The Impact of the COVID-19 Pandemic on Undergraduate Enrollment in the United States: A Quantitative Analysis

By Salama, Saikiran Reddy

Abstract

The higher education landscape, in the United States underwent upheaval due to the impact of the COVID-19 pandemic on enrollment trends between 2016 and 2022 examined in this study across pre pandemic and post pandemic eras with a focus on different institutions data points for regression analysis aimed at capturing enrollment shifts regionally across states during the specified periods under scrutiny revealing a noticeable drop in student numbers both during and post the pandemic era, with varied changes observed across different states. This paper provides perspectives on the long-term impacts of the pandemic, on education. Proposes potential topics for further study.

Introduction

The global outbreak of COVID. 19 Presented obstacles, for schools around the world. Colleges and universities in the United States encountered challenges like switching to learning and fluctuations in student enrollment numbers. In this study we examine how undergraduate enrollment patterns evolved during three periods: pre-pandemic (2016-2019) pandemic (2020-2021) and post-pandemic (2022). The goal of this research is to measure changes in enrollment

figures pinpoint the factors impacting these changes and offer insights into variations, among regions and educational institutions.

Research Objectives

- Assess trends in undergraduate enrollment before, during, and after the COVID-19 pandemic.

- Analyze the impact of the pandemic using regression models for pre-pandemic, pandemic, and post-pandemic periods.

- Identify states and institutions most affected by the enrollment changes.

Literature Review

The COVID-19 pandemic had an significant impact, on the enrollment of undergraduates in education institutions, in the United States by worsening existing downward trends and presenting new obstacles to overcome It reviews how the pandemic has altered enrollment patterns and contrasts these effects with those seen in past economic downturns while delving into the factors shaping these trends.

Pre-Pandemic Enrollment Trends

Before the outbreak of the pandemic the number of students pursuing degrees, in colleges and universities was already on a trend. By fall 2021 there were 15. Four million students enrolled, which marked a 3% drop, from the year and a significant 15% decline compared to fall 2010. Interestingly almost half of this decrease happened during the pandemic suggesting a hastening of existing patterns (NCES, 2023).

Impacts of the COVID-19 Pandemic on Enrollment

The pandemic made the decrease, in students even worse in fall 2020 compared to fall 2019 (NCES, n.d.) with a 9% drop in enrollment numbers for first time undergraduates specifically. Reasons for this drop include worries about health issues and financial instability as the sudden move to online learning methods. Furthermore changes, in tests and college application procedures added uncertainties that could have discouraged students.

Comparison with Previous Economic Recessions

During times of downturns, in the past have resulted in more people pursuing education to upgrade their skills and boost their job prospects when unemployment rates are high historically this phenomenon has been observed such as during the 2008 recession where student enrollment surged across various types of institutions (Jingyun Li, 2019), however the COVID-19 recession presented a different scenario with the pandemic introducing new obstacles like health concerns and the abrupt shift, to online learning these factors may have disrupted the usual trend of increased enrollments during economic downturns observed in previous recessions

State-Level Variations in Enrollment Trends

Enrollment patterns, during the pandemic showed changes in states. Utah and New Hampshire observed an increase in enrollment numbers while Alaska and Rhode Island faced significant drops in enrollments levels. These discrepancies indicate that factors such as situations and public health policies influenced how students chose to enroll based on available online education resources, in each region.

Institutional Responses and Adaptations

Higher education institutions responded to the pandemic by implementing various strategies to mitigate enrollment declines. Many expanded online course offerings, adjusted admissions policies, and increased financial aid to support students facing economic hardships. Despite these efforts, challenges such as the digital divide and varying levels of institutional resources influenced the effectiveness of these interventions.

Long-Term Implications

During the outbreak universities and colleges took action to address decreasing enrollment numbers by introducing approaches. They broadened their online course options, modified admission rules and enhanced financial assistance to help students dealing with difficulties. However obstacles, like access to technology and differences in resources, among institutions affected how well these measures worked out.

Data and Methodology

Data Description

The dataset includes undergraduate enrollment data from U.S. higher education institutions spanning 2016 to 2022. Key variables include:

- **Year:** The academic year.

- **Institution ID:** Unique identifier for each institution.

- **Reported Undergraduate Enrollment (FTE):** Full-time equivalent enrollment.

- **Activity Type:** Public or private classification.

- **State:** Location of the institution.

Preprocessing and Cleaning

Data cleaning involved:

- Dropping non-U.S. locations and irrelevant rows.

- Handling missing values in institutional and state columns.

- Categorizing periods into pre-pandemic (2016-2019), pandemic (2020-2021), and post-pandemic (2022).

