Sense of Belonging and Peer Effects in Principles of Economics: An Experiment in Group Formation

By

Derek Stimel, Ph.D.*
Associate Professor of Teaching Economics
Department of Economics
University of California at Davis
One Shields Avenue
Davis, CA 95616
dstimel@ucdavis.edu

Janine Lynn Flathmann Wilson, Ph.D.
Professor of Teaching Economics
Department of Economics
University of California at Davis
One Shields Avenue
Davis, CA 95616
jlflathmann@ucdavis.edu

Abstract

Evidence suggests that under-represented minority and female students enter introductory courses with a lower sense of belonging than their non-URM male peers (Bayer et al, 2020). Evidence also suggests the importance of peer effects along many dimensions including the effect on academic performance (Hoxby, 2000; Carrell, Fullterton, & West, 2009; Carrell, Hoekstra, and West, 2011). Our experiment exploits a natural split in a hybrid version of a principles of microeconomics course; that is, half the students in the class attend lectures on Tuesdays and the other half on Thursdays. This allows us to deploy two different methods of small group formation; one where the students self-select their own groups often based on friends or haphazardly by where they are sitting in the lecture hall and the other where the instructor selects the groups specifically to balance the gender, URM-status, and educational background of the group. Data is collected from course assessments, student surveys, and the institution. We then assess the extent to which the construction of the groups affects student sense of belonging in economics. We also examine how the academic achievement and sense of belonging among group peers affects a students' own sense of belonging. This allows us to see a more holistic picture of a student sense of belonging and the role that peer effects may play. Finally we also look at the extent a sense of belonging impacts students proceeding with taking additional economics courses. Sense of belonging has been shown as a factor affecting student persistence in a major (Gopalan & Brady, 2020). In this context, we consider the possibility of how groups are formed may help or hinder diversity efforts in the economics major.

*Corresponding author

Introduction

Recently there has been increased awareness and concern for the lack of diversity, particularly based on gender and underrepresented minority (URM) status in the economics profession (Bayer & Wilcox, 2019; Stansbury & Schultz, 2023). Much of the attention of economic educators focuses on hindrances and ways to overcome them for those groups in introductory economics courses. This is sensible as this is some sense the start of the pipeline of students into the economics profession and where diversity may be best increased by retaining and converting underrepresented groups into economics majors and eventually, practicing economists (Buckles, 2019). One central element of this is to understand and encourage a greater sense of belonging among students (Bayer et al, 2020). Sense of belonging has been shown as a factor affecting student persistence in a major (Gopalan & Brady, 2020). To that end the role of active learning as a means to enhance belonging shows encouraging results. While diminished somewhat, the persistent reliance on more passive techniques such as lecturing remains a barrier to those efforts (Asarta, Chambers, & Harter, 2021).

The benefits of cooperative learning or small group work to enhance learning economics is much studied and shows much promise as an active learning tool particularly for underrepresented groups (Bayer & Rouse, 2016). In addition to the benefits of active learning, small group work may also better leverage the positive effect of peers in the classroom. Peer effects have been shown to have impacts not just on academic achievement (Hoxby, 2000; Carrell, Fullerton, & West, 2009) but also in surprising areas such as fitness (Carrell, Hoekstra, and West, 2011). The potential for these positive spillovers among students makes this form of cooperative learning attractive. However, many economics courses especially at public universities are taught in large lecture formats where student course enrollment can be hundreds of students despite the fact that median class size nationally is 40 students (Asarta, Chambers, & Harter, 2021). The large size of classes may present a large barrier to implementing small group work. The lack of resources as well as the time and effort may prove prohibitive in that setting.

In this study we seek to examine the extent small group work promotes a greater sense of belonging among under-represented students, specifically based on gender and ethnic minority status. We are motivated in part by findings such as Cagliesi and Ghanel (2022) that find team-based learning can reduce achievement gaps among different student types. Studies such as Bayer et al (2020) found that relevance, belonging, and growth mindset in combination is a positive factor on student academic performance. Other studies have found a positive effect specific to a sense of belonging (Walton and Cohen, 2007). Our study in contrast attempts to isolate the factors important to a sense of belonging in the classroom that uses small group or team-based learning and the extent that sense of belonging in turn contributes to the likelihood of taking future economics courses.

