

AI Algorithmic Evaluation of the Counterfactual Impact of the New F-1 Student Visa Policy on U.S. Economic Outcomes

Roopalatha Mangalseth Budda¹, Atif Farid Mohammad²

^{1,2} University of the Cumberlands, Williamsburg, Kentucky, USA

Corresponding author: Roopalatha Mangalseth Budda, mbroopalatha@gmail.com

Abstract: This study evaluates the potential economic impact of the 2026 U.S. policy replacing duration of status for F-1 students with a fixed period of admission and an extension-of-stay procedure. Because sufficient post-policy observations are not yet available, the study applies a regression-based counterfactual simulation using 11 academic-year observations from 2014–2015 through 2024–2025. International student enrollment data from the Institute of International Education are combined with NAFSA estimates of annual economic contribution. A linear regression model is trained and evaluated, then refit on the full dataset to simulate 5%, 10%, and 15% enrollment-decline scenarios relative to the 2024–2025 baseline. The test-set model produced a mean absolute error of \$2.04 billion, a root mean squared error of \$2.30 billion, and an R-squared of 0.82. Under the modeled scenarios, projected economic contribution declines to \$40.89 billion, \$37.46 billion, and \$34.04 billion, corresponding to estimated losses of approximately \$2.01 billion, \$5.44 billion, and \$8.86 billion relative to the observed baseline. The findings indicate meaningful economic exposure if the policy contributes to lower international student enrollment, while emphasizing that these estimates are conditional projections rather than identified causal effects.

Keywords: F-1 Student Visa, International Students, Counterfactual Simulation, Economic Contribution, Enrollment, Immigration Policy, Linear Regression

Introduction

International students are an important component of the U.S. higher education system and the wider economy. They contribute through tuition and fees, housing, food, transportation, healthcare, and other consumer expenditures. They also participate in research, graduate education, and optional practical training. During the 2024–2025 academic year, international students contributed approximately \$42.9 billion to the U.S. economy and supported more than 355,000 jobs (NAFSA, 2025b). According to the Institute of International Education (IIE, 2025), 1,177,766 international students were enrolled in U.S. higher education institutions during the same academic year.

On July 17, 2026, the U.S. Department of Homeland Security (DHS) published a final rule replacing the duration-of-status framework for F nonimmigrant students with a fixed period of admission and an extension-of-stay procedure. The rule is scheduled to take effect on September 15, 2026. Under the new framework, admission is tied to the program period, subject to a maximum period established by the rule, and some students may need to request an extension to remain lawfully in the United States when additional time is required (DHS, 2026b). Additional implementation guidance was provided through the Study in the States program (DHS, 2026a). Although the policy is intended to strengthen immigration oversight and improve administrative consistency, it may also introduce additional administrative requirements and uncertainty for prospective international students and higher education institutions.

Because the rule is newly issued, sufficient post-policy observations do not yet exist for a conventional causal evaluation. Therefore, this project uses counterfactual simulation to estimate how different international student enrollment responses could influence economic outcomes. The primary research question is: How might the replacement of duration of status with a fixed admission period affect the annual economic contribution of international

students to the United States? The analysis evaluates mild (5%), moderate (10%), and severe (15%) enrollment-decline scenarios.

Data Description

The project dataset combines annual U.S. international student enrollment totals from the Institute of International Education's (IIE) Open Doors reports with annual estimates of international students' economic contribution published by NAFSA: Association of International Educators. Open Doors, supported by the U.S. Department of State, provides annual data on international student enrollment at U.S. colleges and universities (Institute of International Education [IIE], 2025). Economic contribution estimates were obtained from NAFSA: Association of International Educators (2025b) and were calculated using the methodology described by Baumgartner (2025).

The analytical dataset contains 11 academic-year observations spanning 2014–2015 through 2024–2025. The primary predictor variable is the number of international students enrolled in U.S. higher education institutions, while the outcome variable is the annual economic contribution measured in billions of U.S. dollars. This historical period captures enrollment growth before the COVID-19 pandemic, the pandemic-related decline, and the subsequent recovery. For example, enrollment decreased to 914,095 students during the 2020–2021 academic year before increasing to 1,177,766 students in 2024–2025 (IIE, 2025).

Data preprocessing included verification of variable types, duplicate records, and missing values to ensure data quality. No missing observations were identified in the final dataset. Nevertheless, the Python workflow includes median imputation for numeric variables to maintain reproducibility should future versions of the dataset contain missing values. The predictor variable was standardized using StandardScaler, which centers the data around a mean of zero and scales it to unit variance before model training. Finally, the dataset was partitioned into training and testing subsets using a fixed random seed to ensure reproducibility of the regression results.