Statistical Methods

Regression Models

The following Ordinary Least Squares (OLS) regression equation was used to analyze trends in enrollment:

$$E_i = \beta_0 + \beta_1 Y_i + \beta_2 A_i + \epsilon_i$$

Where:

- E_i: Reported undergraduate enrollment for institution i

- Y_i: Year

- A_i: Activity type

- ϵ_i: Error term

- Separate regressions were performed for each period.

Metrics

R-squared (R^2): To assess model fit.

Percentage Change: Used to compare enrollment trends across states.

Results

Descriptive Statistics

The dataset comprises 30,488 observations across 50 states. Average enrollment during pre-pandemic, pandemic, and post-pandemic periods was:

Pre-pandemic (2016-2019)	Pandemic (2020-2021)	Post-pandemic (2022)
2909.95	3106.66	2979.33

Regression Results

Pre- Pandemic

$$E_i = -1.816 \times 10^5 + 89.43Y_i + 2223.32A_i$$

$$(R^2 = 0.036, p < 0.05)$$

Pandemic

$$E_i = 1.68 \times 10^5 - 83.86Y_i + 2410.16A_i$$

$$(R^2 = 0.031, p < 0.05)$$

Post-Pandemic

$$E_i = -0.712Y_i + 2364.27A_i$$
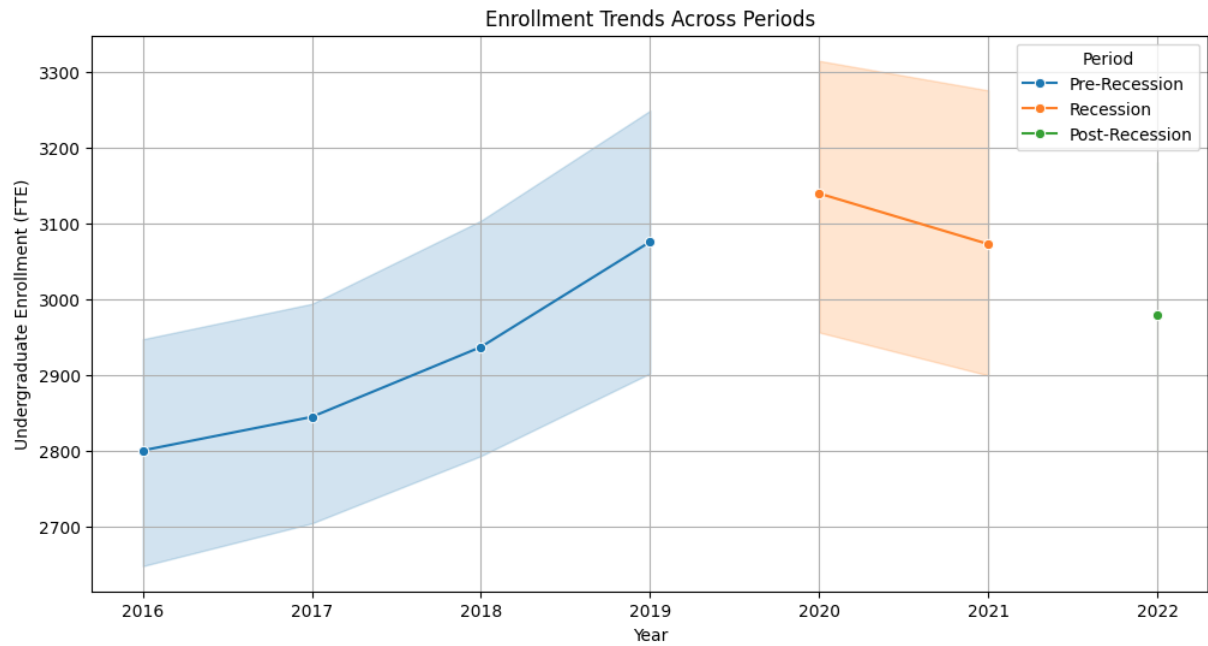
$$(R^2 = 0.03, p < 0.05)$$
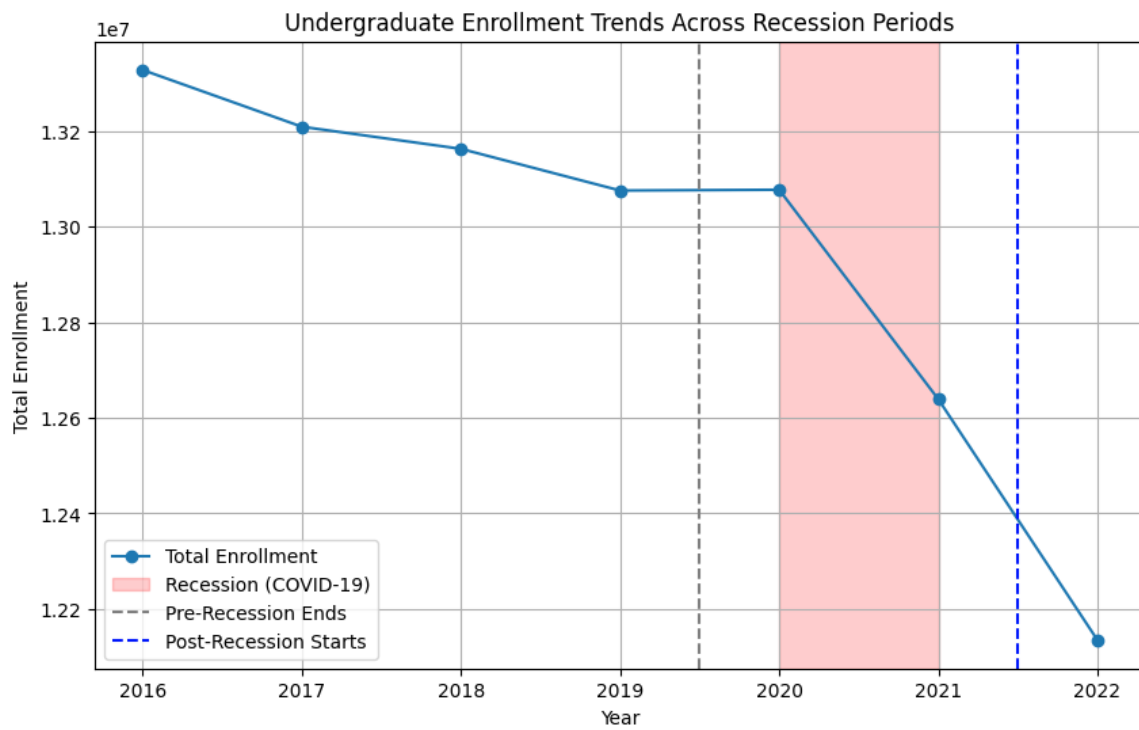
Figure 1 Enrollment trends across all periods

