Course Format Impact on Choice of and Persistence in the Economics Major

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Increasing diversity, equity, inclusion, and belonging in the economics major has been a goal of many large public universities. The principles classroom provides the introduction to the discipline for many undergraduate students. It is with this course that our first- and second-year students either decide that economics is relevant and valuable for them or turn off any future interest in the field. The authors use "backward design" (Wiggins and McTighe 2005) to create an interactive principles of microeconomics course[1]. The course is delivered in a hybrid format with more than 300 students. They compare the probability of a student taking more economics courses or switching into an economics major after their principles experience with the interactive course delivery method relative to the traditional lecture or online course format. The authors are careful to identify where the impact of course delivery on major choice differs across gender, historically underrepresented, low-income and first-generation college student status.

[1] The authors would like to thank the American Economic Association, UCOP for the ILTI grant supporting online learning, George Orlov for his thoughtful discussion, UCD small grant, and all participants in EDUCATE 2021 for their contributions to the creation of a course designed to promote diversity, equity, inclusion, and belonging in the Economics discipline.

Introduction

There is reason to believe that course format will be chosen, not because of the level of effective learning for a student but for the balancing of alternative costs. For example, as the cost of higher education has increased in the United States, students need to work additional hours to fund their schooling and/or take larger course loads in any given term to decrease the time enrolled in a university for any given degree. As economists, we understand that turning to online and hybrid courses and away from in-person courses could be an economic choice that students make to optimize their individual utility. As researchers, we want to ensure that students understand the implications of their choices on their learning outcomes. In addition, administrators need to be aware if a particular course format does not provide the same opportunities for their students. More important, an administrator should be aware if a face-to-face course provides greater opportunities than a hybrid or online course to students from one group over another based on group characteristics such as gender, first generation college student status, income status, and historically underrepresented status. The implication of this result is extremely important for the field of economics. The lack of diversity in the field has been a topic of concern for decades (Bayer and Rouse 2016). The principles of microeconomics classroom provides an opportunity to attract students with diverse backgrounds into our field. It is vital that we understand how course delivery method impacts students' choice to remain in the economics major, add economics as a major or change from their current major to become an economics major.

The innovation presented by the authors comes in the form of a hybrid course, created using "backward design,"[2] (Wiggins and McTighe 2005) where the authors were careful to start the redesign with desired learning outcomes, build assessment where students illustrate mastery of the desired outcomes, and learning activities give students opportunities to practice illustrating their mastery. Half of the weekly lecture is replaced by video lectures with embedded quizzing to teach the basic modeling required for a principles of microeconomics course. These videos were carefully created using "learning glass technology"[3] where students see the instructor and the explanation clearly and videos are captioned. Having learned the basic modeling students arrive equally prepared for the in class learning activities. In person lectures include a variety of active learning techniques. Students are placed in groups upon arrival to the classroom with a worksheet printout of the problems of the day. The first one or two problems are opportunities to practice the basic modeling and clarify any questions students may have. The class then watches a short video of a student who has graduated from the major talking about how their economics degree is used in their career. The next problems ask content question related to the career of the alum. There is a back and forth where student groups answer the questions together and the instructor discusses the answer in the wider group. The final worksheet questions give students opportunities to share their varied opinions and points of view as they apply to the concept of the day. Alumni videos, TED Talks, current events, and current research are all used throughout the

[2] The authors would like to thank the American Economic Association and all participants in EDUCATE 2021 for their contributions to the creation of a course designed to promote diversity, equity, inclusion, and belonging in the Economics discipline.
[3] See example: https://youtu.be/jaTT-mIKWHg?si=ZDX1ZMSKCIC6G796

quarter. See *Figure 1* for an example of the worksheets used. The goal of the authors is to embed the relevance of the field into the exercises relating the material to employment, hot topics, and share the relevance of economic research. Growth mindset is embedded into the format as students at various levels with differing backgrounds work through the problems together with teaching assistants and the instructor answering any questions and prompting further discussion with individual groups. Diverse alumni and researchers are used in the videos illustrating for the students that the field has valued participants from a wide variety of backgrounds. A more detailed description of the course can be found in Wilson (2023). This relevance, belonging, and growth mindset is important for welcoming diverse students into the major (Bayer et al. 2020) The aim of the authors is to understand if this new format has a positive impact on the decision of students to pursue additional economics courses or further, make the switch to a major in economics.