Methodology

Counterfactual Model

A regression-based counterfactual model was selected. Linear regression estimates the historical relationship between international-student enrollment and economic contribution. This method is appropriate for a transparent classroom simulation because the outcome is continuous, the primary policy pathway is expected to operate through enrollment, and the coefficients and predictions can be readily interpreted. The method is also reproducible using widely available Python packages.

The regression model can be expressed as $Y_t = \beta_0 + \beta_1 \text{Students}_t + \epsilon_t$, where Y_t represents economic contribution in academic year t , Students_t is international enrollment, β_0 is the intercept, β_1 is the estimated marginal relationship, and ϵ_t captures unexplained variation. The model does not claim that every historical change in economic contribution was caused by enrollment alone. Tuition levels, living costs, inflation, exchange rates, institutional aid, and the composition of students may also affect the outcome.

Training and Evaluation

The dataset was divided into training and testing subsets, with approximately 27% of the observations retained for testing. The test-set mean absolute error was \$2.04 billion, and the root mean squared error was \$2.30 billion. The test-set R-squared was 0.82. Because the sample is small, the test statistic is sensitive to the particular split and should be interpreted cautiously. The model was subsequently refit using all observations for the scenario simulation; the full-sample R-squared was 0.82.

Simulation Setup

The 2024–2025 academic year was used as the baseline because it is the most recent complete annual observation in the assembled dataset. The baseline includes 1,177,766 international students and an estimated economic contribution of \$42.9 billion. Three counterfactual scenarios were evaluated: a 5% enrollment decline, a 10% decline, and a 15% decline. These values are sensitivity assumptions rather than measured effects of the final rule. They allow the researcher to examine how economic outcomes would change if greater administrative uncertainty reduced enrollment.

Results

Table 1. Descriptive Statistics for International Student Enrollment and Economic Contribution

Variable	Mean	Range
International students	1,053,403	914,095 - 1,177,766
Economic contribution (\$B)	37.1	28.4 - 43.8

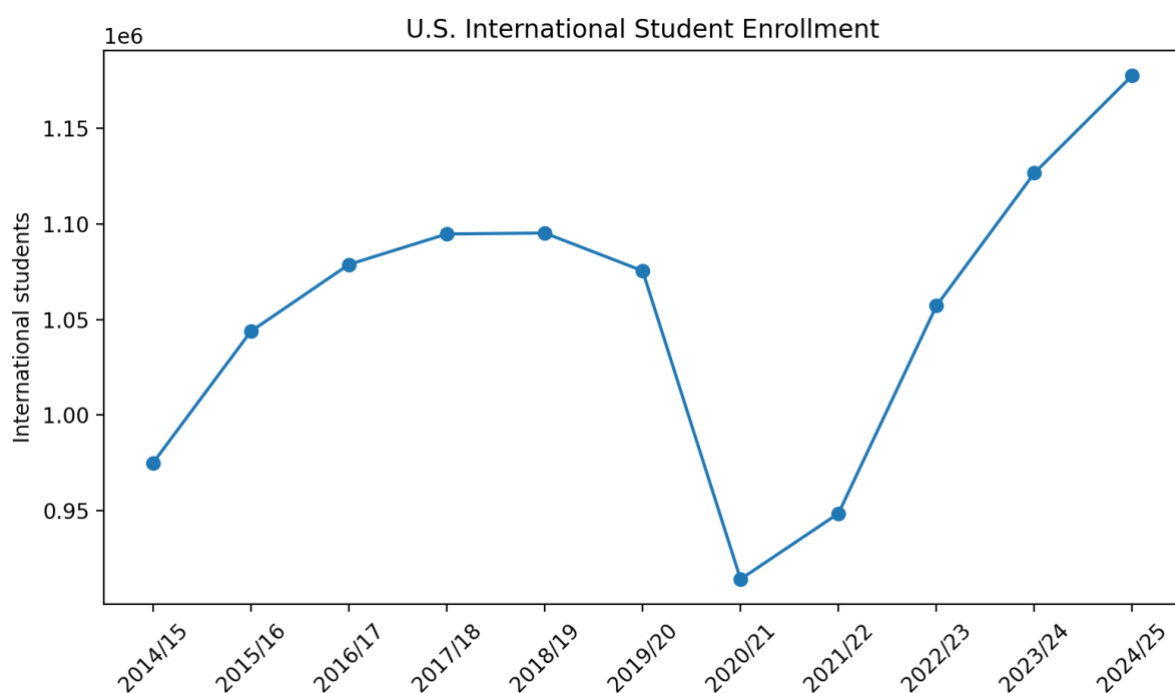


Figure 1. U.S. international student enrollment, 2014–2015 through 2024–2025

Figure 1 demonstrates growth through the late 2010s, a pronounced decline during the pandemic, and recovery afterward. The pattern shows that international enrollment is responsive to major shocks. However, the pandemic was a uniquely large disruption and should not be treated as a direct analogue for the new immigration rule.

