

Development of the Online Economics Program

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University of Colorado
Boulder

Economics

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Summary

This report is an analysis of the evolving landscape of economics education at the University of Colorado Boulder, with a particular focus on the integration of online learning. It examines demographic, academic, and experiential differences between students enrolled in online and on-campus economics courses using data from 2018 to 2024.

The findings reveal that the Economics Department has emerged as a campus leader in online education, offering a full suite of high-quality, asynchronous courses that adhere to best practices in instructional design and have significantly expanded access for all students. The data show that while online and main campus students are broadly similar, a logistic regression analysis indicates the online modality functions as a crucial completion tool, evidenced by the statistically significant tendency for it to appeal to older students, international and non-resident students, and those with lower academic profiles. These patterns highlight the nuanced ways in which modality intersects with student experience, leading to distinctions such as lower GPAs and an older average age among online learners. The report also identifies the persistent structural gender imbalance among Economics majors, where women constitute only 19% of the cohort.

Beyond demographic comparisons, the quantitative findings confirm the program's strategic success and impact on student enrollment patterns. The phased development led to the online course catalog expanding from 13 courses in 2018 to a full degree pathway by 2023, with enrollment stabilizing at over 1,500 students annually. Analysis of enrollment trends shows that the online modality is primarily used as an academic completion tool, evidenced by the dominant enrollment of Seniors who are utilizing the flexible format for core requirements late in their academic careers. Furthermore, students who initially enroll online show strong retention and consistently return to the modality for subsequent courses.

The structure of this report is as follows: Section 1 is an introduction to online learning. Section 2 describes the Economics Online Learning program at the University of Colorado Boulder. Section 3 provides an overview of students who enroll in Economics courses, highlighting key demographic and academic trends. Section 4 focuses on Economics majors, examining how they differ from non-Economics majors and exploring the role of online learning within this group. Section 5 concludes with a discussion of key findings and their implications for the future of economics education.

WHAT IS ONLINE LEARNING?

The Online Economics Program at the University of Colorado Boulder reflects a broader transformation in higher education. Across disciplines, universities are experimenting with new modalities that extend access while maintaining rigor and engagement. This section outlines the defining characteristics of online learning and explains how it complements traditional in-person instruction. Drawing from research in education and in the learning sciences, it examines how time management, communication, community, content design, and instructional practice shape the learning experience. Understanding this dimensions allows the Department of Economics to design courses that are rigorous, inclusive and aligned with students' diverse circumstances.

Online learning also has an important financial dimension. In some cases, tuition for online classes is lower than for traditional in-person instruction:

Table 1.1: Undergraduate Tuition per Credit, University of Colorado Boulder

	One Credit	One Course (3 Credits)
Resident Cost	\$487	\$1,461
Non-resident Cost	\$1,492	\$4,475
CE Online Cost	\$515	\$1,545

Source: Fall 2025, Bursar's Office, University of Colorado Boulder.

Some students also believe—rightly or wrongly—that online courses are less demanding. Geographic distance can influence enrollment choices, particularly for those who still live with family and commute to campus. Personality traits also matter: students who are more reserved may find it intimidating to speak up in a physical classroom, while the online environment can provide a sense of safety that encourages participation (Boyd, 2004). In contrast, face-to-face courses offer distinct advantages, such as immediate interaction with instructors and opportunities to build personal connections with peers—factors that

can make learning feel more collaborative and less isolating.

Research comparing in-person and online instruction suggests that both formats serve important and complementary roles in higher education. On many campuses, including ours, these modalities coexist in a dynamic balance. When in-person courses are unavailable or students require greater flexibility, online instruction provides an alternative that maintains access and continuity (Boyd, 2004). Conversely, students who seek close interaction, immediate feedback, or a physical sense of community may prefer the traditional classroom. The growing portfolio of both modalities strengthens our capacity to meet students where they are –geographically, professionally, and developmentally (Barrow et al., 2024; Kofoed et al., 2024).

1.1. The Asynchronous Model

Most online economics courses at the University of Colorado Boulder are delivered asynchronously. In this model, students engage with materials and peers at their own pace rather than through scheduled class meetings. Asynchronous e-learning, commonly facilitated by tools such as discussion boards, email, and learning management systems, allows students to access resources and contribute at times that fit their schedules (Hrastinski, 2008). This flexibility particularly benefits nontraditional students—such as parents, working professionals, or those with health challenges—who require adaptable structures.

Because students can review lectures and readings multiple times, asynchronous formats can deepen reflection and comprehension (Noetel et al., 2021). However, flexibility also demands greater autonomy. Students must take ownership of their pacing, engagement, and communication. Instructors, in turn, must design courses that provide structure and feedback without requiring simultaneous participation (Wu et al., 2025). Throughout this report, the term online learning refers specifically to asynchronous online instruction, which characterizes our department's program.

1.2. Time Management

Time management is consistently identified as a key determinant of success in online learning. A systematic review of learning skills across modalities found that the most critical competencies for online learners are time management, metacognition, effort regulation, and critical thinking (Broadbent & Poon, 2015)

¹. In asynchronous environments, these skills replace the external discipline of

¹In contrast, traits that are more beneficial for in-person learning –rehearsal, elaboration and organization– showed the least empirical support for predicting online success. Rehearsal involves repetition, elaboration is the ability to fuse new ideas with previous knowledge, and organization relates to the ability to identify and structure main ideas while learning (Broadbent & Poon, 2015)

scheduled class meetings with an internalized sense of organization and persistence.//

In asynchronous environments, where students engage with material at their own pace rather than through scheduled class meetings, time management becomes a defining factor of academic success. Without the structure of fixed meeting times, students must independently allocate their time to complete assignments, interact with peers and instructors, and engage meaningfully with course content. Likewise, instructors must carefully design learning experiences and feedback cycles that align with this flexible rhythm. In this sense, effective time management -by both students and instructors- reflects not only a skill for academic success but also an adaptation to the broader demands of an increasingly interconnected and self-directed educational environment (Hung et al., 2024).

1.3. Communication

Learning and satisfaction in online courses depend heavily on three forms of interaction: with course content, with the instructor, and with peers (Swan, 2002). Each relies on clear and intentional communication. Online environments offer unique advantages: students can revisit lectures, messages, and multimedia content multiple times, reinforcing comprehension and retention. Written exchanges often encourage more deliberate and reflective participation than spontaneous in-class discussions.

In-person instruction retains irreplaceable strengths, such as immediate feedback and the ability to read nonverbal cues—features that have long defined the social character of teaching (Wilson-Medhurst & Childs, 2024). Many pedagogical tools were developed for physical classrooms, and instructors often have more experience using them effectively (Bovill et al., 2025). The challenge, therefore, is not to replicate the in-person classroom online but to design distinct, multimodal communication strategies that make best use of the medium's strengths.

1.4. Building a Community for Learning

A strong sense of community enhances both motivation and learning outcomes (Avila Forcada, 2023; Bovill et al., 2025). (McKenna et al., 2019) define community as emerging when “students are comfortable, feel welcome, and can connect with others” (p. 186). Online environments can foster inclusion in unique ways. As (Schrader, 2015) observes, technology-mediated interaction can “equalize participation” by allowing students to be judged more by the content of their contributions than by demographic or social factors.

Nevertheless, community does not emerge automatically—whether online or in person. Instructors play a central role in designing relational spaces through

discussion structures, group activities, and tone-setting. (York, 2015) notes that attending class is not the same as belonging to a community; belonging must be cultivated intentionally. While in-person classes can rely more heavily on content delivery and lecture structure, online learning, when implemented using best practices, is intentionally designed around community formation (Mazer & Hess, 2017).

1.5. Content Design

Effective online instruction requires a thoughtful transformation of teaching materials, not merely a transfer of in-person lectures to digital form. Digital platforms enable instructors to combine diverse media—videos, podcasts, simulations, articles, blogs, and interactive exercises—into cohesive learning experiences. Laurillard (2013) emphasizes that digital platforms facilitate a “conversational” approach to teaching, where students actively engage with diverse resources and respond through multiple forms of expression. This flexibility allows instructors to design rich, media supported activities that accommodate different learning styles, fostering deeper understanding through dialogue between learners and materials.

Designing for online learning involves significant preparation and creativity. Long lectures are often restructured into shorter, self-contained learning units with guiding questions, embedded quizzes, or reflective prompts (Elzinga & Harper, 2023; Farrell & Brunton, 2020). The best practices in online content development combine collaborative and reflective activities, clear assessment criteria, and intentional integration of technology (Kebritchi et al., 2017). Coherence across these elements is key to producing a seamless and engaging student experience.

1.6. Instructional Practice

Teaching in higher education calls for a deliberate synthesis of cognitive, social, and teaching presence (Van Dorresteijn et al., 2024).

These three dimensions characterize effective instruction across modalities. Cognitive presence refers to the instructor’s ability to guide learners in constructing meaning through inquiry and reflection. Social presence involves creating a climate of trust and belonging that encourages participation and collaboration. Teaching presence encompasses the design, facilitation, and direction of learning experiences. Together, these elements provide the foundation for meaningful engagement in both face-to-face and online environments.