We examine whether the composition of the groups matters to that sense of belonging along two dimensions. The course we examined is hybrid where the structure was such that half the course attended lecture on one day of the week and the other half on a different day. For one half of the class small groups were formed by the instructor to balance the diversity of the group and ensure that female & and URM students had at least one other member of the group that was like them. These we refer to as instructor-formed groups. The other half of the course formed groups by the students themselves. These student-formed groups were likely based on where students were sitting on the day of lecture or friend groups formed prior to the start of the course. The second dimension we look at is whether the proportion of a female or URM students affects the sense of belonging particular for the female and URM students themselves.

Concretely, we examine four specific hypotheses. First, students in instructor-formed groups are likely to have a higher sense of belonging in economics than those in student-formed groups. Our basis for this is work such as Hurtado and Ponjuan (2005) and others who find there are advantages of interacting with diverse peers on campus climate. Improved campus climate then contributes to a greater sense of

belonging. We also wanted to be mindful of making sure the instructor-formed groups were both diverse but also not isolating for female and URM groups. Each instructor-formed group with a female has at least one other female and the same for URM students. Our second hypothesis is that students in a group with more students that share their characteristics are likely to have a higher sense of belonging in economics. This is a statement that the higher the percentage of female students in a group the higher the belonging among those female students and similarly for URM students. For example, Hansen, Owan, & Pan (2015) found positive effects on achievement the higher the number of females in the group but no effect for ethnicity. It's important to note that the forces behind our first and second hypotheses could work against each other. For example, by favoring diversity, the instructor-formed groups might prevent the formation of groups with large percentages of females and/or URM students.

Our third hypothesis is that students in a group where their peers have a higher sense of belonging in economics are likely to have a higher sense of belonging in economics as well. That is being in a group with other students that feel like they belong will create positive spillovers. As discussed earlier, there is a literature that finds the importance of many peer effects and we surmise that belonging feelings of one student might well impact students close to them such as fellow group members. Carrell, Hoekstra, and West, (2011) illustrate an interesting example related to physical fitness. Our fourth and final hypothesis is that students with a higher sense of belonging in economics in a principles class are more likely to take an additional economics course in the near-term future. For example, Good and Dweck (2012) expand the understanding of the influence of belonging to include, not only the link to academic success, but also the desire to pursue a particular field.

Data Description

Our data comes from three separate sources. First students in the course completed pre- and post-course surveys. These were completed early in the quarter and at the end of the quarter but prior to the last exam. The pre-survey asked demographic information used to form the groups for half the course by the instructor. The survey also asked students to self-assess preferences about having and making friends, whether they like studying alone or in groups, and whether they like interacting with students in class generally. It asked about whether they had a job or not as that might confound their ability to fully participate in group work as well as make meaningful connections among their peers, which is a key factor in belonging. Students on the pre- and post-survey were asked to gauge the number of contacts, acquaintances, and friends they have in the course. We would expect these numbers to be higher in the post- rather than pre-survey. They were also asked to assess their interest in the course as well. On the post-survey only, they assessed their feeling of belonging economics and in the university in general on a 5-point Likert scale. They also assessed their interactions with their fellow classmates, the professor, and the teaching assistants as well as some standard questions about their satisfaction with the course. The second source of data is the course assessments. We construct the peer belonging measures from this data based on which small group a particular student was in. Particularly we have the students overall course percentage and their score on each of three exams during the course. Third we have data provided by the university itself. In addition to same demographic information that students self-reported on the pre-survey, the university provides data on whether students are low income or not, whether they are an international student or not, whether they are a transfer student or not, their GPA from the prior quarter and any additional economics courses they may have taken in the future three quarters (one academic year).