At the large public university in the study, the composition of the economics major differs significantly from the overall campus. The major has fewer female (37%), first generation (33%), and fewer students from minoritized groups (13%) than the rest of campus[4]. The department has been experimenting with offering online, hybrid and traditional versions of the principles of microeconomics course to increase diversity in the undergraduate major. This study looks at which students enroll in the various course formats offered and the likelihood of a student changing their major to economics or persisting in the economics major based on course format. Data was collected from 6,097 students during Winter Quarter sessions from 2017, 2018, 2019, 2020, and 2023[5] in all principles of microeconomics and principles of macroeconomics courses offered at the university. The students are followed through March of 2024 so that each student in the sample has at least one year to switch majors or take additional courses. This paper will dive into the impact on major choice and persistence in an economics major by students after principles enrollment in the various formats based on gender identification, first generation college student status, low-income status[6] and historically minoritized group status.

The literature is not clear regarding which course delivery method is best for differing student identifying groups. Some studies have found that drop-out rates rise with less in person instruction (McLaran 2004 and Allione and Stein 2016). Others have found an impact of delivery method on test scores. Specifically, these studies find that test scores decline with online delivery. (Brown and Liedholm 2002, Coates, Humphreys, Kane and Vachris 2004). Vachris (1997) and Navarro & Shoemaker (1999) find that students perform better in an online format. Other studies have looked at gender and minoritized status and found that female and historically underrepresented students underperform male students in both face-to-face and online course delivery (Gratton-Lavoie and Stanley 2009). However, some studies have found that the gap in performance is reduced or eliminated in remote delivery methods relative to in person delivery methods (Brown and Liedholm 2002). Figlio et al. (2013) find an advantage of live lecture over online lecture for student learning outcomes that is especially pronounced for

[4] In fall 2024 the students on campus identified 58% female, 37% first generation, and 26% historically underrepresented in the degree seeking undergraduate program.
[5] Winter 2021 was taught remotely due to Covid restrictions, and the first four weeks of Winter 2022 were taught remotely due to Covid restrictions. Winter 2020 is included as only the final week of the quarter was forced online.
[6] The authors do not have data on total student population qualifying as "low-income"

Hispanic, male, and low-achieving students. A more recent study by McCary, Bennett and Carter (2013) find that student performance gaps increase for students from historically underrepresented minority groups relative to their white male peers in an online setting. Babin et. al (2022) compares student performance between a hybrid and online course format finding that students in the hybrid model earned lower exam scores. They express concern regarding their limited sample size and call for additional comparisons of student performance across course formats. Jensen and Owen (2001) found that students who find the material relevant to their lived experiences are more likely to persist in the economics major. The authors contribute to the understanding of how principles course format influences students' choice to enroll in additional economics coursework and choice of an economics major based on group identity at a large public university with large class sizes.

Preliminary Analysis

Our sample comes from courses at a large, public, R1 university taught in "Winter" quarters which run from early January to late March. When the authors refer to an "economics major", they include students majoring in both managerial economics and economics at the university. These are both economics majors, one is housed in the college of agriculture and the other housed in the college of letters and sciences. All principles courses are taught by the faculty and lecturers housed in the department of economics. The courses were taught by eight different instructors over the sample period. Seven instructors taught in a face-to-face lecture style format and a single instructor taught in a lecture style face-to-face, online, and interactive hybrid course format. The typical class size is either 240 or 360 students though during this time-period there were courses run with as many as 500 students. The interactive hybrid format allowed the instructor to teach half of their 300 students at a time in groups of 150. Teaching assistants hold discussion section once a week for an hour in groups as small as 37 students.

The authors are keenly interested in the impact of class format on students, particularly those from groups traditionally under-represented in economics including female, first generation, low income, and historically underrepresented students. Of the full sample, about 53% of students identify as female. About 35% are first generation college students, 24% have come from low-income household by university metrics, and 18% of the students are from historically underrepresented groups (URM) in economics. At this institution, most students in the URM sample identify as Hispanic. In winter 2020, students were able to choose between online and face-to-face lecture versions of principles of microeconomics, and in winter 2023 students were able to choose between online, face-to-face, and interactive hybrid versions of principles of microeconomics. See *Table 1* for the differences in composition of student identities across the various formats. Female identifying students have greater representation in the hybrid and online courses, as do students from a low-income household though the differences are less pronounced. First generation college students are more likely to choose the online course and slightly less likely to choose the interactive hybrid course. There is no difference in format choice for the students historically underrepresented in the field.

