REASONS FOR THE DECLINE OF U.S. POSTSECONDARY EDUCATION ENROLLMENT

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ABSTRACT

The United States has led the world in higher education for decades. However, enrollment in U.S. postsecondary institutions has declined year by year since 2011. Especially under the influence of the COVID-19 epidemic in 2020, this decline escalated, and the trend may continue. I focus on the possible factors that have led to this result, including high tuition fees and reduced financial subsidies, unmatched household incomes, a decreased college-age population, and major disease outbreaks. My hypothesis is disease outbreaks, economic factors, and demographic characteristics collectively affect enrollment in U.S. postsecondary institutions. Because COVID-19 related data are not yet available, I employ flu cases to simulate the effect of a major disease outbreak. After conducting fixed effects regressions, the results show that the coefficients on the variables of tuition fees, financial subsidies, flu cases, and total population are statistically significant, which support my hypothesis. My findings suggest that the government and universities should increase financial subsidies, especially during major disease outbreaks. Special preference and assistance policies can also help support enrollment.

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I. Introduction

After the completion of compulsory education, many high school graduates are faced with a choice. Whether to continue to study at university has become a problem for them to weigh. What is the purpose of receiving higher education? I believe that many people's answers will be to gain an advantage in the social competition, or to find an ideal job. This is a very reasonable idea. If you want to enter a competitive company with a good reputation, academic qualifications and graduation institutions are important selection criteria, reflecting either your IQ or the degree of your effort. In other words, receiving a higher education is generally considered to be positively related to having higher competitiveness and stronger strength.

Postsecondary education in the United States has always been at a leading level in the world, and students all over the world dream of going to the United States for further studies. But an interesting phenomenon is worthy of our attention. Since the peak in 2010/2011, the enrollment of U.S. colleges and universities has declined year by year. Especially due to the global epidemic of COVID-19, the enrollment of colleges and universities in the fall of 2020 dropped significantly. It is foreseeable that the impact of the epidemic is likely to continue in the next two years.

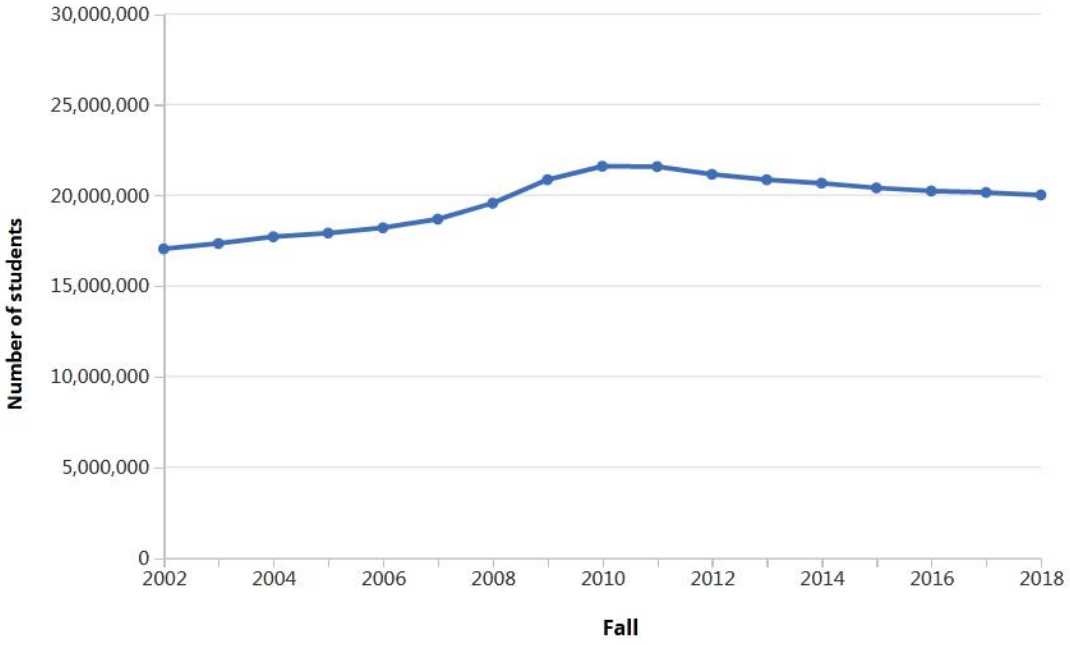

Figure 1. Number of Students Enrolled in Postsecondary Institutions in Fall 2002-2018