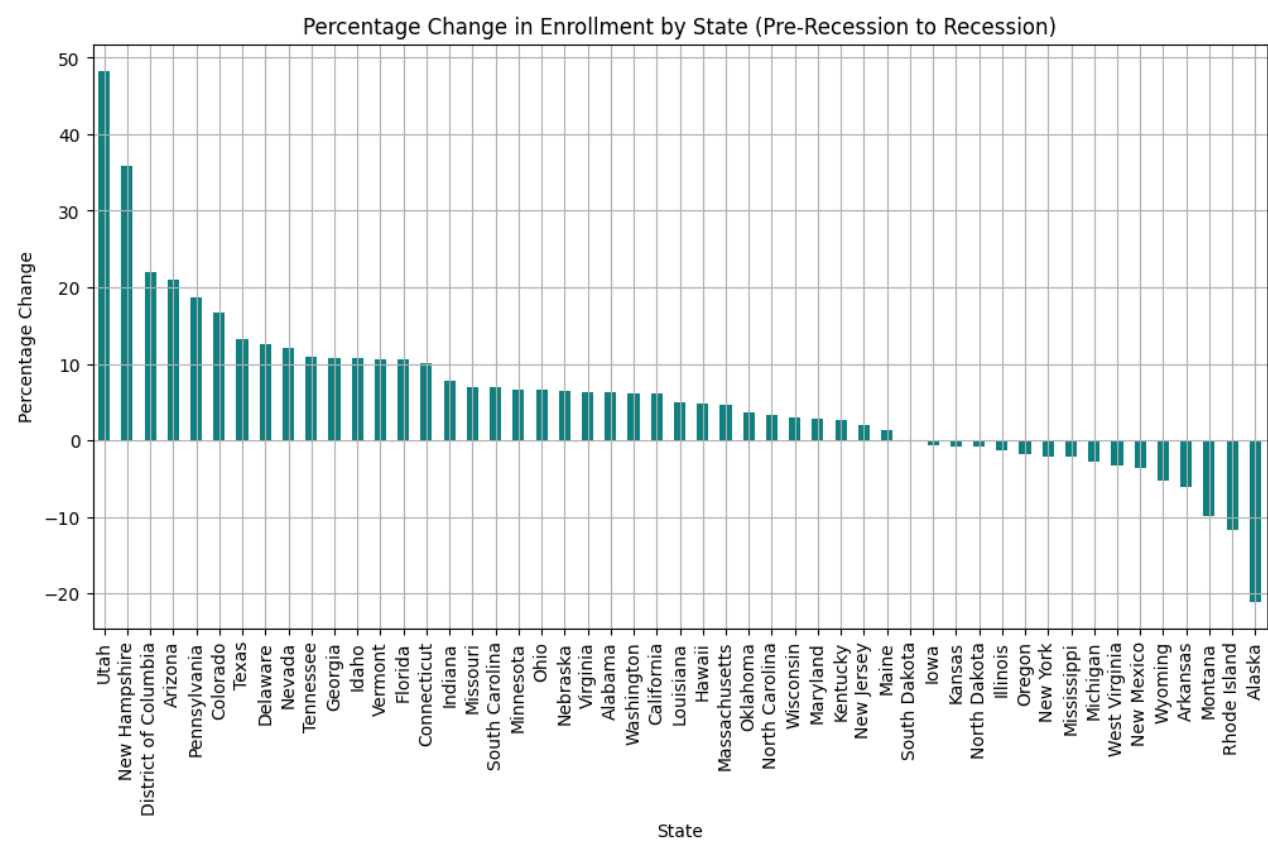*Figure 2 Enrollment trends across recession periods*

