other courses. A t-test comparison between the control group and each experimental group shows statistically significant difference only for class size.

Table B: Demographic Variables by Intervention Group

	N	Female	Asian	Black	Hispanic	White	First year	Second year	Large Class	GPA
Control	282	.398	.076	0.247	.079	.513	.253	.181	.36	2.614
Email Only	177	.35	.053	0.296	.084	.5	.292	.142	.46	2.605
Visit Only	160	.426	.047	0.278	.083	.503	.32	.178	.0***	2.736
Both	219	.396	.06	0.268	.102	.506	.298	.204	.47	2.594

GPA is for all other courses besides the course of interest. *** or ** indicates a statistically significant difference between the experimental group and the control group at 1% or 5% level.

Appendix C

In Table C below we first show that none of the three intervention groups had different withdraw rates by running the model on the outcome if the student withdrew. We then rerun the model with these students who withdrew on four of the five outcomes. In columns 2 through 5 we note that coefficients on experimental groups are similar when we included students who dropped the course (see Tables). As students who withdrew do not receive a letter grade on a 4.0 scale we cannot estimate the effects on grades including those students who withdrew.

Table C.1: Regression on Withdraw/Incomplete and Sample with Students who Withdrew

	(1) With Draw	(2) Any300	(3) Any400	(4) Allintro	(5) Econ courses
Email Only	.003	.075*	.032**	-.013	.359*
	(.019)	(.039)	(.016)	(.059)	(.208)
Visit Only	.002	.066*	.027*	-.024	.249
	(.017)	(.035)	(.014)	(.053)	(.186)
Both Email & Visit	.005	-.004	.02	.032	.173
	(.019)	(.04)	(.016)	(.059)	(.209)
= 1 if female	.008	-.019	-.012	-.113***	-.268**
	(.01)	(.021)	(.009)	(.032)	(.111)
Asian	-.024	.037	.007	.001	.263
	(.021)	(.043)	(.018)	(.064)	(.226)
Black	-.006	-.036	-.003	-.003	-.07
	(.012)	(.025)	(.01)	(.037)	(.13)
Hispanic	.014	.046	.03*	-.019	.185
	(.019)	(.038)	(.016)	(.057)	(.201)
Other	0	.002	.009	.082	.291
	(.022)	(.045)	(.019)	(.068)	(.24)
First year	-.002	-.097***	-.023**	.129***	-.122
	(.012)	(.025)	(.01)	(.037)	(.13)
Second year	-.005	-.058**	-.017	.019	-.195
	(.014)	(.028)	(.012)	(.042)	(.149)
Large50	.186***	-.064	-.029	-.104	-.464
	(.029)	(.06)	(.024)	(.089)	(.315)
Constant	-.001	.078*	.008	.262***	1.137***
	(.021)	(.043)	(.018)	(.064)	(.227)
Observations	862	862	862	862	862
R-squared	.128	.046	.024	.049	.028

Appendix D

In this Appendix we re-estimate the regression excluding one professor each time for the chance a student takes Any 300 or Any 400 level course (see Tables D.1 and D.2) and we also re-estimate the main specification only for sections with the 15 sections with 30 to 40 students, recall 3 of the 18 sections had close to 100 students each (see Table D.3 below). The point estimates in the robustness checks are similar to the full sample of .078 and.067 for Email and Visit only increasing the chance a student takes Any 300 level class and .035 and .029 for Any 400 level class compared to the control group (see Table 4). When we eliminate one of the instructors in 12 of 16 and 14 of 16 cases do the coefficients maintain statistically significant signs for visits only and email only on Any300 (Table D.1) or Any400 (Table D.2). Similarly in Table D.3 we show the coefficients are similar when we drop the three large sections from our sample.

Table D.1 Regression of Pooled Sample on Any 300 Level Course Excluding 1 Professor from Sample

	(1)	(2)	(3)	(4)
Email Only	.078*	.097**	.044	.077*
	(.041)	(.042)	(.048)	(.041)
Visit Only	.069*	.102**	.054	.067*
	(.036)	(.041)	(.041)	(.037)
Both Email& Visit	-.01	.009	-.024	-.014
	(.041)	(.042)	(.048)	(.041)
Observations	774	767	676	730
R-squared	.047	.054	.043	.045
	(5)	(6)	(7)	(8)
Email Only	.095**	.064	.077*	.078**
	(.042)	(.055)	(.04)	(.04)
Visit Only	.053	.051	.066*	.067*
	(.036)	(.047)	(.036)	(.035)
Both Email& Visit	-.004	-.039	-.013	-.011
	(.042)	(.056)	(.04)	(.04)
Observations	740	636	738	805
R-squared	.05	.049	.05	.047

Table D.2: Regression of Pooled Sample on Any 400 Level Course Excluding 1 Professor from Sample

	(1)	(2)	(3)	(4)
Email Only	.035**	.035**	.03*	.034**
	(.016)	(.016)	(.018)	(.015)
Visit Only	.029**	.029*	.021	.028**
	(.015)	(.016)	(.015)	(.014)
Both Email&Visit	.013	.012	.019	.01
	(.017)	(.016)	(.018)	(.016)
Observations	774	767	676	730
R-squared	.027	.028	.023	.034
	(5)	(6)	(7)	(8)
Email Only	.05***	.027	.035**	.035**
	(.016)	(.023)	(.016)	(.016)
Visit Only	.027*	.042**	.029**	.029**
	(.014)	(.02)	(.014)	(.014)
Both Email&Visit	.004	.021	.012	.013
	(.017)	(.023)	(.016)	(.016)
Observations	740	636	738	805
R-squared	.033	.026	.029	.026

D.3 Sample Sections with Under 40 Students

	(1) Any300	(2) Any400	(3) Allintro	(4) Econ courses	(5) Grade4
Email Only	.075*	.033**	-.02	.331	.26**
	(.043)	(.017)	(.06)	(.217)	(.118)
Visit Only	.067*	.028*	-.022	.24	.26**
	(.038)	(.015)	(.054)	(.195)	(.106)
Both Email & Visit	-.015	.009	.026	.08	.023
	(.043)	(.017)	(.061)	(.22)	(.119)
Female	-.043	-.022**	-.141***	-.433***	.051
	(.028)	(.011)	(.04)	(.144)	(.078)
Asian	.066	.023	.061	.541*	-.08
	(.058)	(.023)	(.082)	(.298)	(.162)
Black	-.019	.006	.022	.05	-.169*
	(.032)	(.012)	(.045)	(.162)	(.088)
Hispanic	.111**	.064***	.013	.545**	.105
	(.054)	(.021)	(.076)	(.275)	(.149)
Other	-.004	-.007	.058	.023	-.262
	(.065)	(.025)	(.091)	(.33)	(.179)
First year	-.097***	-.018	.114**	-.077	-.3***
	(.034)	(.013)	(.048)	(.172)	(.093)
Second year	-.057	-.011	-.016	-.208	.124
	(.038)	(.015)	(.053)	(.192)	(.104)
Constant	.153***	.006	.36***	1.34***	2.368***
	(.051)	(.02)	(.072)	(.261)	(.142)
Observations	566	566	566	566	566
R-squared	.048	.04	.045	.039	.07

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1