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS)

Many scholars compared the prosperity of American higher education to a "bubble". For example, Bryan believes that after nearly half a century of growth, US higher education may have reached its peak (Alexander, 2018). He infers that from now on this industry will shrink. The data also confirm this inference.

There are many possible reasons for this enrollment decline. For example, the number of US high school graduates has shrunk due to the declining birth rate. Universities' costs do not match the students' and families' ability to pay. Financial aid cannot meet the needs of students, and the process of applying for financial aid is lengthy and complicated, which may exert negative

impact on accessing financial aid and attending college for families (Bettinger et al. 2012). In addition, more and more people are skeptical about the value and necessity of college: whether the benefits after going to college can be greater than those from going directly to work after high school. Some scholars have also mentioned the spate of institutional scandals and growing concerns about the fairness of the admissions process. Those are the critical reasons that can influence students' decision-making. Moreover, they foresee a bleak future for US postsecondary education.

In addition, the sudden outbreak of COVID-19 in 2020 caused an even more dramatic drop in higher education enrollment. According to National Student Clearinghouse Research Center, one month after the start of the semester, the enrollment rate of undergraduates had dropped by 4.0% compared with 2019, while the trend of enrollment at graduate institutions had dropped by 2.7%. By September 24, the overall postsecondary enrollment rate had dropped by 3.0% (NCES, 2020).

Why is the impact of the reduction in higher education enrollment so significant? One reason is the business model of many universities relies on students enrollment. If enrollment declines, school income will decrease, and funding for facilities, staff, and courses will also decrease. This becomes a vicious circle. Universities cut courses due to reduced funding, which in turn makes it more difficult for schools to attract students. Such a dilemma means that many schools may be merged or closed. In some places, such as Maryhurst University and St. Gregory's University, such things are already happening.

In this case, systematically exploring the reasons for the decline in higher education enrollment and finding appropriate solutions will have a vital impact on the prosperity of the U.S. education industry. In this paper I hope to combine statistical models to find the variables that correlate with the decline in enrollment in colleges and universities, and propose feasible policy recommendations based on those results.

In the next two sections, I summarize relevant background information and then review related literature. In sections IV and V, I describe the theoretical framework and illustrate the descriptive statistics of the dataset used for this study. Then in section VI, I provide the empirical model. Finally, in section VII, I present my conclusions and policy recommendations.

II. Background

From 2011 to 2019, the number of students enrolled in US postsecondary institutions continued to decline (NCES, 2020). Student enrollment at U.S. colleges is down 11% since 2011 (Nadworny, 2019). In 2020, according to NPR, due to the global pandemic, the postsecondary enrollment rate declined further (Nadworny, 2020). Private colleges, which largely depend on students' tuition and fees, may be particularly impacted. During this economic uncertainty period, and with many schools going virtual in the fall semester of 2020 and 2021, the global pandemic could be an unprecedented shock to the postsecondary education system (Polikoff, Silver and Korn, 2020). In this scenario, exploring the potential impact of COVID-19 on US enrollment rates is urgent.

I want to examine whether COVID-19 had a negative impact on the postsecondary enrollment rate in the US. However, the current crisis is so recent that data are not available. An alternative that can shed light on the COVID-19 crisis is to examine how other major disease outbreaks in the past, such as the 2009 H1N1 influenza, influenced enrollment rates similarly so as to derive a general idea about the impact of COVID-19 on enrollment.