As with any course, there can be some enrollment shrinkage as the course proceeds. First, there is a lot of churn early in the quarter as students finalize their schedules. Second there can be some attrition particularly after the first exam and prior to the final drop date of the course. Occasionally there are also students that stay enrolled in a course even though they complete no work; this is often related to financial aid and maintaining full-time status. Ultimately in our sample we ended up with 302 students split as 162 in the section where the instructor chose groups in 140 students in the section where the students

themselves chose. Later in some specifications the effective sample size will be smaller as some students failed to answer a survey question or a piece of their demographic information was missing from the university's database.

Summary Statistics

As mentioned, our sample has 302 students. Of those, 59.6% identify as female and 18.5% were underrepresented minorities (URM). 87.5% of the URM students are Hispanic with the remainder identifying as black or African American. There is a small number of those that identify as multiracial in some way. Also, 14.2% of the full sample are both female and URM, which means 76.8% of the URM students are also female. There were 59 small groups formed with 27 formed by the instructor and 32 formed by the students. This means the groups formed by the instructor were on average a little larger based on the earlier mentioned split between the course sections.

We start by looking at the belonging measures for students; both the self-reported belonging in economics and belonging in the university. We also look the peer group measures of belonging as well. These measures are the average of the other students in the groups belonging in economics: female, URM, female and URM with non-URM males as a reference group. *Table 1* summarizes this data.

Table 1: Belonging Comparisons by Student Group

	Non-URM Male	Female	URM	Female & URM
Variable	Mean Rating [P-value]			
Belonging in Economics	3.95	3.80	3.67	3.59
		[0.16]	[0.07]	[0.03]
Belonging at University	4.01	4.01	3.96	3.93
		[0.23]	[0.77]	[0.63]
Peer Belonging in Economics	3.80	3.92	3.90	3.91
		[0.04]	[0.12]	[0.13]
Peer Belonging at University	3.98	4.00	3.97	4.00
		[0.80]	[0.85]	[0.84]

Table 1 shows us the critical issue faced by economics. Female and URM students (and those that have both characteristics) show no statistically significant difference at a 10% level from non-URM males when it comes belonging at the university. However, when it comes to belonging in economics, female students show a noticeably lower average rating though not statistically significant at a 10% level. URM students and URM & female students show statistically significant lower rating at least at a 10% level. When it comes to peer ratings, we see that females, URM, and students with the combined characteristics have higher ratings in economics than non-URM males though it is only statistically significant for female students. There is no difference again for belonging at the university among peers. At first the fact the average ratings are higher for females and URM students relative to non-URM males may be surprising. However, it is likely due to the fact that a female or URM student will have a higher probability to be in a group where a non-URM male is their peer than the reverse.

We next look at differences in academic performance. We look both at the GPA students bring into the course as well as their performance in the course on exams and overall. These results are in *Table 2*. There are some striking differences. First female students show no difference with their prior GPA relative to non-URM males but they perform worse on every major assessment while finishing the course with a statistically significant lower grade at a 10% level. URM students and those that are both URM and

female enter the course with a lower GPA and proceed to perform worse than both non-URM males and worse than female students as well.

Table 2: Academics by Student Group

	Non-URM Male	Female	URM	Female & URM
Variable	GPA and Percentages [P-value]			
Prior Term GPA	3.22	3.22	2.92	2.90
		[0.96]	[0.00]	[0.01]
Exam 1	70.92	65.95	55.44	54.53
		[0.02]	[0.00]	[0.00]
Exam 2	80.05	77.23	66.88	65.01
		[0.15]	[0.00]	[0.00]
Exam 3	81.72	76.60	70.14	71.18
		[0.01]	[0.00]	[0.01]
Course Percentage	86.15	83.25	77.23	77.20
		[0.01]	[0.00]	[0.00]

Group Formation Statistics

We turn now to look at statistics related to group formation, whether in instructor-formed or student-formed groups. *Table 3* reports that demographic information along the p-value testing whether the proportions differ between the sections with different group formation methods. As we can see from *Table 3*, the split along demographic characteristics is relatively similar. At a 10% significance level we fail to reject differences in the groups. In fact they are quite similar. The only noticeable qualitative differences are a slightly higher percentage of female students and students that have jobs in the section where the instructor choice the groups. Again, though we fail to reject that the proportions are different statistically. We further note that from the pre-survey students were asked the education level of their parents. Similar to the results in *Table 3*, the there was no statistically significant difference between students in the instructor-formed and student-formed groups. The average student's parents completed slightly less than a college degree. That is, on a 4-point scale between none, some college, college, and graduate school the average is around 2.75.