Online instruction, however, often requires instructors to assume two additional roles: that of facilitator and designer. As facilitators, online instructors move beyond content delivery to sustain motivation, provide individualized feedback, and monitor student progress throughout the course. They maintain a visible and supportive presence—checking in regularly, clarifying expectations, and en-

couraging persistence (Martin et al., 2019). As designers, they structure the learning environment itself, integrating readings, media, assessments, and discussion opportunities into a coherent sequence. This design work replaces the spontaneous interactions of a physical classroom with carefully planned opportunities for connection and feedback (Farrell & Brunton, 2020).

Ultimately, effective teaching depends less on modality than on reflective, intentional design. Some educators thrive in face-to-face classrooms, others in online spaces; many are skilled in both (Van Dorresteijn et al., 2024; Wilson-Medhurst & Childs, 2024). What unites effective instructors across formats is a commitment to fostering meaningful learning through clarity, responsiveness, and community.

Ultimately, the efficacy of teaching depends less on the modality itself than on intentional design and reflective practice. Both, online and in-person formats offer complementary opportunities for meaningful learning. Having established this foundation, the following chapter moves from theory to practice, tracing the milestones and course development processes that led to the creation of the comprehensive online Economics program at CU Boulder.

2

DEVELOPMENT OF THE ONLINE ECONOMICS PROGRAM

2.1. Background

The University of Colorado Boulder (CU) is a public Research 1 university whose mission is to serve as the state of Colorado's comprehensive graduate research university with selective admission standards, offering a comprehensive array of undergraduate, master's, and doctoral degree programs. CU enrolled 38,428 students in Fall 2024, of which 31,939 were undergraduates (Office of Data Analytics, 2024).

Although online courses and programs are increasing at CU, the University has historically not been a champion of online learning. CU is known as a residential campus, and the development of online courses and programs, until recently, has been somewhat unsystematic without a strategic plan, especially at the undergraduate level. To provide context for the development of the online economics program, we should first examine the University's progress in undergraduate online education from 2018 to 2023, and then compare the University-wide process with the experience at the Economics Department.

Looking at where the university was in 2018, at the undergraduate level, there were some online courses offered through the Division of Continuing Education (CE) and some through CU's main campus. Data shows that in spring 2018, approximately 4% of undergraduate student credit hours were classified as online and 96% were in-person (Office of Institutional Research, 2023). At this time, there was no path to complete an undergraduate degree entirely online at CU.

Looking at where the University is today, at the undergraduate level, there are many more online courses offered through Continuing Education and schools and programs on the main campus. In spring 2023, 9% of undergraduate stu-

dent credit hours were classified as online, 86% were in-person, and the remaining 5% were some type of hybrid or remote courses (**CU-ODA**). Although nearly 10% of student credit hours are taken online, there is still no path to complete an undergraduate degree entirely online at CU, but several departments now offer more comprehensive online offerings. For example, 11 departments have partnered with CE to offer degree completion programs, which typically means that these departments consistently offer upper-division coursework online for students to complete their major requirements at a distance. Two of these departments offer enough online courses for a student to complete the entire major online (Economics and Sociology). Despite the lack of a comprehensive undergraduate online strategy, in Spring 2023, 41% of undergraduate students took at least one course that was remote or online.

In 2018, the Department of Economics was in a very similar position to the University; it offered a few online undergraduate courses. Economics had four remote courses that were self-paced (as opposed to term-based) and consistently offered. Based on an evaluation completed in Spring 2018, none of the self-paced courses followed most of the best practices in online course design as evaluated using the Open SUNY Cote Quality Review Process and Rubric (Rubric, 2023). Based on this evaluation, the large number of undergraduate economics majors (more than 800), and the recognition that offering high-quality online courses would support student retention and graduation rates, the department chair, in partnership with the department's executive committee, committed to developing an online program starting in Fall 2018.

Five years later, in Spring 2023, the Department of Economics successfully fully developed its undergraduate major online and offered a section of every core course (8 courses) and a rotating suite of 3-5 upper-division courses each term (Fall, Spring, Summer), providing flexible options to undergraduates. Enrollments have grown from about 600 in the first year to more than 1,400 today. Three full-time instructors, 5-6 part time instructors, several tenured faculty, and some selected graduate instructors work in the program. The program is well-known throughout the university for its high-quality courses that follow best practices in online course design, its stability in course offerings, and its partnership with other campus offices and student success initiatives. See Table 2.1 for a course development timeline and program milestones achieved.

The strategic evolution of the Continuing Education (CE) online Economics program is detailed in Table 2.1, illustrating a phased expansion of its curriculum and a corresponding growth in student enrollment from 2018 to 2024. Launched in the 2018–2019 academic year with 13 courses and an initial enrollment of 657 students, the program quickly began to mature. A significant expansion occurred in 2019–2020 with the introduction of Intermediate Micro and Macro courses, contributing to a doubling of the course catalog to 26 and a 124% surge in enrollment, reaching 1,474 students. Subsequent years focused on filling core curricu-

lum gaps, notably the 2020–2021 launch of Statistics and Econometrics, bringing the program to 31 courses. By the 2022–2023 cycle, the introduction of Math prerequisites formally completed the online pathway, enabling a student to finish all degree requirements remotely. Additional courses were added, such as Environmental Economics (ECON 3545) and Economic Development and Policy (ECON 3784), and higher level courses: Urban Economics (ECON 4242), Economics of Crime and Corruption (ECON 4262), The Economics of Inequality and Discrimination (ECON 4626), and Topics in Economic Development, History and Political Economy (ECON 4774). This period marked the program’s maturation, with course offerings stabilizing at approximately 36 courses and enrollment maintaining high levels, demonstrating the sustainable integration and impact of the CE online program on the department’s academic portfolio.

	AY 2018–2019*	AY 2019–2020	AY 2020–2021	AY 2021–2022	AY 2022–2023	AY 2023–2024
Courses						
Math courses					✓	
Principles of Micro/Macro	✓	✓	✓	✓	✓	
Intermediate Micro/Macro		✓	✓	✓	✓	
Statistics and Econometrics			✓	✓	✓	
3000-level (non-majors)				✓	✓	
4000-level (majors)	✓	✓	✓	✓	✓	
Number of courses	13	26	31	31	32	36
Online Enrollment	657	1,474	1,382	1,690	1,488	1,507
Milestone	Program launched	Two full-time faculty hired, Intermediate Micro and Macro courses launched	Statistics and Econometrics courses launched	Expanded collection of 4000-level courses, reduced number of 3000-level courses	Math courses launched, full degree is now online	Program maturation and stability

Table 2.1: CE Online Economics Program Course Offerings, Enrollment, and Milestones (2018-2024)

Source: Authors' data.

**For example, Academic Year (AY) 2018–2019 includes fall 2018, spring 2019, and summer 2019.*

The deliberate, phased expansion of the CE online program—from its limited inception in 2018 to the offering of a full degree pathway by 2023—demonstrates the department's commitment to academic innovation and accessibility. This structural foundation now allows for an empirical analysis of its impact. The next chapter transitions from program history to student data, providing a detailed demographic and academic overview of all students who have enrolled in an Economics course during this period.

3

STUDENTS TAKING ECONOMICS

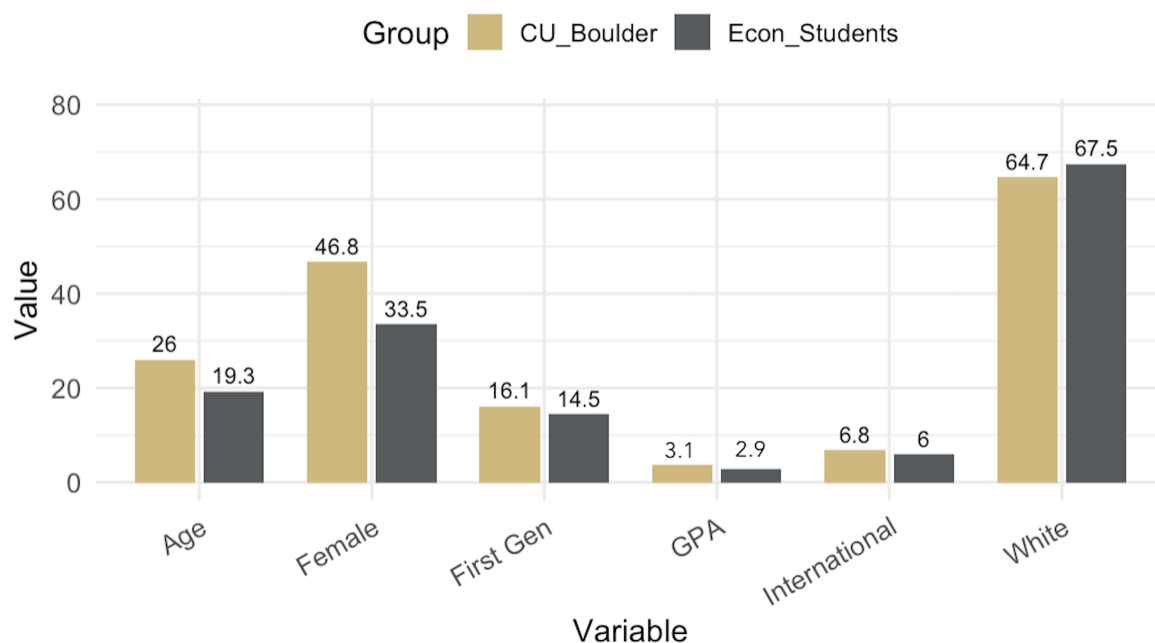
This section refers to students from different majors who took at least one Economics course in any term between the Fall of 2018 and the Spring of 2024. In other words, we exclude all the students who have never enrolled in any economics course. Compared with the rest of the students at CU-Boulder, our students are younger. This is explained by the fact that most mandatory economics courses must be taken in the early semesters while students are Freshmen or Sophomores. 14.5% of our students are First Generation, which is low compared to the 16.1% of First Gen students on the University. Our students are slightly less racially diverse: 67.5% of our students identify as White, while 64.7% of the student body at CU Boulder does. We have a lower proportion of females taking Economics courses, 33.5%, compared with 46.8% of female students in the University. The average GPA of a CUBoulder student is 3.07, while students who take Economics have a 2.9 GPA. Finally, we have about the same proportion of international students taking Economics as the rest of the University: we have 6% and the University has 6.8%. (Office of Data Analytics, 2025)