In addition, I also want to explore what factors have caused the postsecondary enrollment rate in US to decline before 2020, that is, before the occurrence of COVID-19. Economic factors must be considered. From the data I have obtained, the enrollment rate of higher education continued to rise before 2010, especially during the Great Recession from 2007 to 2009. The number of incoming, credential-seeking students in 2008 grew to 2.7 million from 2.4 million, which

indicated that more students enrolled in college in 2008, as the recession was beginning (Fain, 2014). This pattern suggests that higher education runs in the opposite direction of the economy. That is to say, as the unemployment rate increases, enrollment in postsecondary education basically increases in the context of an economic downturn (Betts and McFarland, 1995), and the unemployed usually decide to go back to college to improve their job prospects (Barshay, 2020).

The current global pandemic is triggering a new recession in US right now. Will the economic recession caused by COVID-19 witness rise in the postsecondary enrollment rate like the Great Recession of 2007-2009? This question remains to be answered, since according to Doug Shapiro, Executive Director of the National Student Clearinghouse Research Center, the impact on postsecondary institutions is not immediate (National Student Clearinghouse, 2020).

III. Literature Review

1. The Great Recession and Higher Education Enrollment

Many scholars have directly or indirectly analyzed the relationship between college enrollment and the unemployment rate during the Great Recession and concluded that the impact of the recession on enrollment is a complex social phenomenon. As Bridget Terry Long (2014) demonstrated that the increase in unemployment and financial aid caused by the Great Recession may have encouraged many people to go to college, especially in the states most affected by the recession. However, the decline in family income, the increased difficulty in obtaining private financing, the increase in tuition fees, and the tension in institutional capacity indicate that the trend of college enrollments may now be declining. In addition, part-time enrollment increased while full-time enrollment declined. Barr and Turner (2012) also think this issue seems contradictory. Although the reduction in state funding and the increase in tuition fees may weaken the overall enrollment response. However, these factors will not be strong enough to "offset" the increase in enrollment. This confirms what Betts and McFarland (1995) concluded that enrollment in postsecondary education increases in the context of an economic downturn.

Scholars have explained the reasons for this theory. First of all, Bell and Blanchflower (2011), conclude that youth unemployment rates may have been higher than adult rates during the Great Recession because youth have less specific human capital and work skills or work experience. Companies need to spend more money to train young people. It was not good for the development of companies during the Great Recession. Previous studies have found that college enrollment generally grow with unemployment (Long, 2004), especially among 16 to 24 years

old due to lack of employment opportunities (Bell and Blanchflower, 2011). Nick Hillman (2020) agrees with this view, arguing underemployment or unemployment is even worse for young people if they do not continue to study and having more skills can protect them against the effect of economic downturn. But this perspective also had partial or complete refutations. Craft (2012), Hemelt & Marcotte (2011) and Stanley & French (2009) conclude that there is no clear relationship between unemployment and enrollment. Kane (1995) adds nuance to this view, arguing that two-year public institutions' enrollment is positively related to unemployment, whereas four-year institutions' enrollment is inversely related.

Dunbar, Hossler, and Shapiro (2011) conducted further research on enrollment rates during the Great Recession in different types of institutions and different regions. They suggest that the enrollment patterns of different institution types were different. Specifically, they conclude, enrollment in the two-year public sector increased more than the four-year private sector in the recession. They point out, however that private institutions seem to have maintained their market share of student enrollment more effectively than expected.

2. Economic Factors and Higher Education Enrollment

There are many socio-economic factors that affect college enrollment. Scholars generally agree that tuition, Pell grants, financial aid, and family income are most critical.