Table 3: Course Demographics

Variable	Instructor-Formed Groups (%)	Student-Formed Groups (%)	Hypothesis Test of Differences (P-value)
Female	0.62	0.56	0.30
URM	0.19	0.19	0.99
First Generation	0.32	0.32	0.99
Low Income	0.24	0.21	0.59
Transfer	0.07	0.05	0.39
International	0.25	0.25	0.99
Has Job	0.23	0.17	0.22
Course Percentage	0.84	0.84	0.53

The results from *Table 3* give us more confidence that there may not be much that the split of students between the two sections may be quasi-random. While students did not literally get sorted into the

sections randomly, the two sections ended up looking as if they did. First, there is no inherit schedule advantage to one section over the other. The groups had lecture at the same time of the day and given the typical academic schedule of Tuesday/Thursday classes and Monday/Wednesday/Friday classes, one group attended lecture on Tuesday and the other on Thursday. Either section would fit into the typical academic course load in a similar way. The two sections came together to take exams on a specially scheduled Friday section so there would be no advantage in that dimension either. Finally, students would not know in advance that the groups would be formed differently. To them the sections would appear equivalent in all meaningful ways when they enrolled.

Looking within each group formation type we examine the belonging measures similar to *Table 1*. These results are in *Table 4A* and *Table 4B*. From these tables we see the drop off in a sense of belonging in economics for female and URM students seems to be concentrated in the instructor-formed groups. Put succinctly, *Table 4A* which shows the instructor-formed groups mimics the results of *Table 1*, while *Table 4B* does not really. The results then show some support then for our second hypothesis that groups with more concentrated female and/or URM membership have boost the sense of belonging in economics. The student-formed groups have more female-dominated or URM-prevalent groups. The instructor-formed groups do not as they were chosen more so to balance diversity. This also provides less support for our first hypothesis as the more diverse groups are not beneficial to a feeling of belonging in economics, but perhaps even detrimental to it.

Table 4A: Belonging Comparisons for Instructor-Formed Groups

	Non-URM Male	Female	URM	Female & URM
Variable	Mean Rating [P-value]			
Belonging in Economics	3.95	3.68	3.61	3.57
		[0.02]	[0.05]	[0.06]
Belonging at University	4.00	3.87	3.86	3.87
		[0.45]	[0.56]	[0.62]
Peer Belonging in Economics	3.74	3.86	3.94	3.97
		[0.12]	[0.03]	[0.02]
Peer Belonging at University	3.93	3.90	3.88	3.96
		[0.67]	[0.60]	[0.73]

Table 4B: Belonging Comparisons for Student-Formed Groups

	Non-URM Male	Female	URM	Female & URM
Variable	Mean Rating [P-value]			
Belonging in Economics	3.85	3.94	3.75	3.61
		[0.52]	[0.62]	[0.28]
Belonging at University	4.02	4.18	4.08	4.00
		[0.30]	[0.77]	[0.93]
Peer Belonging in Economics	3.85	3.99	3.86	3.83
		[0.13]	[0.96]	[0.85]
Peer Belonging at University	4.04	4.13	4.07	4.04
		[0.35]	[0.80]	[0.99]

To examine our second hypothesis a bit further we looked at differences between groups based not on group formation method but whether they were a group that contained a "high percentage" or "low percentage" of the students we have been examining (non-URM male, female, URM, and the combination of female and URM). We define "high" as above the median percentage and at or below the median as "low". The thresholds differ by student characteristic as female students are a much larger percentage of the course so the median percentage for females in a group will naturally be higher than URM students or URM and female. For non-URM males the cutoff was 50%, for females it was 67%, for URM students it was 40%, and for students that are both URM and female it was 33%. *Table 5* presents the results focused exclusively on belonging in economics. This is because it is the most central issue to our second hypothesis that students will feel a higher sense of belonging in economics if they are in a group with more students that share their characteristic.