Figure 3.1 gives a graphic representation of our students compared with the rest of CU Boulder students.

3.1. Students Taking Economics

From 32,403 seats in Economics classes, 74% were Non-Economics Majors. Given the interdisciplinary nature of Economics, students from other majors often take economics courses to complement their primary field of study. Also, students from a variety of majors can enroll in ECON classes to satisfy their core curriculum needs. For instance:

- Environmental Studies and Natural Resources: Students interested in sustainability and environmental policy may take courses like ECON 3535, Natural Resource Economics, and ECON 3545, Environmental Economics.

Figure 3.1: CU Boulder vs. Students Who Take Econ

- Political Science and International Affairs: Students focused on international relations or development studies may take ECON 3784, Economic Development and Policy.
- Business and Finance: Foundational courses like Principles of Microeconomics (ECON 2010) and Principles of Macroeconomics (ECON 2020) are prerequisites for business-related majors.
- Computer Science and Data Science: The Economics Department offers ECON 3818 Introduction to Statistics with Computer Applications, which offers statistical methods applicable in data analysis.

In this section, we divide students into those who take at least one online course and those who only take main campus courses. Those, 32,403 seats were occupied by 20,082 students, some of whom took more than one course. The following analysis counts each of these 20,082 students. 5,763 students were Econ Majors and 14,319 were Non-Econ Majors. To better understand these artificially divided groups, we explore their GPA, age, gender, race, whether they are domestic or international, whether they are first-generation students, their high school GPA, and we make two groups: Econ Majors and others.

Here is a bit of context on those variables: GPA is measured in points from 0 to 4. Age is measured in years. We only know if the student identifies as male or female. In this case, female = 1 and zero otherwise. White = 1 if the student identifies as white and zero otherwise. The other racial categories are Hispanic, Asian, Black, Pacific Islander, and Amerindian. International = 1 if the student is a non-resident alien (also referred to as international students) and = 0 otherwise. "First Gen" = 1 when the student is a first-generation student and = 0 otherwise.

The variable "hs GPA" shows the high school GPA of students on a scale from 0 to 4. Finally, EconMajor = 1 if the student is an Economics Major and 0 otherwise. Table 3.1 shows the mean differences between these two groups.

Table 3.1: Students who take Economics: T-test Results for Main Campus Only vs Online

Variable	Mean		Observations	Difference (Online - Main Campus)
	M. Campus	Online		
End-Term GPA (gpa_endterm)	2.938 (0.006)	2.854 (0.011)	14,223 / 5,699	-0.084***
Age (age)	19.116 (0.016)	19.401 (0.040)	14,319 / 5,763	0.285***
Female (Proportion) (female)	0.345 (0.004)	0.334 (0.006)	14,319 / 5,763	-0.011
White (Proportion) (white)	0.680 (0.004)	0.674 (0.006)	14,319 / 5,763	-0.005
International (Proportion) (international)	0.064 (0.002)	0.052 (0.003)	14,319 / 5,763	-0.012***
First-Gen (Proportion) (first_gen)	0.151 (0.003)	0.136 (0.005)	14,319 / 5,763	-0.015***
High School GPA (hs_gpa)	3.604 (0.003)	3.569 (0.006)	13,622 / 5,439	-0.035***
Economics Major (Proportion) (econmajor)	0.130 (0.003)	0.076 (0.003)	14,319 / 5,763	-0.054***

Notes: This table presents a summary of T-tests comparing means across In-Person and Online student groups. Standard Errors are reported in parentheses below the means. The last column reports the difference in means (Online minus In-Person) and is flagged with significance stars based on the P-value.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

These two groups, students taking Economics Online or on the Main Campus, are remarkably similar across most demographic categories, suggesting that the choice of modality does not substantially alter the composition of the student body. There is no statistical difference between Online and Main Campus students in terms of:

- **Gender Ratio:** Both groups mirror the overall gender imbalance among Economics course-takers, with approximately 66% male and 33% female students.
- **Racial Composition:** The proportion of White students (about 66%) and Non-White students (about 33%) is statistically equivalent across modalities.

In contrast, several academic and demographic characteristics exhibit small but statistically significant differences, indicating that Online students have somewhat distinct academic profiles:

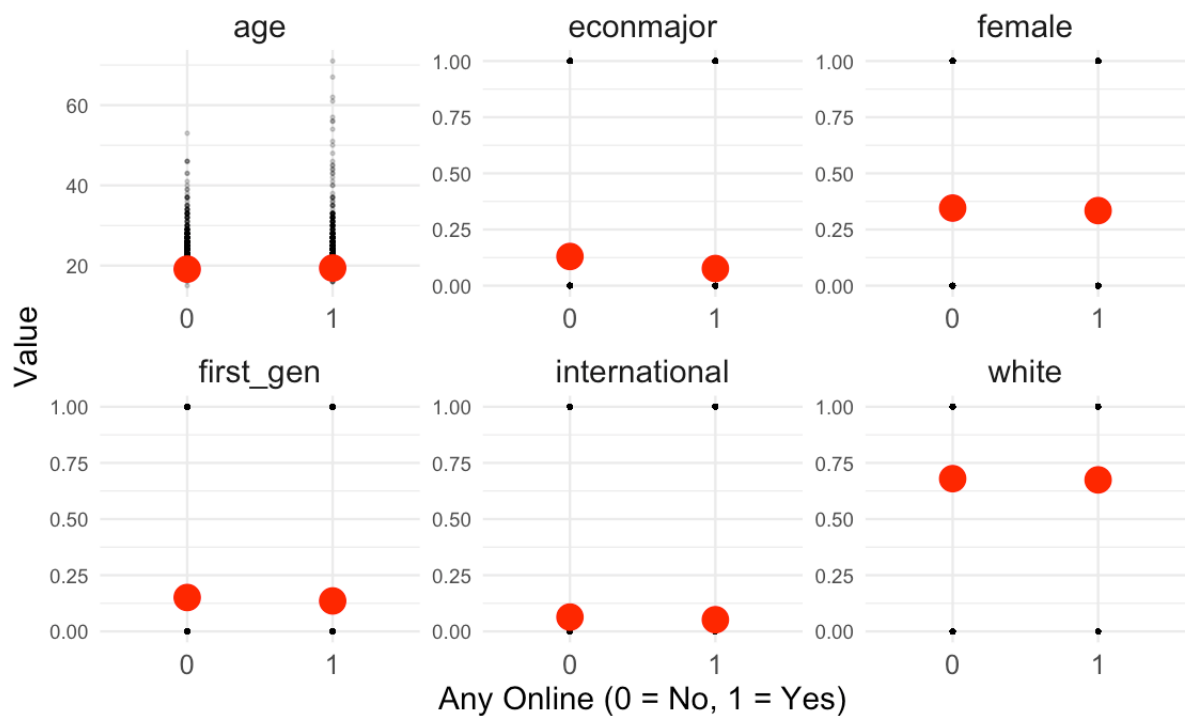
- **College GPA:** Online students have a slightly lower average cumulative GPA (2.85) compared to their In-Person peers (2.94).
- **High School GPA:** This pattern extends to pre-college performance, with Online students averaging 3.57 versus 3.60 for In-Person students.
- **Age:** Online students are marginally older, by approximately three months on average.
- **International and First-Generation Status:** The share of International students (5% Online vs. 6% In-Person) and First-Generation students (14% Online vs. 15% In-Person) is very similar across both groups.
- **Economics Major Choice:** The largest difference arises here—only 8% of *Economics Majors* take Online courses, compared with 13% of students who major in other fields.