Many scholars believed that the mismatch between higher tuition fees and financial aid in recent years can explain the decline in enrollment in higher education institutions. Bridget Terry Long

(2014) concluded that, although the tuition fees of various sectors have increased, the government's financial assistance has remained basically unchanged. Samuel Stebbins (2019) believed that increasing tuition fees and the heavy burden of paying off student loans make students hesitate to continue higher education. To make matters worse, it is not a small number of families who cannot enroll in college because of high tuition fees. The College Board and Art & Science Group research stated that more than half of students surveyed will have some difficulty paying for college. The latest data from the College Board show that between 2009-10 and 2019-20, average tuition and fee prices rose by $670 at public two-year colleges, by $2,020 at public four-year institutions, and by $6,210 at private nonprofit four-year colleges and universities. Obviously, college tuition may increase at a faster rate (Lewin, 2008). Poor economic conditions and the states' budget cut has created pressure for substantial increases in tuition fees, as Hemelt and Marcotte (2008) concluded.

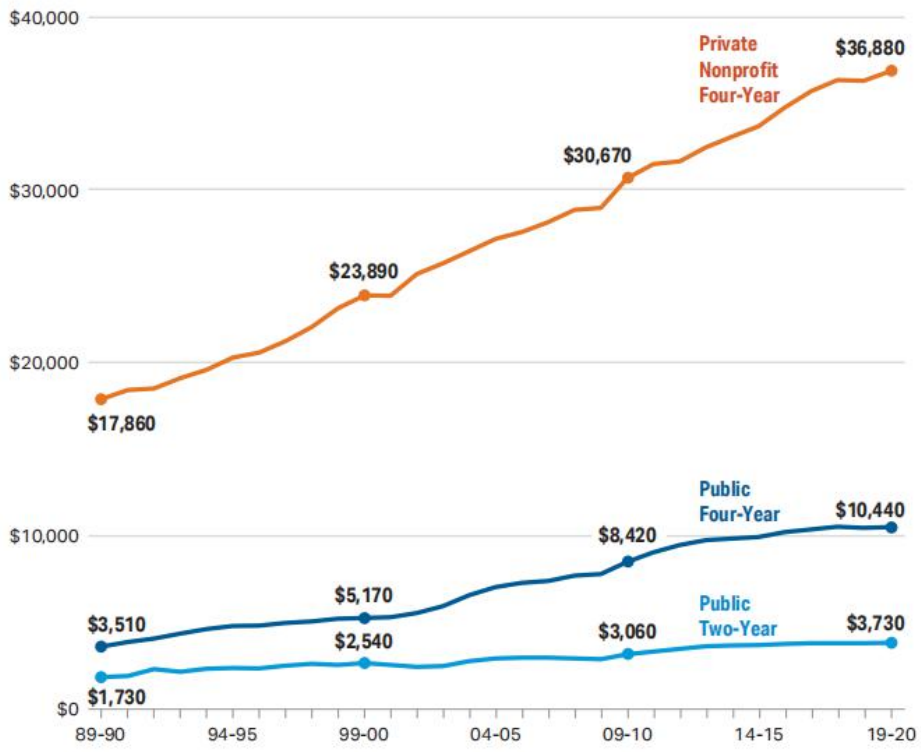

Figure 2. Published Tuition and Fees in 2019 Dollars

SOURCE: College Board, Annual Survey of Colleges; NCES, IPEDS Fall Enrollment data.

With the rising of tuition fees, financial aid, tuition subsidies and Pell grants are crucial to the high school graduates' decisions about whether they enter postsecondary institutions. Bridget Terry Long (2014), for example, concludes that the level and distribution pattern of state subsidies strongly influences student's decisions. Specifically, if aid were allocated as credits applicable to any in-state university, as many as 29% of students would prefer to attend a private four-year university. In addition, Adams (2011) affirms the role of Pell grants in decision-making, indicating that more funding for Pell grants also means that the marginal cost of attending community colleges has fallen. Dynarski (2003) used experiments to prove this theory. He gathered groups of high school students, randomly distributed loans, and observed their

decision on whether to enroll higher education institutions after a period of time. The study found that a $1,000 loan subsidy increased college enrollment rates by 5.1 percentage points. This experiment confirmed price subsidies, in the forms of grants and low tuition, increase college enrollment. Parrott (2017) further studied the importance of Pell grants and proposed that Pell grants have a vital impact on expanding higher education opportunities for non-traditional groups (such as the elderly and returning students). In addition, he believed that Pell grants not only affect people's school decision, but also affect graduation rates. Specifically, Pell grants may help some students reduce their workload for academic purpose. He summarized that if college costs reduce by $1,000, the enrollment rate can be increased by 3-5 percentage points, with lower-income students being more price sensitive.