Table 1: Demographic as a percent of total by format				
	Female	Low income	First Generation	URM
Face to face	52%	23%	35%	18%
Hybrid	59%	26%	33%	19%
Online	67%	29%	39%	18%
Full Sample	53%	24%	35%	18%
Total in Sample	6,097	5,896	5,874	5,936

We are interested in student choices to switch majors (to or from economics) as well as their choice to take further economics courses. Of the 6,097 students in the sample, 2% switched out of the economics major, 82% neither switched in or out of the economics major, and 16% switched into the economics major after their first principles course at the university. In the sample, 53% of the students took an additional principles or upper division course after their principles course and 41% took an upper division economics course after their principles course. The demographics of those students can be found in *Table 2*[7]. There are fewer historically underrepresented students choosing to switch into the economics major as a percent of the sample, fewer low income and historically underrepresented students choose to take additional economics courses and upper division economics courses. The female and first-generation students are choosing to switch majors and take additional economics courses in similar proportion to the total group.

Table 2: Number of Students and Students as a percent of Sample										
	Total		Female		Low income		First Generation		URM	
Switched to Econ	998	16%	475	15%	205	15%	337	16%	118	11%
Switched out of Econ	129	2%	76	2%	38	3%	49	2%	32	3%
Took any Econ	3,246	53%	1651	51%	648	47%	1,074	52%	490	45%
Took upper Div Econ	2,521	41%	1,281	40%	478	35%	820	40%	332	30%

Looking at the students in the various course formats, the authors find that students in both the hybrid and online format choose to switch to an economics major and take additional economics courses at much lower rates than the face-to-face lecture style course format. The number and percent of total students from the sample in each category by course format can be found in *Table 3*.

[7] The authors study student reactions to their first principles course experience. All students taking both principles of micro and macro together were dropped from the sample leaving 5,765 students for the rest of the analysis.

Table 3: Number of Students and Students as a percent of Sample by Format						
	Face to Face		Hybrid		Online	
Switched to Econ	939	17%	30	10%	29	12%
Switched out of Econ	127	2%	1	0.4%	1	0.4%
Took any Econ	3,070	55%	96	33%	80	34%
Took upper Div Econ	2,396	43%	60	21%	65	28%

Some of this variation is a function of who chooses which format. Indeed, in the face-to-face format 1,045 or 19% of the students began their first principles course as a declared economics major while only 6% of students in both the hybrid and online courses began their principles course as an economics major. Further analysis attempts to differentiate the choice of course format and the impact of the chosen course format on decision to switch into economics or take additional economics coursework.

Additional Analysis

The authors are particularly interested in how the interactive hybrid course attracts diverse students to the economics major. Controlling for final grade in their principles course, we run an OLS model on the choice to switch to an economics major. There are three choice outcomes where the dependent variable takes on a value of zero if the student has not changed their major in or out of economics, "1" if they have changed their major to economics, and "-1" if they have changed out of the economics major after taking their first principles course. The data extends to winter 2024 so all students in the sample are studied for at least one full year after taking their principles course to identify major switching or completion of additional economics courses. These results are compared with the same model run on students from the face-to-face and online course formats, the results can be found in *Table 4*. The fact that there is one instructor who teaches the online and hybrid courses requires cautious interpretation of the findings below. The coefficients on the hybrid and online dummy variables are describing the correlation between that one instructor teaching in these alternative formats. The instructor has been teaching for more than two decades and has been trained extensively in best practices teaching in all course formats. That being said, the interpretation of the findings are limited.

The model finds clear positive significance on student grades which is not surprising as those students who find success would be more likely to consider a major in economics. The interactive hybrid format has the opposite of the desired effect on the choice to switch to an economics major. Fewer students are choosing to major in economics after taking principles in the new interactive hybrid format. The positive and significant coefficient is instead found on the traditional face-to-face course format. Students are more likely to change their major to economics after taking a lecture style face-to-face principles course.