It is important to note that students on academic probation are required to take Online courses, which may contribute to slightly lower average GPAs in the Online group. Nevertheless, some academically strong students also choose the Online format for its flexibility, enabling them to pursue multiple majors or accelerate degree completion.

Figure 3.2 presents the mean values for key variables, including age, major, gender, first-generation status, international status, and race. As indicated by the t-tests, gender and race show no significant differences, and the figure highlights how similar the two groups are across all variables—even in the case of *Economics Major*, the dimension showing the largest divergence.

Figure 3.3 shows a timeline on the x-axis and three modalities over time. The red bar represents “remote,” which refers to every course that was taught on a remote modality, including CE Online. Fall 2020, Spring 2021, Summer 2021, and Fall 2021 were atypical due to the COVID-19 emergency. Some courses originally intended for in-person instruction were taught online. These courses are counted in the red bar. To differentiate between courses intended to be in-person and courses meant to be online, we created two categories: CE Online (green) and Main Campus (blue). CE Online (green) courses are those designed from their conception to be given in the online format. Main Campus courses are those courses designed from their conception to be given in-person, but that during the COVID months were given remotely.

Figure 3.4 considers students who have taken any Economics course and counts each Economics course as one observation. In this graph, it is easier to compare students in the two modalities: Main Campus and CE Online. Three trends appear evident in this graph: 1) Econ courses have a higher attendance in the Fall versus the Spring. 2) We offer more online courses during the summer than in-person alternatives. 3) Overall enrollments show a slight but steady decline through Spring 2024. Notably, enrollments rebounded in Fall 2024 and continued to rise into 2025, suggesting a recent recovery in student demand (Office of Data Analytics, 2025).

Figure 3.2: Comparison Main Campus Only vs Online

In summary, the aggregated data confirms that students enrolling in Economics courses exhibit demographic and academic profiles that are broadly aligned with the overall university student body, with nuanced distinctions in age, GPA, and proportion of international students. While these statistics establish a comprehensive baseline for all students served by the department, they obscure the potentially divergent experiences and outcomes of students who choose to pursue the degree. Therefore, the subsequent chapter will narrow the focus to analyze the characteristics, performance, and enrollment trends of declared Economics Majors, specifically isolating the role of the online modality within this crucial cohort.

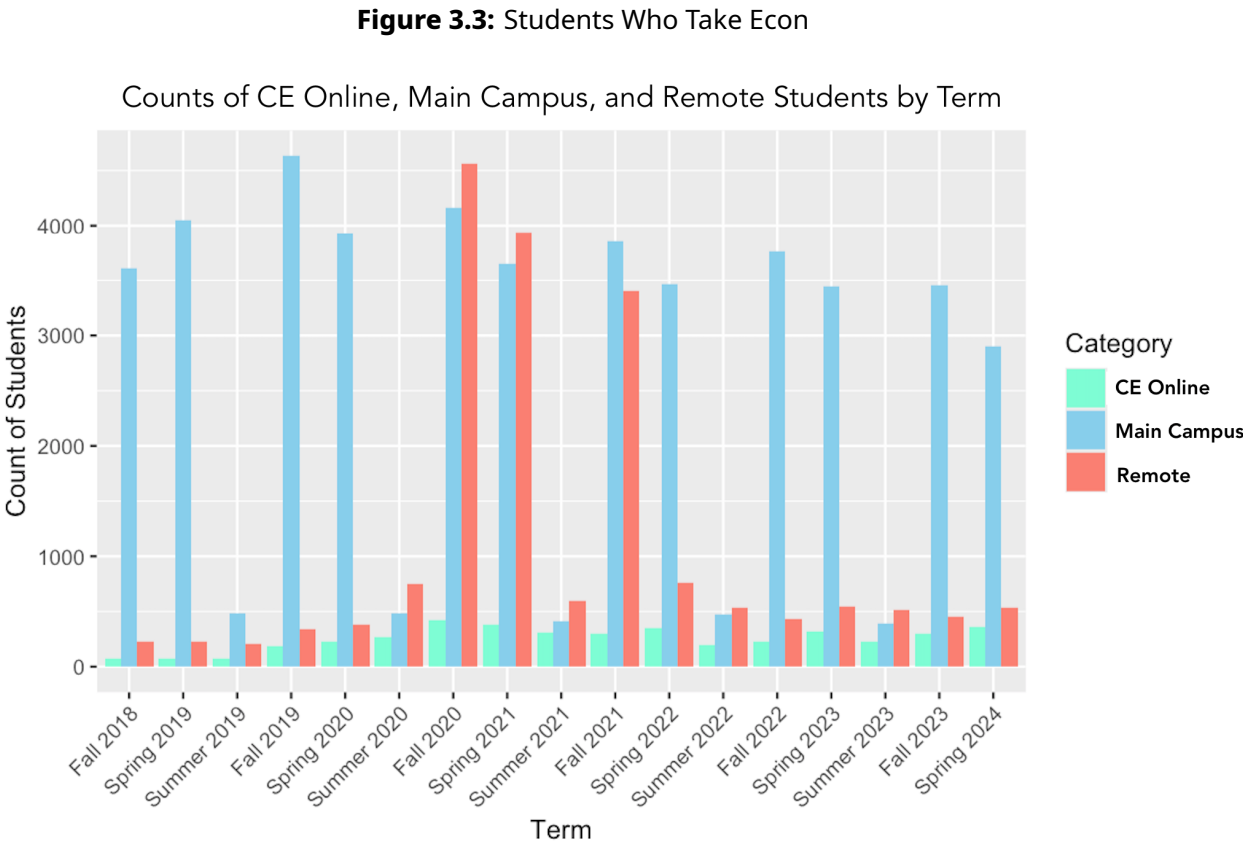
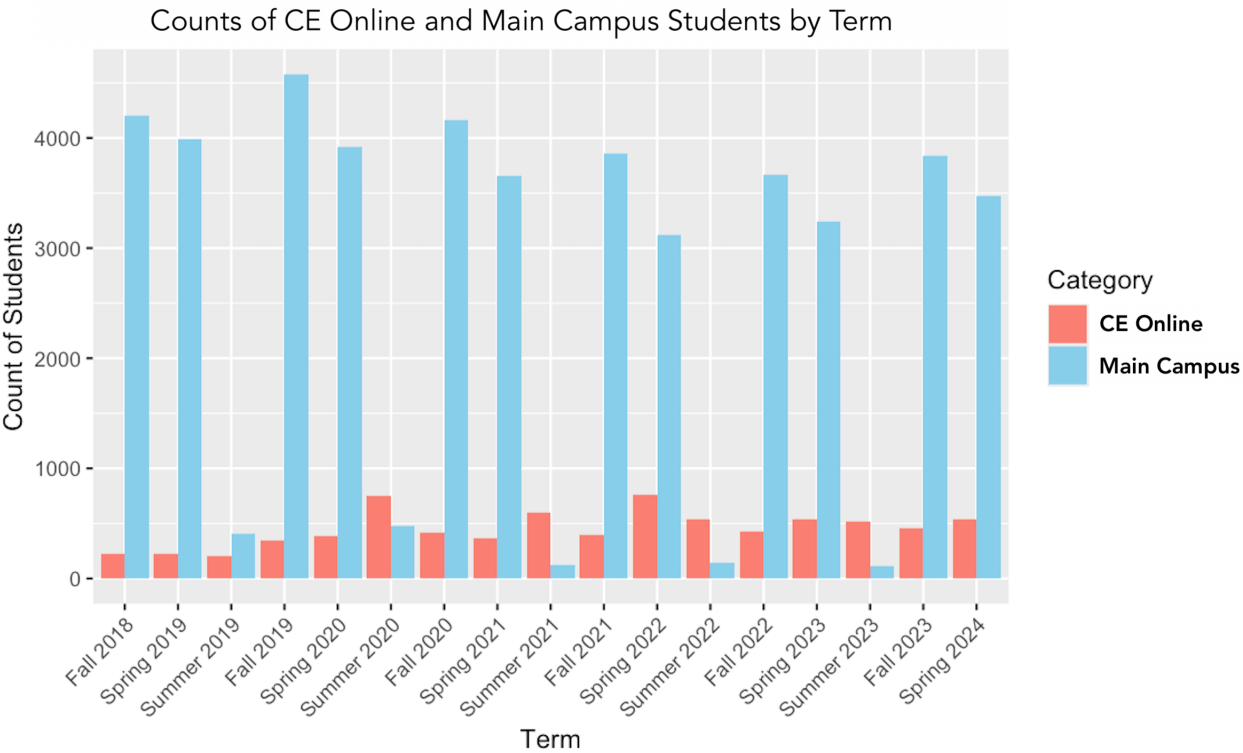


Figure 3.4: Courses in Economics on two different modalities



4

ECONOMICS MAJORS

Between the Fall of 2018 and the Spring of 2024, a total of 11,199 (26%) of course seats were occupied by declared Economics Majors seeking to fulfill elective or general education requirements. The average demographic and academic composition of the Economics Major cohort for this period is summarized in this section.