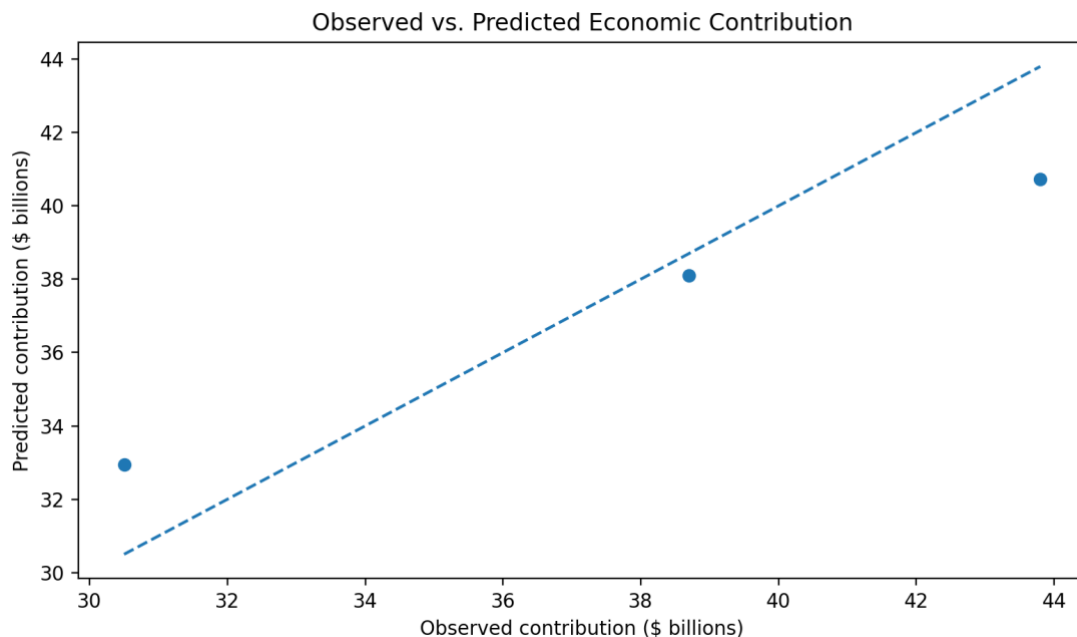


Figure 2. Observed and predicted economic contribution in the test sample

Table 2. Counterfactual Economic Contribution Under Alternative Enrollment-Decline Scenarios

Scenario	Students	Projected contribution	Loss vs. observed
Baseline (0% decline)	1,177,766	\$44.32B	\$0.00B
Mild (5% decline)	1,118,878	\$40.89B	\$2.01B
Moderate (10% decline)	1,059,989	\$37.46B	\$5.44B
Severe (15% decline)	1,001,101	\$34.04B	\$8.86B