State-Level Analysis

Figure 3 Change in enrollment by State (Pre-Recession to Recession)

Top 5 States with Growth	Percentage
Utah	+52.56%
New Hampshire	+42.49%
District of Columbia	+24.62%
Arizona	+22.24%
Colorado	+17.20%

Top 5 States with Decline	Percentage

Alaska	-21.10%
Rhode Island	-11.73%
Arkansas	-9.83%
Wyoming	-6.12%
Montana	-5.83%

Discussion

The pandemic's impact on undergraduate enrollment was highly state-specific. States like Utah and New Hampshire demonstrated resilience, likely due to strong public institution networks. In contrast, Alaska and Rhode Island experienced significant declines, possibly due to their reliance on smaller private colleges.

Key Insights

- Enrollment declined more sharply post-pandemic than during the pandemic.
- Public institutions fared better than private institutions, as reflected in regression coefficients.

Conclusion

The COVID-19 pandemic led to a significant shift in undergraduate enrollment patterns across the United States. Regression analysis highlights the varying resilience of states and institutions. Future research should explore additional factors, such as online learning adoption and demographic changes.

APPENDIX: List of States in Study

Alabama, Minnesota, Colorado, Alaska, Arizona, New Jersey, California, Georgia, Arkansas, Louisiana, Pennsylvania, Tennessee, Connecticut, New York, Washington, Texas, Maryland, South Carolina, Delaware, District of Columbia, Florida, North Carolina, Mississippi, Illinois, Kentucky, Massachusetts, Hawaii, Idaho, Iowa, Kansas, Indiana, Michigan, Maine, West Virginia, Missouri, Oregon, Ohio, Nebraska, Montana, Nevada, New Hampshire, New Mexico, North Dakota, Vermont, Oklahoma, Wyoming, Rhode Island, South Dakota, Wisconsin, Utah, and Virginia.

References

Hayoung Kim, C. K. (2020, May 21). *COVID-19 and US higher education enrollment: Preparing leaders for fall*. Retrieved from mckinsey.com: https://www.mckinsey.com/industries/education/our-insights/covid-19-and-us-higher-education-enrollment-preparing-leaders-for-fall

Howell, J., Hurwitz, M., Ma, J., Pender, M., Perfetto, G., & Young, L. (2021). *College Enrollment and Retention in the Era of Covid.* CollegeBoard.

Jingyun Li, J. M. (2019, February). *College and University Professional Association for Human Resources*. Retrieved from https://www.cupahr.org/: https://www.cupahr.org/surveys/research-briefs/2018-impact-of-the-economic-recession/?utm_source=chatgpt.com

NCES. (2023, May). Retrieved from nces.ed.gov: https://nces.ed.gov/programs/coe/indicator/cha?utm_source

NCES. (n.d.). *Annual Reports and Information Staff (Annual Reports)*. Retrieved from nces.ed.gov: https://nces.ed.gov/surveys/annualreports/topical-studies/covid/?utm_source

NSC Blog. (2020, April 15). *How Will the Next Recession Impact U.S. College Enrollment, Persistence and Completions?* Retrieved from https://www.studentclearinghouse.org/: https://www.studentclearinghouse.org/nscblog/how-will-the-next-recession-impact-u-s-college-enrollment-persistence-and-completions/