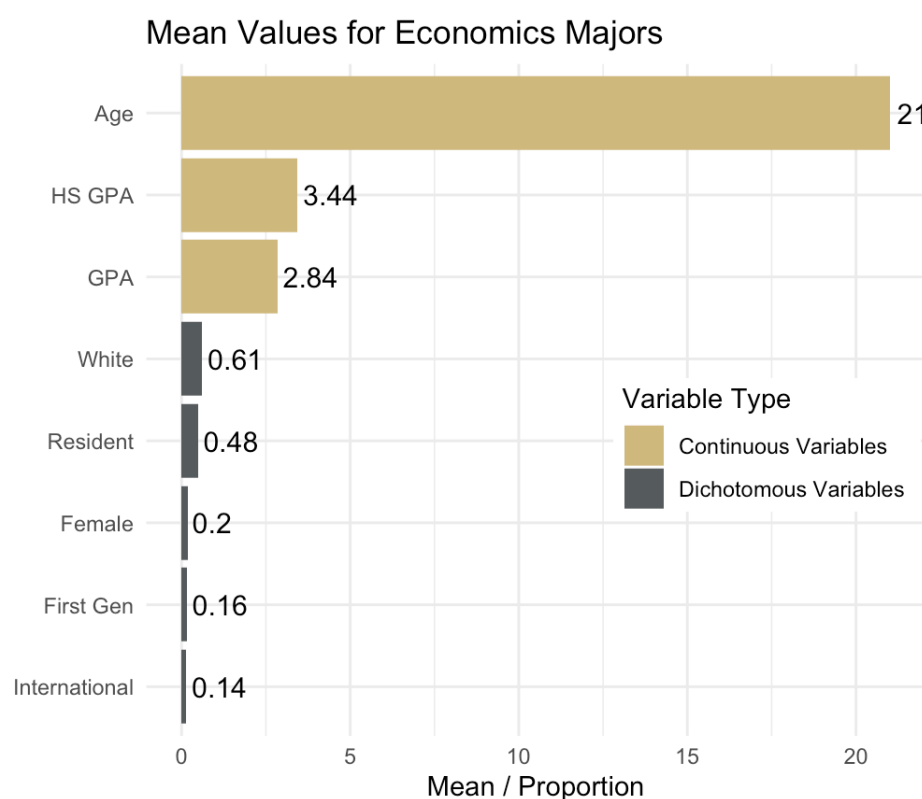
On average, our declared Majors were 21 years old and entered with a high school GPA of 3.44. Their college cumulative GPA (gpa_endterm) averaged 2.84. Racially, 61% of Econ majors identified as White. Geographically, 48% were Colorado residents, and 16% were first-generation students. A notable distinction compared to the overall university student body is the proportion of international students (14%). The most significant structural imbalance observed is the gender disparity: 80% of Economics Majors are male, and only 20% are female.

Table 4.1: Summary Statistics for Economics Majors

Statistic	Min	Mean	St. Dev.	Max
gpa_endterm	0.00	2.84	0.62	4.00
age	17	21.01	2.41	67
female	0	0.20	0.40	1
white	0	0.61	0.49	1
international	0	0.14	0.35	1
first_gen	0	0.16	0.36	1
hs_gpa	1.03	3.44	0.47	4.00
resident	0	0.48	0.50	1

4.1. Economics Majors Compared with Non-Econ Majors

Examining how Economics majors differ from students in other disciplines allows us to better understand the demographic and academic profile of those drawn to the field. Figure 4.1 and Table 4.2 present results for all students who take

Figure 4.1: Economics Majors

economics, dividing them into two groups: Econ Majors and Non-Econ Majors. Across every dimension examined, the difference is statistically significant.

The data highlights several key distinctions:

1. **Gender and Racial Composition:** The most pronounced structural difference is the "gender gap": only 19% of Economics Majors are female, compared to 34% of non-majors taking Economics courses. However, Econ Majors are more racially diverse, with 60% identifying as White, compared to 68% among non-Econ majors.
2. **Academic Profile:** Economics Majors tend to have a lower cumulative college GPA, 2.8 vs. 2.96, and arrived with a marginally lower high school GPA, 3.4 vs. 3.6.
3. **Age and Enrollment Status:** Majors are older on average, (21 years old vs. 19 years old) and are significantly more likely to be international students 14% vs. 5%. They are also slightly more likely to be first-generation college students (16% vs. 14%).
4. **Online Modality:** 37% of Economics Majors take at least one online course, which is higher than the 30% observed among non-majors, suggesting that the online program is serving the Majors cohort slightly more intensely. Majors are also slightly less likely to be Colorado residents (48% vs 51%).

These findings indicate that students who commit to the Economics Major are not only distinct from the broader university population but also from the casual Economics course-taker, exhibiting characteristics that suggest a potentially higher incidence of non-traditional academic paths, a slightly more diverse environment, a greater reliance on course flexibility, and a challenge regarding gender balance.

Table 4.2: T-test Results for Economics Majors vs. Non-Economics Majors

Variable	Mean		Observations	Difference (Econ - Non-Econ)
	Econ	Non-Econ		
End-Term GPA (gpa_endterm)	2.841 (0.005)	2.960 (0.004)	11,199 / 32,403	-0.120***
Age (age)	21.005 (0.023)	19.304 (0.011)	11,199 / 32,403	1.701***
Female (Proportion) (female)	0.199 (0.004)	0.344 (0.003)	11,199 / 32,403	-0.144***
White (Proportion) (white)	0.609 (0.005)	0.685 (0.003)	11,199 / 32,403	-0.076***
International (Proportion) (international)	0.142 (0.003)	0.053 (0.001)	11,199 / 32,403	0.088***
First-Gen (Proportion) (first_gen)	0.157 (0.003)	0.144 (0.002)	11,199 / 32,403	0.013**
High School GPA (hs_gpa)	3.435 (0.004)	3.612 (0.002)	11,199 / 32,403	-0.176***
Resident (Proportion) (resident)	0.484 (0.005)	0.513 (0.003)	11,199 / 32,403	-0.029***
Any Online (Proportion) (anyonline)	0.375 (0.005)	0.302 (0.003)	11,199 / 32,403	0.074***

Notes: This table presents a summary of T-tests comparing means across Economics Major and Non-Economics Major groups. Standard Errors are reported in parentheses below the means. The last column reports the difference in means (Economics Major minus Non-Economics Major) and is flagged with significance stars based on the P-value. The p-value of 0.0000 was converted to $p < 0.01$ (***) and $p = 0.0015$ was converted to $p < 0.05$ (**). Standard Errors were estimated using $SE = SD/\sqrt{N}$.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

4.2. Econ Majors in Online and In-person

This section narrows the focus to declared Economics Majors to compare the profiles of those who utilize the CE online modality at least once against those who enroll exclusively in Main Campus courses. This comparison isolates the characteristics most strongly associated with the choice of flexible learning within the major.

The analysis reveals some characteristics that were statistically significant and some that were not (see Figure 4.2 or Table 4.3 for detailed statistics):

The two cohorts are remarkably similar across several major demographic categories, confirming that the choice of modality does not fundamentally alter the composition of the major. There is no statistical difference between Main Campus-only and CE Online Majors in terms of:

- **Gender Ratio:** Both groups maintain the department's persistent gender imbalance, with approximately 20% female enrollment.
- **International and First-Generation Status:** The proportions of International students (13%) and First-Generation students (14.5%) are statistically equivalent across both modalities.
- **Residency:** Roughly 50% of students in both groups are Colorado residents.

In contrast, several key academic and demographic variables exhibit statistically significant differences, suggesting that the online modality appeals to students with distinct academic histories or progression timelines:

- **Age:** Online students are older, averaging 10 months (or 0.8 years) older than Main Campus students.
- **College GPA:** Online students have a lower average college cumulative GPA (2.76) compared to their Main Campus counterparts (2.82).
- **High School GPA:** This difference is also observed pre-college: Main Campus students entered with a higher high school GPA (3.5) than Online students (3.4).
- **Racial Composition:** Main Campus students exhibit a higher proportion of White students (60%) than the Online cohort (57%).

Figure 4.3 displays two pie charts illustrating the average number of courses taken by class in a given term, across both online and main campus modalities.

The Main Campus courses primarily serve students in the early stages of their academic careers, reflecting the structure of a more residential, undergraduate degree:

- Freshmen (FR) and Sophomores (SO) constitute the largest share of course enrollment, typically making up the majority of the "Principles" and "Intermediate" level classes.
- The enrollment distribution is more uniform across the traditional four undergraduate years (FR, SO, JR, SR), consistent with courses required throughout a four-year degree.
- The proportion of students extending into a fifth year (SR5) is minor, as these students are typically finishing final degree requirements.