Table 4: OLS Switching Major to Economics estimated coefficient [t-value]			
	Hybrid	Online	Face-to-Face
Grade in First Principles Course	0.03*** [5.14]	0.026*** [4.98]	0.03*** [5.22]
Hybrid	-0.06*** [-2.52]		
Online		-0.03 [-0.88]	
Face-to-Face			0.05*** [2.55]
Constant	0.07*** [4.67]	0.07*** [4.68]	0.02 [0.94]
Observations	5765	5765	5765
Adj R-squared	0.0049	0.0040	0.0050
*90% confidence, **95% confidence, ***99% confidence			

The design of the model on major switching limits the ability to control for student major choice upon enrolling in their first principles course. Those students who have already sorted into the major would be more likely to take those courses. The following model specification includes this control. The authors use a probit model on the decision to take additional economics courses. *Table 5* is run on the choice to take another principles or an upper division economics course. *Table 6* looks more narrowly at upper division economics courses after a student has completed the hybrid version of the principles of microeconomics course. The options for upper division courses include the intermediate microeconomics and intermediate macroeconomics courses in the managerial economics and economics majors. The authors differentiate between those students who became interested in economics and tried another principles course as part of their general education requirements and those students who considered a minor or a major by taking an upper division economics course. The results can be found side-by-side with the results from the same model run for the face-to-face and online formats.

The results in both *Tables 5 and 6* indicate that the interactive hybrid and online versions of the principles course discourage students from taking additional courses in Economics. Consistent with the major switching results found in *Table 4*, the interactive hybrid course has a clear, negative impact on student desires to pursue Economics as a discipline.

Table 5: Probit Model of Choice to Take Additional Econ estimated coefficient [z-statistic]			
	Hybrid	Online	Face-to-Face
Grade in First Principles Course	0.16*** [9.07]	0.15*** [8.83]	0.16*** [9.47]
Declared Econ Major in First Principles Course	1.29*** [23.47]	1.29*** [23.62]	1.27*** [23.21]
Hybrid	-0.52*** [-6.43]		
Online		-0.39*** [-4.22]	
Face-to-Face			0.49*** [7.86]
Constant	-0.48*** [9.39]	-0.49*** [9.41]	-0.98*** [-11.98]
Observations	5765	5765	5765
Pseudo R-squared	0.1010	0.0979	0.1036
*90% confidence, **95% confidence, ***99% confidence			

The fully online course with asynchronous lecture videos also discourages future Economics coursework. However, the interactive hybrid course is worse. The magnitude of the sign is greater in both *Tables 5 and 6.*

Table 6: Probit Model of Choice to Take Upper Division Economics estimated coefficient [z-statistic]			
	Hybrid	Online	Face-to-Face
Grade in First Principles Course	0.19*** [10.61]	0.18*** [10.19]	0.20*** [10.86]
Declared Econ Major in First Principles Course	1.41*** [27.76]	1.42*** [28.00]	1.40*** [27.55]
Hybrid	-0.62*** [-6.86]		
Online		-0.26*** [-2.74]	
Face-to-Face			0.48*** [7.20]
Constant	-0.94*** [-17.10]	-0.93*** [-17.07]	-1.42*** [-16.21]
Observations	5765	5765	5765
Pseudo R-squared	0.1353	0.1299	0.1358
*90% confidence, **95% confidence, ***99% confidence			

The positive and significant sign on the face-to-face dummy variable indicates a correlation between students taking the lecture style face-to-face course and the pursuit of additional and upper division courses. The traditional classroom is coming out ahead.

The authors are particularly concerned with understanding how these formats impact the decisions of our students who are underrepresented in the economics major. If there was an overall negative impact of the hybrid course format on some students, but a positive impact on groups of vulnerable students, the authors could recommend certain formats for some students. Careful interactive course design in many settings has had a positive impact on student sense of relevance and belonging (Bayer et al. 2020). The following models look at the correlation of major choice to group identity. There are 30 students from the interactive hybrid and 29 students from the online courses who changed their major to economics. The authors want to discover if the students from the underrepresented groups in the field of economics (female, URM, low-income, and first-generation) are more likely to switch to the economics major.