3. Major Disease Outbreaks with Higher Education Enrollment

Few studies discuss the relationship between diseases and the higher education enrollment. But after the outbreak of the COVID-19 epidemic in 2020, scholars began to focus this issue, believing that corresponding measures must be taken to deal with the drastic decrease in higher education enrollment. The National Student Clearing House data indicate that US college enrollment has decreased by 11.2% among international students, 7.7% among Native American students, and 6.3% among both Black and White students. In response to this circumstance, higher education analysts have anticipated two likely situations: the loss of international students and low-income students, and the delayed entry (Startz, DeBaum and Kreuger, 2020). Kim and Krishnan(2020) found that a large portion of students reported that COVID-19 had affected their readiness, willingness, or financial ability to attend a postsecondary education institution. Korn

(2020) also agreed that the COVID-19 outbreak disrupted many students' plans including not wanting to take classes virtually, concerns over traveling to areas where COVID-19 is concentrated, and financial stress related to unemployment of family members. Among them, Blagg (2020) believed that the decline in international student enrollment would have the greatest impact on graduate schools.

On the other hand, Hillman (2020) remained optimistic, arguing that while international student numbers may be sharply decreased, a greater proportion of domestic high school graduates may try to enroll in higher education institutions. Blagg (2020) proposed that if enrollment changes during epidemic this time resemble the changes during the 2008 recession, for-profit institutions would see the largest percentage increases in enrollment. In addition, almost all scholars mentioned that schools should formulate corresponding policies to overcome difficulties. Clark and Fritz (2020) proposed that schools should personalize financial aid strategies. Rather than providing "COVID grants", they argued, colleges and universities should work with individual students and families to fix their specific financial problems and try to make the best use of limited resources.

This paper will contribute to the body of literature by using regression models to explore whether the economic and demographic characteristics, and major disease outbreaks, have a significant impact on the enrollment of higher education in the U.S. After reading the literature, I selected several economic and demographic variables that theoretically have an impact on the changes in enrollment of higher education, which laid a foundation for the establishment of my regression

model. Specifically, I hope that these variables are indeed the important factors contributing to the decline in enrollment in higher education. In addition, even if there is no available data related to COVID-19, I hope to fill the gap in this field after analyzing the impact of similar types of infectious respiratory disease, such as influenza, on my dependent variable, enrollment.

IV. Theoretical Framework

In order to determine which factors are related to the decline in enrollment in higher education, I develop the theoretical model described below. This model will provide a framework for the following discussion. Theoretically speaking, I think that socioeconomic factors, demographic characteristics, and major disease outbreaks have jointly influenced the decline in enrollment in US higher education. Among them, the discussion of the economic and demographic portions of the model are based on the research of the previous scholars. However, the impact of the disease outbreak on the enrollment of higher education comes from my observation of the outbreak of the 2020 epidemic. Therefore, this variable needs to be further tested. I developed the empirical model that follows with this framework, and the empirical model will test the implications of the theoretical model.

$$\text{Total Enrollment} = f(\text{Disease Case, Economic Factors, Demographic Characteristics, } \mu) \quad (1)$$

I employ flu disease to simulate the impact of the COVID-19 epidemic. The reason why I use flu disease case to analyze is that: 1) COVID-19 and flu disease are both airborne respiratory diseases that are somewhat similar in terms of infectivity, 2) COVID-19 is a new type of disease that appeared in 2020, so only one year of data on disease cases can be collected by now. Too small a sample size can lead to biased results. Instead, flu disease cases are recorded by CDC almost every year, and the sample size is sufficient to support regression analysis. However, it must be emphasized that although these two infectious diseases have some similarities, they are

still quite different. The purpose of my thesis is to analyze the impact of major disease outbreak on postsecondary enrollment on a broad view, rather than to analyze a specific disease.