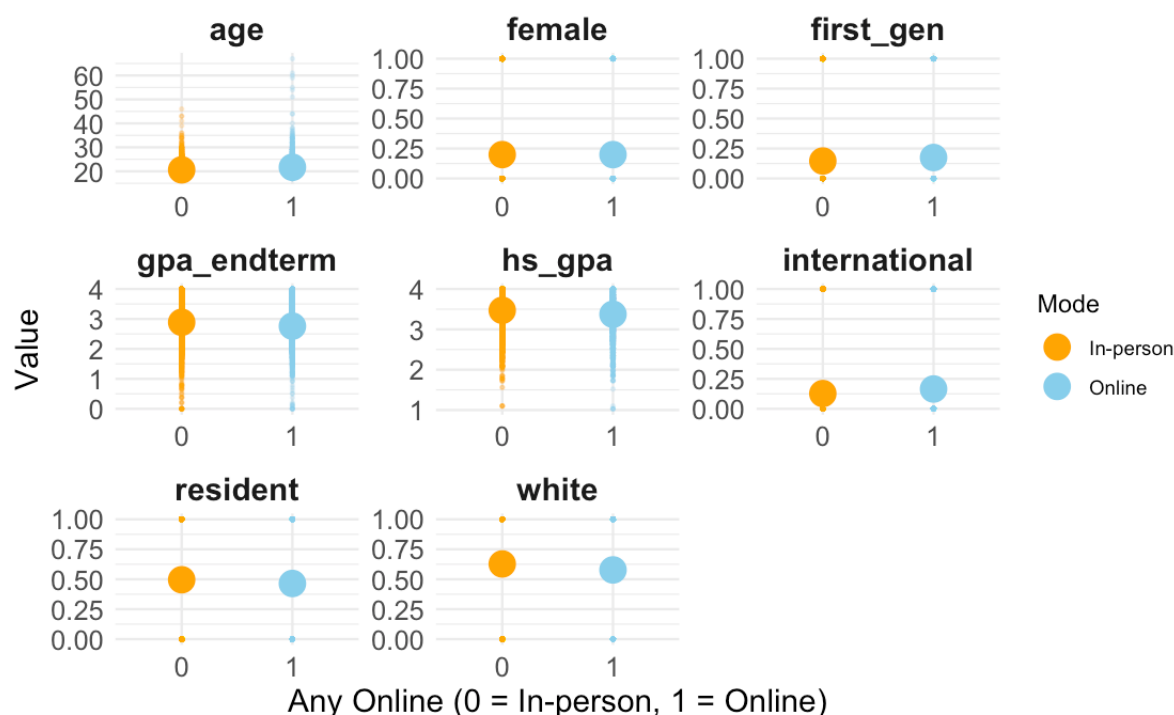
The CE Online courses are predominantly utilized by students in the later stages of their degrees, indicating a reliance on this flexible path to complete requirements:

Table 4.3: T-test Results for Online vs. Main Campus Economics Majors

Variable	Mean		Observations	Difference
	In-person	Online		(Online - In-person)
End-Term GPA (gpa_endterm)	2.820 (0.014)	2.767 (0.027)	2,411 / 696	-0.053*
Age (age)	20.122 (0.045)	20.914 (0.164)	2,411 / 696	0.792***
Female (Proportion) (female)	0.204 (0.008)	0.193 (0.015)	2,411 / 696	-0.011
White (Proportion) (white)	0.631 (0.010)	0.569 (0.019)	2,411 / 696	-0.062***
International (Proportion) (international)	0.136 (0.007)	0.148 (0.013)	2,411 / 696	0.012
First-Gen (Proportion) (first_gen)	0.151 (0.007)	0.145 (0.013)	2,411 / 696	-0.006
High School GPA (hs_gpa)	3.457 (0.009)	3.388 (0.018)	2,411 / 696	-0.069***
Resident (Proportion) (resident)	0.472 (0.010)	0.463 (0.019)	2,411 / 696	-0.009

Notes: This table presents a summary of T-tests comparing means across In-person and Online Economics Major student groups. Standard Errors are reported in parentheses below the means. The last column reports the difference in means (Online minus In-person) and is flagged with significance stars based on the P-value.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Figure 4.2: Comparison Within Econ Majors: Online vs Main Campus

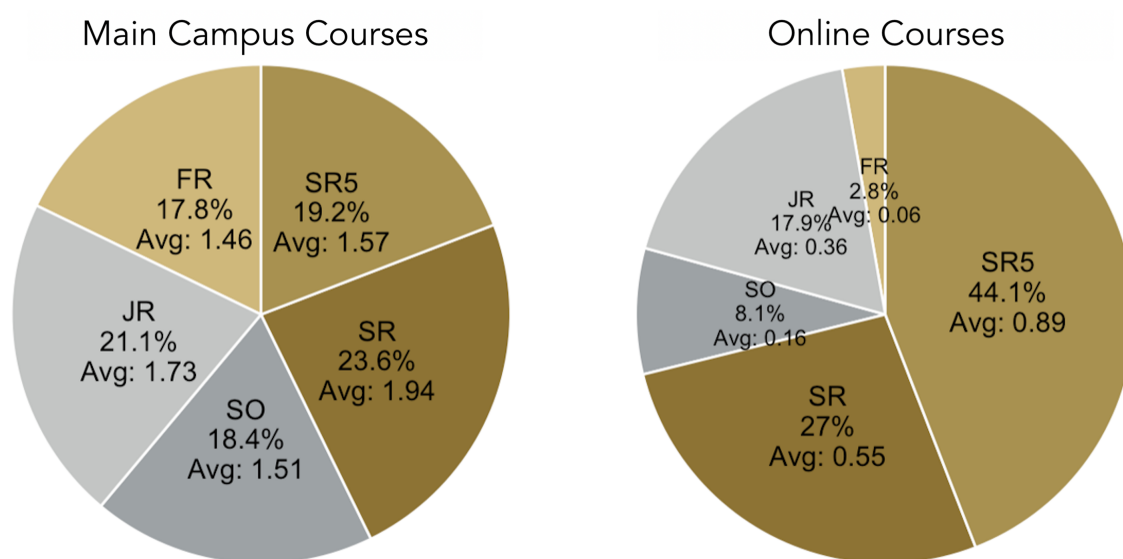
- Juniors (JR) and Seniors (SR) make up the dominant share of online enrollment. This suggests students are leveraging the online format for upper-division electives, core requirements they delayed, or courses needed to complete their major requirements on a flexible schedule.
- The presence of fifth year Seniors (SR5) is noticeably larger compared to the Main Campus chart, further supporting the idea that the online modality is a critical tool for students with non-traditional timelines or those completing degrees after their primary four years.
- The relative absence of Freshmen (FR) underscores that the CE Online program is not primarily used for introductory, first-year gateway courses.

Figure 4.4 shows how many online courses Economics Majors take on average in a given term. COVID-era terms are golden, and the most recent terms are darker than the previous ones. Overall, seniors, particularly seniors in their fifth year, take the most online courses on average.

4.3. Trends in Online Learning

We explore how students use the online courses offered by the Economics department. We find that the first online course has been taken relatively sooner as time has gone by.

Figure 4.5 tracks the first point of entry into the CE Online Economics program

Figure 4.3: Share of Average Courses Taken per Class

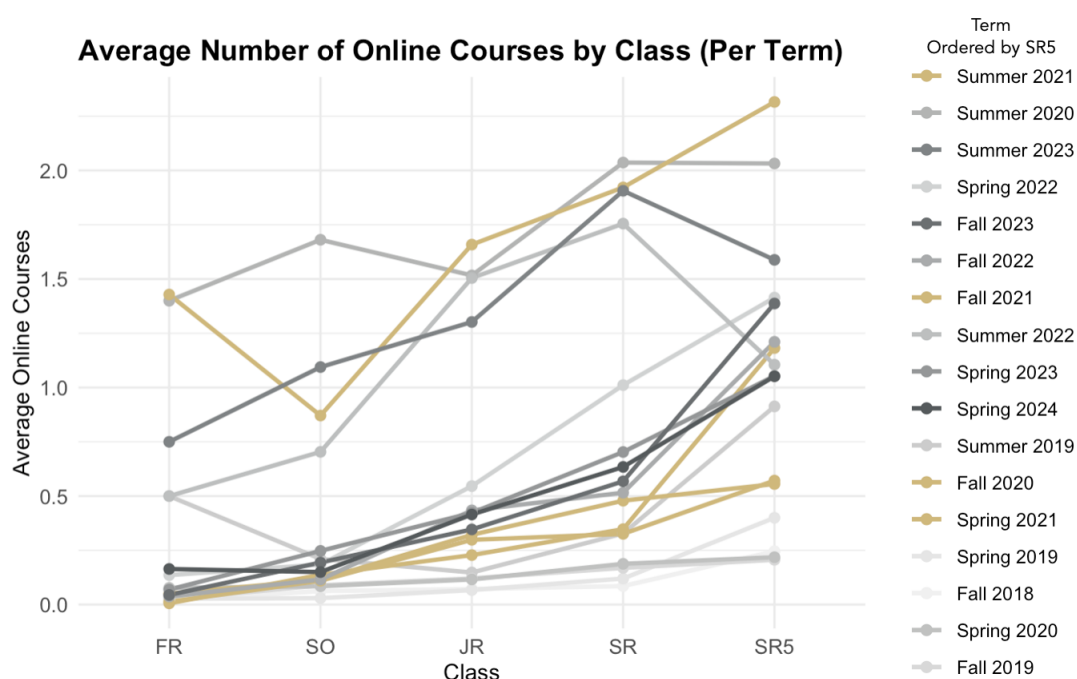
FR=Freshmen, SO=Sophomores, JR=Junior, SR=Seniors, SR5=Fifth year Seniors

for each student over the period, segmented by class standing. This longitudinal view demonstrates a clear progression in who utilizes the online modality as the curriculum has matured.