Table 5: Belonging in Economics Comparison by Group Concentration

	High Percentage	Low Percentage
Variable	Mean Rating [P-value]	
Non-URM Male	3.84	4.06
	[0.25]	
Female	4.01	3.64
	[0.00]	
URM	3.76	3.54
	[0.36]	
Female & URM	3.65	3.40
	[0.55]	

From *Table 5* we see that for non-URM males being with each other qualitatively lowers their sense of belonging in economics, though it is not statistically significant at a 10% level. For all other groups the sense of belonging in economics is higher when they are in groups with a higher percentage of their characteristic. Though the difference is only statistically significant at a 10% level for female students. This is supportive of our second hypothesis for female students and URM students, though much more weakly due to the lack of statistical significance for the URM students. *Appendix A* shows the tables for both belonging measures and the peer measures as in *Table 4A* and *Table 4B* except split by high and low percentage.

While we have begun to evaluate some evidence related to the hypotheses from the *Introduction*, it has been circumstantial at best. We will turn our attention to a more robust analysis in the next section.

Regression Analysis

Our first three hypothesis related to how factors affect a student sense of belonging in economics, which we will define as *BE*. This is our dependent variable for the first set of regressions. The following would be the primary explanatory variables in those regressions. For the first hypothesis we would be keenly interested the interaction between an indicator for the group formation method (instructor or student) and an indicator for whether a student is female or not and whether they are URM or not. We define *IFG* as the indicator for instructor-formed group or not, which we will call *FEM* and *URM* for the student characteristic indicators. For the second hypothesis we would be interested in the percentage of a group that is female (*GRPPCTFEM*) and the percentage of a group that is URM (*GRPPCTURM*) interacted with *FEM* and *URM* respectively. For the third hypothesis we would be interested in the effect of peer sense of belonging in economics from a student's fellow group members (*PEERBEL*) on the students' sense of belonging in economics.

The fourth hypothesis involves whether belonging in economics (*BE*) positively effects students taking more economics courses (*MOREECON*) in the future or not. *MOREECON* will be the dependent variable in our second set of regressions with *BE* as the main independent variable. As our focus is generally on female and URM students so we will also have the interaction of BE with FEM and URM as key explanatory variables as well. We will include the same control variables as the first set of regressions.

While we have a starting point of 302 observations, we also have a potentially large set of control variables in additional to the explanatory variables discussed in the preceding paragraphs. This raises concerns for us about the lack of degrees of freedom and potentially lack of power in the statistical tests for estimated coefficients we are interested in. As potential controls we have all the variables in *Table 2* and *Table 3* (minus the already discussed *FEM* and *URM* variables) as well as the parent education variable mentioned in the text and the belonging at the university and peer belonging at the university from *Table 1*. We also have a lot of self-reported information from students from the pre-survey and post-survey. This includes information about student preferences for group work, their views about interacting in the class with their peers and course staff, and overall course evaluation information. The pre-survey and post-survey also asked students their interest level in economics, the number of contacts, number of acquaintances, and number of friends in the class. We can define these variables based on how they changed over the course. In total we have 29 potential control variables.

With that in mind we use a principal component analysis (PCA) to reduce the dimensionality of the controls. We used parallel analysis to select the number of components, which was five. We then used oblimin rotation to then estimate the five components. Two of the control variables, an indicator of whether a student had a job or not while in the course and an indicator of their status as a transfer student did no load on any factor. We kept those variables in the model individually as controls. *Appendix B* describes the control variables from the pre- and post-survey and shows how the control variables where collected as components.

We estimated our model as a linear probability model. We also collapsed the dependent variable into a belonging in economics indicator variable for students that rated their belonging as very high or not. We then estimated a logit model with this redefined *BE* variable. This serves as a robustness check. *Table 6* presents the estimated marginal effects for our variables of interest with *BE* as the dependent variable. We lose observations due to missing data in the estimation and ultimately have a sample size of 242 and we estimate all models with robust standard errors.