V. Data and Descriptive Statistics

I create a panel dataset by states and years that contains all the variables I want to add. Since my dependent variable is the total enrollment in US postsecondary institutions, the National Center for Education Statistics (NCES) is my main data source.

NCES collects data on fall enrollment and 12-month unduplicated headcount enrollment by state from all Title IV institutions. Researchers usually use the fall enrollment data for academic institutions. The data on student financial aid, such as Pell grants and federal student loans, by State and year, are available for public use, but they are limited to the aid awarded to undergraduates, and the most detailed data are only available for the first-time, full-time degree/certificate-seeking undergraduates. I will assume that these data represent a good proxy for all enrollees.

The Integrated Postsecondary Education Data System (IPEDS) is NCES's the main postsecondary education collection program. IPEDS offers very detailed data on several grids of postsecondary institutions, including institutional revenues and expenses, students' enrollment, and financial aid. The latest postsecondary enrollment data provided by IPEDS come from 2018, so I have selected the data from 2014 to 2018 for analysis.

It is worth noting that IPEDS provides data on the 50 states and Washington, D.C, which contain 6,527 institutions. There is no information on Puerto Rico. Thus, there are a total of 255 observations in my dataset. For my research, I used the option for Statistical Tables at

https://nces.ed.gov/IPEDS/use-the-data. I found the option of fall enrollment/retention rates and then clicked total, full- and part-time enrollment and fall FTE. I want total enrollment, which represents total men and women enrolled for credit in the fall of the academic year, for the years I am interested in. Next step, I clicked to change the answer for classification variables to "yes" and then selected the most recent year and all the States. Finally, I was able to download a compressed excel formatted file. Because this system only provides 50 or fewer variables selected at once, so I used the same steps to download variables of tuition and fees, total amount of Pell grants aid awarded to undergraduate students, number of undergraduate students awarded Pell grants, total amount of federal student loans awarded to undergraduate students, number of undergraduate students awarded federal student loans. I then organized three different excel files into one excel file.

In order to obtain the data for my key independent variable, flu disease cases, I went to the Centers for Disease Control and Prevention (CDC) website and found a page titled "National, Regional, and State Level Outpatient Illness and Viral Surveillance".[a] . This page presents the positive influenza tests reported to the CDC by Public Health Laboratories and influenza like illness (ILI) Activity. I clicked the "Download Data" button and selected "State" for regions and "years of 2014 to 2018" for seasons. The downloaded data cover the total number of flu cases in 52 weeks per year. Since September is the month for student enrollment in the fall semester, I assume that the time for people to make decisions is from January to August (before September). Therefore, I collected the flu cases data of 32 weeks (4*8) for each year for my regression

[a] https://gis.cdc.gov/grasp/fluview/fluportaldashboard.html.

analysis. It is worth noting that the data for Florida are missing for these five years (2014-2018), which may affect my results.

For another big part of my data, I need American Community Survey 1-Year Estimates for my years by states, including data for total population, employment status, average household income. It is worth noting that BLS provides data on the 50 states and Washington, D.C, which also includes Puerto Rico. Thus, there are a total of 260 observations. Due to some technical reasons, I cannot enter this website directly, so I turned to my data analysis adviser, Professor Gardner for help. I am very grateful for his help!