- **Early Program Focus (2018–2020):** In the initial years, Sophomores (SO) and Juniors (JR) formed the largest core of first-time online enrollments, reflecting the availability of lower-division and intermediate courses at that time.
- **Shift to Completion Tool (2021–2024):** Following the expansion of upper-division offerings, the dominant group for first-time online enrollment shifted decisively to Seniors (SR) and 5th year Seniors (SR5).
- The graph confirms that the online program has evolved from being an elective supplement to serving as a crucial “academic completion tool”—students primarily access the online flexibility when they are close to graduation and require specific courses to finish their degrees. This visual trend reinforces the statistical finding that older students (a proxy for higher class standing) are the most likely to enroll in the online modality.

Figure 4.6 builds on the previous analysis by showing when students take their second online Economics course. The data indicates that once students complete their first online course, they tend to enroll in a second one relatively quickly, often within the same academic year. Comparing this to the “first time” enrollment reveals a critical insight into student retention and continued utilization of the online program. Some particular traits to consider:

- **Dominant cohort:** Across the entire period, the combined share of Seniors (SR) and 5th year Seniors (SR5) forms the overwhelming majority of students taking a second online course.
- **Junior (JR) Presence:** The proportion of Juniors, while still significant, is smaller

Figure 4.4: Online Courses per Class

for the second course than it was for the first, suggesting that many students who initially tried an online course as a Junior returned for a second one once they became a Senior.

- The figure is evidence of successful student retention within the online program. Students who try an online course tend to return, validating its quality and confirming its function as an essential degree-completion mechanism, especially for students with non-traditional or accelerated academic timelines.

To better understand the factors driving the enrollment decision, I ran a logistic regression model (logit) to predict the probability of a declared Economics Major enrolling in at least one CE Online course. The results of this model are presented in Table 4.4. To ease interpretation, the results are the Average Marginal Effects.

The logit model identifies age, prior academic performance, and residency status as the primary drivers of online enrollment. I organize the results by 1) Age and academic progression, 2) Reliance on academic flexibility, 3) Academic performance, 4) Racial and ethnic composition, and 5) Non-significant predictors.

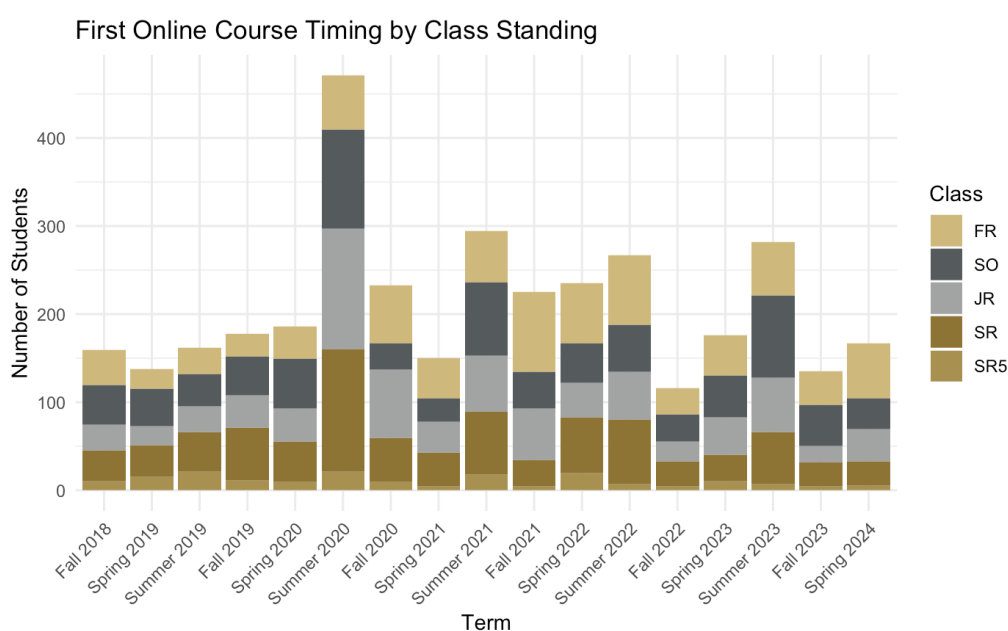
1. **Age and Academic Progression:** The Age coefficient (0.0290, $p < 0.001$) shows that older students are significantly more likely to enroll in online courses. Since the Economics online program features many upper-division (4000-level) courses, age serves as a strong proxy for academic progression, indicating that the online modality is vital for students in their junior and senior years as they work toward degree completion.

Table 4.4: Average Marginal Effects (AME) from Logistic Regression

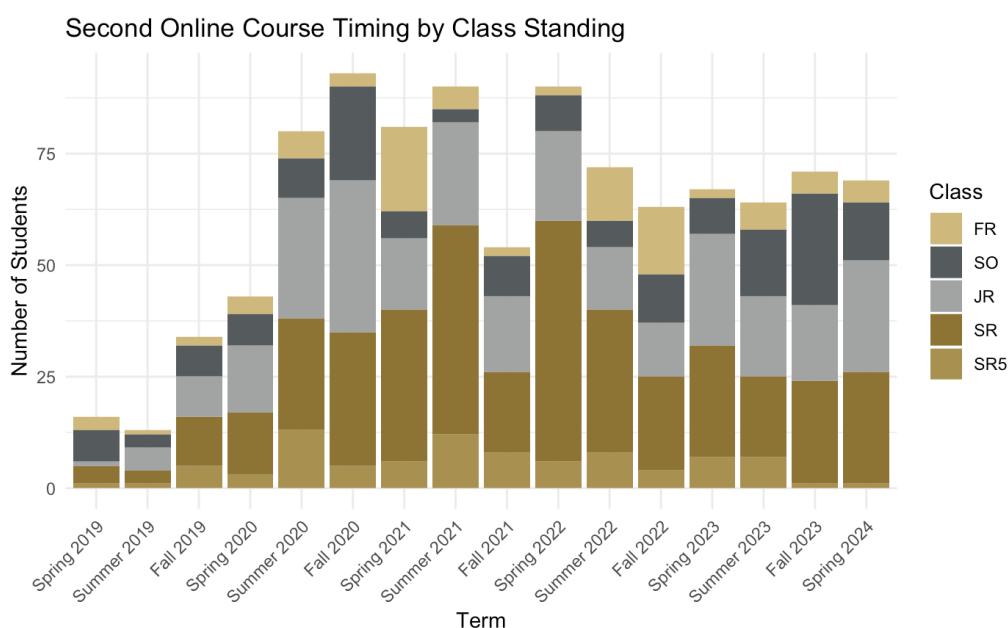
Factor	AME	z-statistic	p-value	95% Confidence Interval	
				Lower	Upper
age	0.0290*** (0.0007)	41.9307	0.0000	0.0276	0.0303
female	0.0039 (0.0035)	1.0960	0.2731	−0.0031	0.0108
first gen	0.0054 (0.0043)	1.2466	0.2126	−0.0031	0.0139
GPA	−0.0390*** (0.0022)	−18.0391	0.0000	−0.0433	−0.0348
HS gpa	−0.0145*** (0.0038)	−3.8034	0.0001	−0.0220	−0.0070
International	0.0317*** (0.0071)	4.4518	0.0000	0.0177	0.0456
Resident	−0.0289*** (0.0032)	−8.9765	0.0000	−0.0352	−0.0226
White	−0.0073** (0.0035)	−2.0511	0.0403	−0.0142	−0.0003

Notes: This table presents Average Marginal Effects (AME) from a logistic regression. Standard errors are reported in parentheses below the AME estimates.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Figure 4.5: First Online Course by Class and Term

2. **Reliance on Academic Flexibility:** Two factors strongly suggest that students seeking flexibility use the online modality:
 - International Status (0.0317, $p < 0.001$) is a strong positive predictor. This suggests that international students may be utilizing the online format to continue their studies while away from campus (e.g., visiting home) or to accelerate their degree completion.
 - Residency (0.0289, $p < 0.001$) shows that non-resident students are more likely to enroll online than Colorado residents. The flexibility of the online option is particularly appealing for out-of-state students, who may be seeking reduced costs or the ability to study from their home state, especially during summer terms or final semesters.
3. **Academic Performance:** Higher academic performance, measured by both College GPA ($\beta 0.0390, p < 0.001$) and High School GPA ($\beta 0.0145, p < 0.001$), is consistently associated with a lower likelihood of online enrollment. This may reflect two mechanisms:
 - Academic Necessity: Students with lower GPAs who face academic probation may be restricted from enrolling in main campus courses, making the CE online option their only viable path to continue their degree. This effect would naturally lower the average GPA observed in the CE online cohort.
 - Preference for Format: It may also reflect that students who struggle academically prefer the asynchronous and self-paced nature of the online format, perceiving it as a more flexible path to success.
4. **Racial and Ethnic Composition:** The White coefficient ($\beta 0.0073, p = 0.0403$)

Figure 4.6: Second Online Course by Class and Term

is statistically significant but small in magnitude, indicating that non-white students are slightly more likely to take online courses than their white counterparts. While the effect size is very small, this may reflect broader socioeconomic or scheduling factors that favor the flexibility of online learning for these groups. Further qualitative research is needed to fully understand the underlying causes of this distinction.