Table 7: OLS of Choice to Switch Major to Economics by Demographic with Instructor Fixed Effects estimated coefficient [t-value]

	Hybrid				Online				Face-to-Face			
Grade in First Principles Course	0.03*** [5.30]	0.02*** [4.11]	0.03*** [4.76]	0.03*** [5.42]	0.03*** [5.27]	0.02*** [4.05]	0.03*** [4.74]	0.03*** [5.40]	0.03*** [5.31]	0.02*** [4.11]	0.03*** [4.80]	0.03*** [5.45]
Hybrid Dummy	-0.04 [-1.01]	-0.03 [-1.11]	-0.03 [-0.84]	-0.02 [-0.56]								
Online Dummy					0.05 [1.04]	-0.00 [-0.10]	0.01 [0.22]	0.01 [0.19]				
Face-to-Face Dummy									0.01 [0.23]	0.02 [1.00]	0.02 [0.061]	0.01 [0.41]
Female	-0.03*** [-2.91]				-0.03*** [-2.76]				-0.05 [-1.41]			
Format*female	0.01 [0.10]				-0.07 [-1.13]				0.02 [0.60]			
URM		-0.06*** [4.22]				-0.07*** [-4.45]				-0.06 [-1.32]		
Format*URM		-0.03 [-0.40]				0.04 [0.55]				-0.00 [-0.02]		
Low income			-0.01 [-0.76]				-0.01 [-1.03]				-0.05 [-1.28]	
Format*low income			-0.08 [-1.28]				-0.01 [-0.10]				0.05 [1.00]	
First generation				0.01 [1.05]				0.01 [0.82]				-0.02 [-0.60]
Format*first generation				-0.07 [-1.19]				-0.00 [-0.08]				0.04 [0.89}
Constant	0.09*** [4.79]	0.10*** [5.23]	0.07*** [4.15]	0.06*** [3.16]	0.08*** [4.64]	0.09*** [5.20]	0.07*** [4.08]	0.06*** [3.12]	0.08** [2.10]	0.07*** [2.44]	0.06* [1.91]	0.05 [1.49]
Observations	5765	5609	5580	5557	5756	5609	5580	5580	5765	5609	5580	5557
F Stat	10.27	13.38	8.00	8.22	10.10	12.92	6.90	6.9	10.11	13.13	7.51	7.83
*90% confidence, **95% confidence, ***99% confidence												

Controlling for instructor fixed effects, *Table 7* does not reveal a particularly negative or positive impact of the course format on any of the groups typically underrepresented in the Economics major. Overall, those students identifying as female and from a historically underrepresented minority group, are less likely to switch into Economics. The data does not seem to conclude this is any worse or better with the interactive hybrid format.

Table 8 looks at the choice to take additional economics courses. The following model is an attempt to discover if the 96 students in the interactive hybrid course or the 80 students in the online course that took another principles course were more likely to be from the groups underrepresented in the field of economics. The advantage of the model design is the ability to control for major choice while students are enrolled in their first principles course.

Table 8: OLS of Choice to Take Any Economics by Demographic with Instructor Fixed Effects estimated coefficient [t-value]