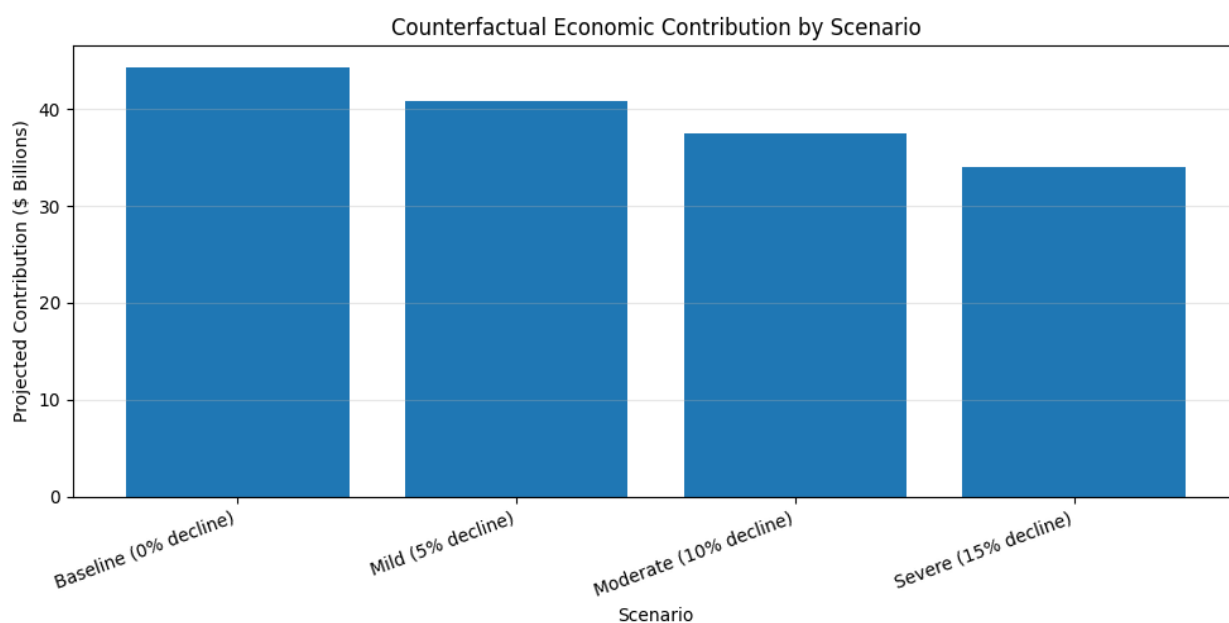


Figure 3. Counterfactual economic contribution under alternative enrollment assumptions

In the mild scenario, enrollment falls to approximately 1,118,878, and the model projects an economic contribution of \$40.89 billion. In the moderate scenario, enrollment falls to approximately 1,059,989, with a projected contribution of \$37.46 billion. In the severe scenario, enrollment falls to approximately 1,001,101, and projected contribution declines to \$34.04 billion. Relative to the observed 2024–2025 contribution of \$42.9 billion, the estimated losses are approximately \$2.01 billion, \$5.44 billion, and \$8.86 billion for the mild, moderate, and severe scenarios, respectively.

Analysis and Interpretation

Short-Term Implications

The simulated results indicate that even a moderate enrollment response could have a measurable economic effect. In the short term, institutions that rely heavily on international tuition could experience budget pressure. Reduced student spending could also affect landlords, restaurants, transportation providers, healthcare services, and other local businesses. NAFSA's estimates show that international education supports hundreds of thousands of U.S. jobs, which means enrollment changes can extend beyond university finances (NAFSA, 2025b).

The rule's direct administrative effect may also matter. Students in programs requiring more time than their authorized period could face extension filing costs, documentation requirements, and uncertainty. Universities may need additional advising and compliance capacity. These burdens could influence prospective students' destination decisions even if most extensions are eventually approved.

Long-Term Implications

Over a longer horizon, reduced enrollment may affect research capacity, especially in graduate STEM programs. International students frequently participate in laboratories, teaching, and advanced research. A sustained reduction could influence the pipeline of skilled workers and entrepreneurs. However, the rule may also produce benefits that are not captured in this model, including improved immigration monitoring and more standardized review of extended stays. A balanced policy assessment should compare these administrative objectives with potential economic costs.

Uncertainty, Assumptions, and Limitations

The analysis has several limitations. First, the policy was finalized only recently and is not yet represented in the historical outcome data. The simulated enrollment reductions are assumptions rather than identified causal effects. Second, the annual sample contains only 11 observations. Third, the model uses enrollment as the principal predictor and does not separately model tuition, inflation, living expenses, student origin, degree level, or state-level differences. Fourth, the relationship between enrollment and economic contribution may not remain constant if the composition of international students changes.

The model also cannot separate the new fixed-period rule from other contemporaneous factors, such as visa-processing delays, geopolitical conditions, exchange rates, travel restrictions, labor-market opportunities, or policies in competing destination countries. Therefore, the findings should be treated as conditional projections. A stronger future study could use state-level or institution-level panel data and apply difference-in-differences, synthetic control, or interrupted time-series methods after several post-policy years become available.

Conclusion

This project evaluated the possible economic impact of the new F-1 fixed-period admission policy using a regression-based counterfactual simulation. Historical data demonstrated a strong positive

association between international-student enrollment and economic contribution. Under the modeled assumptions, enrollment declines of 5%, 10%, and 15% were associated with progressively lower economic contributions.

The central policy implication is not that the rule will certainly cause a specific loss. Rather, the analysis shows the economic exposure associated with potential enrollment responses. Policymakers should monitor visa demand, extension outcomes, new-student enrollment, institutional costs, and student destination choices after implementation. Clear guidance, predictable extension processing, reasonable adjudication timelines, and coordination with universities may help reduce unintended economic effects while preserving the government's compliance objectives.

For economic strategy, universities should conduct institution-specific sensitivity analyses, diversify international recruitment, strengthen advising services, and develop contingency plans for tuition and enrollment volatility. Future counterfactual research should incorporate multiple post-policy years and more granular data before drawing firm causal conclusions.

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