From *Table 6* we see no support for our first hypothesis. Instructor-formed groups (*IFG*) have no impact on the sense of belonging in economics in general or for female and URM students based on the interaction terms. The coefficients are of small magnitude and very large p-values. Our second hypothesis was that students in a group with more people that share their characteristic will feel a greater sense of belonging. We also find some support for this. First we see that being in a group with a higher percentage of female students (*GRPPCTFEM*) is a positive factor in a sense of belonging in economics, but more for male students rather than female based on the interaction between *FEM* and *GRPPCTFEM*. This suggests that it is actually the male students whose sense of belonging in economic is enhanced by being in a group with more female students. For female students there is also a positive effect but more muted (0.49 – 0.38 = 0.11). There is no statistically significant effect at a 10% level for URM students. The result for female students is a bit surprising given that *Table 6* also shows that controlling for other factors, female students have a higher sense of belonging than male students in our sample. That result might be driven by the fact that the instructor for the course was a female (non-URM). Research shows that this can be a powerful force on female students persisting in a discipline (Carrell, Page, & West, 2010; Price 2010). We take this as some support for our second hypothesis though a bit mixed given that while positive for females, it is more positive for male students in a group with female students.

Table 6: Belonging in Economics Regressions

Model	Linear Probability	Logit
Variables of Interest	Marginal Effects [P-value]	
FEM	1.30***	0.94***
	[0.00]	[0.00]
URM	-0.29	-0.28
	[0.57]	[0.28]
IFG	0.00	-0.03
	[0.99]	[0.68]
GRPPCTFEM	0.49***	0.48***
	[0.01]	[0.01]
GRPPCTURM	-0.11	-0.12
	[0.53]	[0.45]
PEERBEL	0.31***	0.32***
	[0.00]	[0.00]
*FEM*IFG*	-0.04	-0.01
	[0.75]	[0.88]
*URM*IFG*	0.04	0.07
	[0.71]	[0.70]
*FEM*GRPPCTFEM*	-0.38	-0.42*
	[0.14]	[0.07]
*URM*GRPPCTFEM*	0.05	0.10
	[0.84]	[0.69]
*FEM*PEERBEL*	-0.32***	-0.33***
	[0.01]	[0.00]
*URM*PEERBEL*	0.05	0.11
	[0.70]	[0.47]

Notes: Significance shown at the *10%, **5%, and ***1% level

Our third hypothesis related to *Table 6* was that there would be a positive spillover effect of group peers with a higher sense of belonging in economics on a student's own sense of belonging. We do see some evidence in support of this hypothesis as *PEERBEL* is positive and statistically significant. However, we see a negative and statistically coefficient of similar magnitude for the interaction of peer belonging and the female indicator variable (*FEM*PEERBEL*). This suggests that there is a positive spillover effect for male students but not for female students. There is no statistically significant effect specific to URM students. For the female students we speculate this may be due to imposter syndrome where being in a group with students that feel like they belong creates negative self-doubt rather than lifting up the student's own sense of belonging. Female students and URM students have been shown to have higher rates of imposter syndrome (Chrousos & Mentis, 2020).

We now turn to our attention to our last hypothesis that a sense of belonging in economics will positively effect a student *Table 7* presents the results of these models where *MOREECON* is the dependent variable and belonging in economics (*BE*) becomes an independent variable. As *MOREECON* was already an indicator variable it did not need to be redefined. In *Table 7* we see that belonging in economics is a positive but not significant factor in whether a student takes more economics courses or not. We see that it is a little more positive for female students relative to male students based on the interaction term but still statistically not significant. Further the results show no clear effect at all for URM students. Finally,

from *Table 7* we can also see some indication of the basic problem economics faces. Both female and URM appear to be less likely to take future economics courses, though the coefficients are not statistically significant. For females this is despite the higher sense of belonging in economics indicated by the coefficient on the FEM variable in *Table 6*. In sum we do not find much support for the hypothesis that a sense of belonging in economics makes it more likely students will take more economics courses.