	Hybrid				Online				Face-to-Face			
Grade in First Principles Course	0.05*** [8.71]	0.05*** [7.48]	0.05*** [7.58]	0.56*** [8.47]	0.05*** [8.66]	0.05*** [7.45]	0.05*** [7.57]	0.06*** [8.46]	0.06*** [8.83]	0.05*** [7.57]	0.05*** [7.72]	0.06*** [8.61]
Declared Econ Major in First Principles Course	0.40*** [25.14]	0.40*** [24.66]	0.40*** [24.73	0.40*** [24.46]	0.40*** [25.21]	0.40*** [24.72]	0.40*** [24.81]	0.40*** [24.52]	0.40*** [25.02]	0.40*** [24.54]	0.40*** [24.60	0.40*** [24.32]
Hybrid Dummy	-0.15*** [-3.28]	-0.14*** [-4.24]	-0.16*** [-4.27]	-0.14*** [-3.76]								
Online Dummy					-0.07 [-1.20]	-0.08** [-2.07]	-0.09** [-2.15]	-0.05 [-1.13]				
Face-to-Face Dummy									0.14*** [3.79]	0.14*** [5.09]	0.15*** [5.18]	0.13*** [4.16]
Female	-0.02* [-1.71]				-0.02 [-1.60]				-0.01 [-0.30]			
Format*female	0.02 [0.38]				-0.02 [-0.27]				-0.01 [-0.12]			
URM		-0.06*** [-3.76]				-0.06*** [-3.65]				-0.04 [-0.81]		
Format* URM		0.04 [0.58]				-0.01 [-0.16]				-0.02 [-0.33]		
Low income			-0.05*** [-3.48]				-0.05*** [-3.36]				-0.03 [-0.67]	
Format* low income			0.03 [0.46]				0.00 [0.04]				-0.02 [-0.39]	
First gen				-0.00 [-0.02]				0.00 [0.24]				-0.02 [-0.52]
Format* first gen				-0.00 [-0.03]				-0.06 [-0.91]				0.03 [0.57]
Constant	0.34*** [16.67]	0.36*** [17.03]	0.36*** [17.36]	0.33*** [15.54]	0.33*** [16.46]	0.35*** [16.81]	0.35*** [17.14]	0.32*** [15.24]	0.20*** [4.78]	0.22*** [6.53]	0.21*** [5.99]	0.20*** [5.64]
Obs	5765	5609	5580	5557	5765	5609	5580	5557	5765	5609	5580	5557
F Stat	151.38	149.96	148.88	143.59	147.95	146.75	145.37	140.26	153.55	152.06	151.25	145.45
*90% confidence, **95% confidence, ***99% confidence												

The dummy variable on the interactive hybrid course is negative and significant throughout the specifications while the dummy variable on the lecture style face-to-face format is positively correlated with students pursuing additional economics coursework. However, the interactive terms do not indicate that format has a unique impact on particular groups of students.

Table 9 tells a similar story with coefficients of lesser magnitude. The model does not indicate that those students taking additional economics generally or those students choosing to advance to upper division economics courses are influenced by different factors.

Table 9: OLS of Choice to Take Upper Div Economics by Demographic with Instructor Fixed Effects estimated coefficient [t-value]

	Hybrid				Online				Face-to-Face			
Grade in First Principles Course	0.07*** [10.89]	0.06*** [9.02]	0.06*** [9.49]	0.68*** [10.76]	0.06*** [10.78]	0.06*** [8.94]	0.06*** [9.39]	0.07*** [10.69]	0.07*** [10.93]	0.06*** [9.06]	0.06*** [9.56]	0.07*** [10.84]
Declared Econ Major in First Principles Course	0.48*** [31.05]	0.48*** [30.58]	0.48*** [30.62]	0.47*** [30.10]	0.48*** [31.16]	0.48*** [30.69]	0.48*** [30.75]	0.48*** [30.22]	0.48*** [30.97]	0.47*** [30.51]	0.47*** [30.54]	0.47*** [30.01]
Hybrid Dummy	-0.14*** [-3.20]	-0.12*** [-3.77]	-0.14*** [-3.88]	-0.10*** [-2.83]								
Online Dummy					-0.02 [-0.33]	0.00 [0.01]	-0.00 [-0.07]	0.03 [0.69]				
Face-to-Face Dummy									0.11*** [2.99]	0.09*** [3.17]	0.09*** [3.31]	0.62** [2.10]
Female	-0.01 [-1.11]				-0.01 [-1.17]				0.02 [0.39]			
Format*female	0.03 [0.50]				0.02 [0..27]				-0.03 [-0.68]			
URM		-0.08*** [-5.12]				-0.08*** [5.10]				-0.10* [1.88]		
Format*URM		0.00 [0.00]				-0.03 [-0.38]				0.02 [0.30]		
Low income			-0.05*** [-3.41]				-0.05*** [-3.58]				-0.06 [-0.37]	
Format*low income			-0.04 [-0.54]				0.01 [0.09]				0.01 [0.28]	
First generation				0.00 [0.02]				0.00 [0.02]				-0.07 [1.51]
Format*first generation				-0.07 [-1.19]				-0.08 [-1.17]				0.07 [1.53]
Constant	0.17*** [8.65]	0.20*** [10.05]	0.19*** [9.78]	0.16*** [7.82]	0.16*** [8.43]	0.20*** [9.77]	0.19*** [9.50]	0.15*** [7.53]	0.06 [1.53]	0.12*** [3.65]	0.10*** [2.97]	0.09*** [2.76]
Observations	5765	5609	5580	5557	5765	5609	5580	5557	5765	5609	5580	5557
F Stat	227.22	228.61	224.22	216.61	222.83	224.54	218.76	212.53	226.17	227.56	222.41	215.63