5. **Non-Significant Predictors:** Finally, the model shows that Gender (0.0039, $p=0.2731$) and First-Generation status (0.0054, $p=0.2126$) do not significantly influence the choice of the online modality in this predictive model. This suggests the online program is equally accessible and utilized across these two important demographic dimensions.

The analysis of Economics majors reveals statistically significant differences between students enrolled in CE Online versus Main Campus modalities, particularly in their age, residency, and prior academic history. Having established a clear statistical understanding of who utilizes the online program and how enrollment trends have progressed, the final chapter will synthesize these demographic and enrollment findings, discuss their broader academic and policy implications for the department, and address the critical structural challenge of the gender gap in Economics.

5

DISCUSSION AND CONCLUSION

This report has detailed the strategic development of the CE Online Economics program at the University of Colorado Boulder and analyzed its impact on the student body from 2018 to 2024. The findings confirm that the Department of Economics has successfully established a high-quality, comprehensive online program that simultaneously enhances student access and academic flexibility while preserving the rigor of its Main Campus curriculum.

5.1. Synthesis of Key Findings

The data validates three main conclusions regarding the online program's role:

1. **Successful Program Development:** The phased expansion of the CE Online program, culminating in a full degree pathway by 2023, has resulted in a robust enrollment base, averaging over 1,500 students annually and integrating seamlessly into the department's course offerings.
2. **Modality as an Access Tool:** The logistic regression model decisively shows that the online modality is a critical tool for students with non-traditional academic timelines or geographic constraints. Older students, international students, and non-resident students are all significantly more likely to utilize online courses, confirming the program's utility as a tool for academic flexibility and completion.
3. **Academic Profile of the Online Learner:** The online cohort, both among all students and declared majors, is statistically distinct. They are older and exhibit lower average College and High School GPAs. This suggests the online modality is either preferred by—or essential for—students who are managing complex life schedules, have returned to their studies, or require academic options not available on the main campus, such as those on academic probation.

5.2. Implications for Departmental Strategy

The findings carry significant implications for the future direction of the Economics Department.

5.2.1. Addressing the Structural Gender Gap

The most significant structural challenge revealed is the persistent gender imbalance, with only 20% of Economics Majors identifying as female. Crucially, the gender ratio does not statistically differ between the online and in-person cohorts, indicating that the mere existence of the flexible online program is not sufficient to resolve the imbalance. Addressing this requires sustained effort beyond course delivery, likely through:

- Curriculum redesign to incorporate more diverse content and real-world applications.
- Targeted mentorship programs and outreach initiatives aimed at female students in introductory courses.
- Faculty development focused on inclusive teaching practices that foster a sense of belonging in the classroom, regardless of modality.
- Keep the Women in Economics Club with its commitment to expand and include students.

The data for 2025 shows that 23.1% of Econ Majors are female, evidence that the department is moving in a more inclusive direction (Office of Data Analytics, 2025).

5.2.2. Strategic Use of Online Modality

The correlation between lower GPA and online enrollment should be viewed not as a deficit but as a positive indicator of access and equity. The online program is successfully serving students who may face barriers to traditional progression. The department should formalize existing support structures—such as dedicated online tutoring or advising—to maximize the success of these students and mitigate the risk of grade disparities. Furthermore, the strong positive prediction of age suggests the department should continue leveraging the online program to serve the growing population of returning students and those pursuing degrees later in their careers.

5.3. Conclusion and Future Research

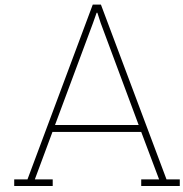
The Economics Department has demonstrated a proactive and strategic approach to online education, positioning itself as a leader at CU Boulder. This initiative has not only increased enrollment but also provided essential flexibility that supports the university's broader access mission. The coexistence of high-quality in-person and online instruction ensures students benefit from a rich and adaptable educational experience.

Future research should focus on two areas: 1) A qualitative analysis of the student experience to understand the motivations behind online enrollment, particularly for non-resident and non-white students, and 2) A new analysis considering the last year's trends (i.e., the female ratio increased to 23% in Fall 2025). Overall, the findings affirm that online education, when implemented with care and rigor, is a powerful tool for expanding access, supporting student success, and enriching the academic experience at CU Boulder.

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Student's Comments

The following excerpts are drawn from a homework assignment in Urban Economics. Although subjective, they offer valuable insight into students' perceptions of online learning. In the context of studying agglomeration economies, students were asked to reflect on the question: How might the concept of agglomeration translate to the experience of taking an online course in Urban Economics? Specifically, they considered the advantages and disadvantages of learning in an asynchronous environment.

- *When thinking about the advantages of learning asynchronously in relation to the in person, I think that we are still able to interact with each other if we choose to do so. Of course, when being in a physical classroom, people are forced to have social interactions that at times can be awkward or potential thoughts could be unarticulated. By being in an online course such as this one, by participating in the discussion posts and assignments we as a community are able to still have social interactions and the exchange of thoughts. What is an advantage of being online, in this type of setting, is that individuals have more time to process the content as well as the thoughts and opinions of others, which then allows for the individual to respond with more detailed and articulated points.* –Senior Male in Boulder
- *I think one of the advantages of taking an online course is that you can allocate the time you spend working based on when you think you'll be the most productive. For example, I know that if I were to take 3-4 hour and fifteen minute long classes on Tuesdays and Thursdays, I would be burnt out and unable to focus on the material by the end of the day. By taking an online class, I can spend some time focusing every evening when I've taken a break from my daytime coursework and have better interactions with the material. On the other hand, taking an online class could mean we lack some social interaction which would have positive externalities for everyone. One way to remedy this is by thoughtfully engaging in discussion posts or connecting with peers through email to form in-person study groups.* –Senior Female in Asia
- *The online asynchronous option allows me to learn in the comfort of my own*

home or wherever I would like, in addition to getting information from the best professors. While online options may make it seem like you cannot converse with classmates, that is completely false with the forums and group discussion boards that are available. So, in my mind it is the best of both worlds, where I am not required to attend, but can attend or get in touch at any given point if needed. –suffered two accidents and writing from the hospital –Senior Male in Boulder

- *Online learning allows a more flexible schedule, which is why I'm participating. It also allows those not close to Boulder to participate and continue their learning to earn a degree. We can still have social interactions through discussion posts that allow us to talk to each other and communicate easily –Senior Male deployed abroad*
- *Learning asynchronously vs in person are nowadays similar but the only real irreplicable thing is in person social interaction. Now we can talk with other online, learn online while being in person and most other aspects. The only real difference of only being online is that you really cant have the in person environment. People can motivate each other and build relationships better but other than that there isn't a direct need. –Junior Male in the East Coast*
- *I take 2 online classes but i am also taking 4 in person classes so the social interaction is still there but being able to do these 2 classes at my own pace really helps me balance my workload across the board and i think i learn better this way. –Senior Male in Boulder*
- *I consider that the main challenge of online is the lack of social interaction. Working in an environment like the Google HQ allows for you to exchange ideas with colleagues in your proximity which spontaneity is not available in the online setting. Building peer connections is high stakes with learning about each others strengths and experiences, and that opportunity is unfortunately not available online.-Senior Male in Boulder*
- *By taking an online course this has the potential to take away collaboration, but it is important to note that not all classes taken in person incite collaboration, such as lectures. Being a part of a remote class there is still room to collaborate online. By being able to push the boundaries of knowledge at my own pace I feel that I actually connect to the material better which not only results in higher grades but in higher connection and understanding of the material. Sometimes when I have a lecture I know I have to read a passage and will lazily skim over the reading to make sure I get it done before class. While having the ability to create my own schedule I am able to complete my work at my own pace based around my own motivation schedule. –Senior Female in Boulder*
- *Interacting with others socially during an online class can sometimes be hard. Still, I've found recently that teachers have done an excellent job forcing interaction and group work via Zoom or in-person. I took a class online last semester and ended up meeting a couple of good friends by participating in the forced group work. It felt more admirable to be allowed to connect and share my ideas with others. –Senior Male in Colorado Springs*