Table 7: Taking More Economics Courses Regressions

Model	Linear Probability	Logit
Variables of Interest	Marginal Effects [P-value]	
BE	0.04	0.04
	[0.50]	[0.50]
FEM	-0.34	-0.36
	[0.32]	[0.31]
URM	-0.07	-0.21
	[0.83]	[0.54]
*FEM*BE*	0.09	0.09
	[0.27]	[0.28]
*URM*BE*	-0.02	0.03
	[0.87]	[0.83]

Conclusion

One overarching takeaway from our work here is that for economics as a profession to reach, connect, and retain underrepresented groups is not easy. For any student and their interactions with others in a classroom there may be highly complicated and unobserved internal factors in play. This can mean what works to build belonging for one student or one group of students may simply not work for others and for difficult to know reasons. For example Duran et al. (2020) explore how aspects of the higher education environment can impact a student's sense of belonging differently based on their various group identities. Specifically, how first-generation students and students from historically minoritized groups are impacted differently by interventions promoting belonging than their white continuing student peers. They find that some interventions that work well for the majority group have a negative impact on minoritized or first-generation students. Many collegiate environments are not perceived as welcoming by these students. Instructor and student as well as peer to peer interactions are an important aspect of whether a student feels that they belong at an institution. In our study, while females are a minority in economics, they are not a minority in our sample. This might impact how they respond to an intervention relative to an alternative class and sample where they are the minority. We examined an introductory course but perhaps there would be different results in an upper division course from the same intervention if female students were the minority of the class. This could be a worthwhile follow up research and comparison to make with our sample.

In our study, we set out four hypothesis to examine. One is that diverse small groups chosen by the instructor would enhance student sense of belonging in economics more than small groups the students chose themselves. We found no evidence to support this hypothesis. Our second hypothesis was that students in small groups with more students that share their characteristics would have a higher sense of belonging in economics than being in a group without similar students. We also found some support for that hypothesis unconditionally but a more mixed result in regressions. Ironically we found that groups with higher percentages of female students in them did positively affect student sense of belonging in economics but it appeared to be for males even more than females. There was no effect URM students. We did find support for our third hypothesis that being a small group with others with a high sense of belonging contributes positively to a student's own sense of belonging in economics. However this peer

effect was found only for male students but not female students. Finally, we found little support for our fourth hypothesis that a higher sense of belonging in economics during the principles of microeconomics course we examined would lead to students taking more economics courses in the future.

One confounding issue for use may be the characteristics of the course itself. Abdullah (2022) suggests that a more welcoming environment can foster a sense of belonging in economics courses. The course we examined had a majority female students and was led by a female instructor. It's possible that even if a female student was in a group with few or no other female students, the large presence of females in the classroom generally enhanced their sense of belonging. This could explain the result in *Table 6* that once conditioned for other factors, being female was a positive effect on sense of belonging in economics. It would also explain the divergence with URM students as the instructor was not a URM and URM students were a clear minority of the course. For female students this may have been a diminishing marginal returns effect in that the large intervention of a female instructor and the majority female course had already impacted female sense of belonging leaving little additional room for the small group composition to matter.

The hills that need to be surmounted to expand the diversity of the economics profession are also on display in our study. They seem to be even more daunting in relation to URM students. *Table 1* showed that sense of belonging in economics was lower for female students than non-URM males but even lower for URM students. Moreover *Table 2* shows us that in our sample, URM students enter the course with a lower GPA than either female or non-URM males. The URM students then underperform relative to female and non-URM males on the major course assessments and then overall in the course as well. Female students also underperform non-URM peers in the course but the gap is smaller and even less so overall if we consider letter grades. Both non-URM males and females earn on average a "B" grade while URM students are averaging a "C+" grade at the end. There is a natural causal question here in that to what extent does student sense of belonging affect grades and grades affect sense of belonging in economics.