*90% confidence, **95% confidence, ***99% confidence

The results are disappointing. Students taking the interactive hybrid course are less likely to switch to economics or pursue economics coursework than their peers in the lecture style face-to-face format. However, an alternative channel by which the interactive hybrid and online courses could provide value to students is simply in the provision of format choice.

Students that are provided options when choosing a course format could sort themselves into a format that is best suited for their personal needs. There is a difference in composition of students in the online and hybrid courses that indicates students are self-sorting. More students that are declared economics majors are choosing the face-to-face lecture version of the course. Within format, we may not find an increase in the propensity to change a major to economics or take additional economics courses, but it could be that more students are making the decision to switch or take additional courses because they were able to choose a format that better fit their lifestyle or learning style. A dummy variable "options" is introduced for winter quarter 2020 and winter quarter 2023 as students could choose between online and face-to-face lecture style principles of microeconomics courses in Winter 2020 and could choose between online, interactive hybrid, and face-to-face lecture style principles of microeconomics courses in Winter quarter 2023. *Table 10* provides the results of an OLS model on switching into an economics major with instructor fixed effects. Underrepresented groups are included to understand if the impact of format options could be different across various demographics.

Table 10: OLS of Choice to Switch to Economics by Demographic and the Option to Take Multiple Formats with Instructor Fixed Effects estimated coefficient [t-value]				
Grade in First Principles Course	0.03*** [5.06]	0.02*** [3.82]	0.03*** [4.55]	0.03*** [5.21]
Format Options	0.01 [0.41]	0.02 [1.44]	0.02 [1.10]	0.02 [1.38]
Female	-0.05*** [-3.42]			
Format Options*female	0.04* [1.74]			
URM		-0.09*** [-4.61]		
Format Options* URM		0.05* [1.71]		
Low income			-0.03 [-1.56]	
Format Options* low income			0.03 [1.13]	
First gen				0.00 [0.23]
Format Options* first gen				0.02 [0.74]
Constant	0.08*** [4.47]	0.09*** [4.81]	0.07***. [3.78]	0.05*** [2.71]
Obs	5765	5609	5580	5557
F Stat	11.48	14.79	7.94	8.49
*90% confidence, **95% confidence, ***99% confidence				

For both female identifying and students from historically underrepresented groups, students are less likely to switch to an economics major than their peers but more likely to change their major to economics when there are format options available. The sign switching continues in *Table 11* when looking at student choice to take additional economics courses. Though overall, students are less likely to take additional economics courses when format options are available, there is a positive sign on female, URM, low-income, and first-generation college students' decision to take additional economics courses when the online or hybrid course options are offered.

Table 11: OLS of Choice to Take Any Economics by Demographic and the Option to Take Multiple Formats with Instructor Fixed Effects estimated coefficient [t-value]				
Grade in First Principles Course	0.06*** [8.84]	0.05*** [7.62]	0.05*** [7.69]	0.06*** [8.60]
Declared Econ Major in First Principles Course	0.40*** [24.97]	0.40*** [24.50]	0.40*** [24.53]	0.39*** [24.34]
Format Options	-0.08*** [-4.03]	-0.06*** [-3.49]	-0.06*** [-3.57]	-0.07*** [3.69]
Female	-0.04*** [-2.76]			
Format Options*female	0.05** [2.15]			
URM		-0.09*** [-4.02]		
Format Options* URM		0.06* [1.91]		
Low income			-0.07*** [-3.81]	
Format Options* low income			0.05* [1.76]	
First gen				-0.02 [-1.30]
Format Options* first gen				0.06** [2.12]
Constant	0.36***. [16.84]	0.36*** [17.13]	0.37*** [17.44]	0.34*** [15.71]
Obs	5765	5609	5580	5557
F Stat	150.42	148.39	146.87	142.15
*90% confidence, **95% confidence, ***99% confidence				

The results of the model on the choice to take upper division economics courses has fewer significant coefficients on format options. However, the coefficients on the interaction of format options with female identifying students and students the university considers low income remain significant. Cautious interpretation of the coefficients is needed. The “options” variable also describes more recent quarters. It could be that some change in the world of our sample that divides 2017-2019 and 2020-2023 is being picked up. One quarter before the pandemic and one quarter after the pandemic may not be enough to say that the impact of the pandemic disruptions is not an issue.

Table 12: OLS of Choice to Take Upper Division Economics by Demographic and the Option to Take Multiple Formats with Instructor Fixed Effects estimated coefficient [t-value]				
Grade in First Principles Course	0.07*** [10.83]	0.06*** [8.94]	0.06*** [9.41]	0.07*** [10.71]
Declared Econ Major in First Principles Course	0.48*** [31.00]	0.48*** [30.55]	0.48*** [30.52]	0.47*** [30.10]
Format Options	-0.05*** [-2.35]	-0.02 [-1.25]	-0.03* [-1.65]	-0.02 [-1.34]
Female	-0.03** [-2.21]			
Format Options*female	0.05** [2.10]			
URM		-0.10*** [-4.94]		
Format Options* URM		0.04 [1.35]		
Low income			-0.07*** [-3.88]	
Format Options* low income			0.05* [1.64]	
First gen				-0.01 [-0.86]
Format Options* first gen				0.03 [1.14]
Constant	0.18*** [8.76]	0.20*** [9.85]	0.20*** [9.66]	0,16*** [7.71]
Obs	5765	5609	5580	5557
F Stat	224.28	225.10	219.68	212.71
*90% confidence, **95% confidence, ***99% confidence				

Conclusion

The hybrid course format was designed specifically to provide a diverse, equitable, inclusive, environment promoting student sense of belonging. However, the course did not create the wave of diverse students transferring into the economics major that the authors hoped to create. Nor was there an increase in the probability of trying additional economics courses. The authors see

these results as a cautionary tale when expanding interactive techniques to the large class setting. It could be that the culture at the large R1 institution is such that students do not engage in the active learning activities as sincerely as their peers at institutions with smaller class sizes. For many of the students enrolled at this university, this hybrid, principles course is the only class where they learn actively with their peers. In a class split in groups of 150, even a skilled team of graduate student teaching assistants and the instructor cannot ensure that each group is engaging instead of spending the in-class time scrolling or shopping on their phones. When all detailed modeling is sacrificed to an asynchronous video to allow time for active learning, even the embedded quizzing may not be enough to keep many students on task. The authors now have a baseline where they can turn up the dial on in person lecturing and down the dial on group interactive classwork to find a more effective balance given the university culture and the number of the students in their classes. They will not give up on creating a more interactive classroom than the lecture style chalk and talk. However, the authors will calibrate until the balance creates the improved outcomes they were hoping to see.

There is some hope in the findings. Variety in the availability of course formats could be an effective manner to increase diversity in the field. Overall, the authors find some groups saw value in having options that fit their lifestyle and learning style. They are not able to see, at the individual level, the impact of student feelings about the field in a world where there are a variety of formats. However, this result does indicate that each student has their own needs. In addition to options creating more diversity based on group identity, the authors also believe that there are unobserved student characteristics where the ability to sort themselves into an active hybrid, online, or lecture style face-to-face course could bring a student into the field of economics.

Figure 1: Sample In-Class Participation Assignment in the Hybrid Course

ECN 1AY
In Class Participation
Week 8

Students watch the following video of Susannah, an alumna from the undergraduate program linked here

1. What does Economics mean to you?

2. Draw a model of costs below labeling marginal cost, average total cost, average variable cost and average fixed cost

3. Point out the "efficient scale" on the model in question 3.
4. Draw the model of long run average total cost below. Explain why it looks different that short run average total cost

5. Where would you guess that Old Navy produces on the long run average total cost curve above? Why? Explain.

6. What are fixed costs and variable costs in the retail clothing business? Give four examples of each.

7. How does open trade between countries lower costs for the clothing retail business? Which costs have been impacted by the pandemic?

8. When Susannah chooses how much to spend on a particular season and line of clothing, is she primarily looking at fixed costs or variable costs?

9. What additional factors would Susannah need to estimate when choosing what to buy and how much? Explain.

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