Our results indicate that the intervention of instructor-formed groups did not lead to a greater sense of belonging in economics for female and URM students. Nor did it lead to those students being more likely to take additional economics courses. However, there was no clear harm to those students either. The fact that there was no clear deficit in sense of belonging in economics when we condition on other variables might actually be a positive result given the deficit in academic performance. In that context the fact the positive effect for females may be quite a positive result. In our sample, unconditionally 33% of female students and 27% of URM students took at least one more economics course. In contrast about 34% of non-URM males took another economics course. This shows that at least in broad terms there was nothing specific in the course that caused female or URM students to fall out of the pipeline of future economists in any major way, at least in the short-term. As we try to encourage greater numbers of female and URM students to join the economics profession by trying new interventions, we should take the physician motto of "do no harm".

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Appendix A

Table A.1: Non-URM Male Belonging Comparisons by Group Composition

	High Percentage Non-URM Male Groups		Low Percentage Non-URM Groups
Variable	Mean Rating [P-value]		
Belonging in Economics	3.84	[0.25]	4.06
Belonging at University	3.93	[0.66]	4.02
Peer Belonging in Economics	3.86	[0.87]	3.87
Peer Belonging at University	4.01	[0.64]	3.98

Table A.2: Female Belonging Comparisons by Group Composition

	High Percentage Female Groups		Low Percentage Female Groups
Variable	Mean Rating [P-value]		
Belonging in Economics	4.01	[0.00]	3.64
Belonging at University	4.07	[0.27]	3.92
Peer Belonging in Economics	4.07	[0.00]	3.80
Peer Belonging at University	4.12	[0.00]	3.90

Table A.3: URM Belonging Comparisons by Group Composition

	High Percentage URM Groups	Low Percentage URM Groups
Variable	Mean Rating [P-value]	
Belonging in Economics	3.76	3.54
	[0.36]	
Belonging at University	3.72	4.15
	[0.11]	
Peer Belonging in Economics	3.86	3.95
	[0.40]	
Peer Belonging at University	3.93	4.00
	[0.00]	

Table A.4: Female & URM Belonging Comparisons by Group Composition

	High Percentage Female & URM Groups	Low Percentage Female & URM Groups
Variable	Mean Rating [P-value]	
Belonging in Economics	3.65	3.40
	[0.55]	
Belonging at University	3.77	4.40
	[0.06]	
Peer Belonging in Economics	3.89	3.98
	[0.44]	
Peer Belonging at University	3.95	3.90
	[0.00]	

Appendix B

Table B: Principal Components

Component	Source	Survey Statement/Variable	Factor Loadings
1	Course	Course Percentage	0.9
	Course	Exam 2	0.8
	Course	Exam 1	0.8
	Registrar	Prior Term GPA	0.7
	Course	Exam 3	0.7
	Registrar	First Generation	0.5
	Registrar	Parent's Education	0.5
2	Post-Survey	The course stimulated my thinking	0.8
	Post-Survey	The course stimulated my interest	0.8
	Post-Survey	The professor and TAs stimulated my interest	0.8
	Post-Survey	I learned a lot from this course	0.7
	Post-Survey	Rate my satisfaction with the course	0.6
3	Post-Survey	Rate how much interaction you had with TAs	0.7
	Post-Survey	Rate how much interaction you had with other students	0.6
	Post-Survey	Rate how much interaction you had with Professor	0.6
	Pre-Survey	Do you prefer to study along, with one other, or two or more students	0.4
	Post-Survey minus Pre-Survey	Change in Friends	0.4
4	Pre-Survey	How many friends do you prefer to have	0.6
	Pre-Survey	How easily or not do you make friends compared to others	0.6
	Pre-Survey	How much do you like interacting with students in a class	0.5
	Registrar	International	0.5
	Post-Survey minus Pre-Survey	Change in Interest in Economics	0.4
	Post-Survey	Belonging at University	0.3
5	Post-Survey minus Pre-Survey	Change in Acquaintances	0.5
	Post-Survey minus Pre-Survey	Change in Contacts	0.5
	Post-Survey	Peer Belonging at University	0.4
	Registrar	Low Income	0.4
None	Registrar	Transfer	na
	Pre-Survey	Has Job	na