Table 1. Summary Statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
totalenroll	255	393,038	460,663.8	26,547	2,764,585
flucase	255	10,466.41	16,205.55	136	99,247
tuition	255	1,041,446	1,092,200	23,391	5,413,709
fsl_amt	255	840M	765M	40M	3420M
fsl_num	255	124,260	112,813.1	5,980	493,551
Pellgrant_amt	255	500M	608M	21.7M	3520M
Pellgrant_num	255	123,705.5	149,415.3	5,915	877,035
totalpop	260	6,281,755	7,131,004	577,737	39.6M
above16_employ	260	2,954,218	3,337,710	282,202	18.9M
HHmedInc	260	57,504.26	11,408.99	18,626	85,203

As presented in Table 1, I employ 9 independent variables to measure the impact on the dependent variable. Among them, the variables of flu cases and tuition are my key independent variables of interest, and the remaining variables are my controlling variables. All the variables in my dataset are continuous variables. To summarize briefly, the minimum postsecondary enrollment is Alaska in 2018, and the maximum is California in 2018. The minimum flu cases occur in Montana in 2017, and the maximum occur in Virginia in 2018. The minimum total tuition fee is Wyoming in 2014, and the maximum is New York in 2018.

In the next section, I present the empirical model I estimate with these data.

VI. Empirical Model

I estimate the following empirical model:

$$\text{logtotalenroll} = \beta_0 + \beta_1 \text{logflu} + \beta_2 \text{logtuition} + \beta_3 \text{logfslamt} + \beta_4 \text{logfslnum} + \beta_5 \text{logPellamt} + \beta_6 \text{logPellnum} + \beta_7 \text{logtotalpop} + \beta_8 \text{logabove16employ} + \beta_9 \text{logHHmedInc} + \mu \quad (2)$$

Where:

logtotalenroll is the natural log of total men and women enrolled for credit in the fall by state for a given academic year.

logflu is the natural log of 32 weeks of influenza positive tests reported to the CDC by Public Health Laboratories and influenza like illness (ILI) activity from January to August each year.

logtuition is the natural log of the average price of attendance for full-time, first-time undergraduate students for the full academic year. (Price of attendance means tuition and fees, books and supplies, room and board, and other expenses).

logfslamt is the natural log of the total amount of federal student loans (FSLs) awarded to undergraduate students.

logfslnum is the natural log of the number of undergraduates awarded FSLs.

logPellamt is the natural log of the total amount of Pell grants aid awarded to undergraduate students. (The Pell grants program provides grant assistance to eligible undergraduate postsecondary students with demonstrated financial need to help meet education expenses.)

logPellnum is the natural log of number of undergraduate students who were awarded Pell grants.

logtotalpop is the natural log of the population based on that year's census data.

logabove16employ is the natural log of the population of those unemployed over 16 years old.

logHHmedInc is the natural log of households' median income and

μ is the random error.

Logtotalenroll is my dependent variable in my model. Data for **logtuition**, **logfslamt**, **logfslnum**, **logPellamt** and **logPellnum** are obtained from IPEDS, reflecting the cost and subsidy of entering a higher education. **logtotalpop** and **logabove16employ** are demographic variables, reflecting the total population and the population of employees over 16 years old. The ACS 1-year estimate only provides the population of employees over 16 years old and cannot be customized. **logHHmedInc** is an economic variable, indicating households' median income. I take the natural log of all variables for reasons described below.

The reason for using the logarithmic function is to reduce the absolute value of the data. Many of the original data in my panel are extremely large, and the calculation of such large values may exceed the value range of the data. Using logarithms can narrow the gap between the values and make the coefficients easier to read and interpret. In addition, employing logarithms will order the data in a stationary manner, which could reduce the probability of collinearity and heteroscedasticity. "Log" version will not change the relationship of the data and variables but will minimize the bias.

Before conducting my regression analysis, I anticipate the relationship between all independent variables and my dependent variable. I expect flu cases will correlate negatively with total enrollment since I assume that the greater the impact of disease outbreak on society, the more cautious people will be in deciding whether to enroll in college, regardless of whether the impact comes from economic factors or health risk reasons. Although there is a lack of relevant literature to confirm this, such a phenomenon has been witnessed in the 2020 Fall semester. Tuition will, in my estimation, correlate negatively with total enrollment. Similarly, I expect the amount of FSL, the number of FSL, the amount of Pell grants and the number of Pell grants will lead to increased total enrollment. This conjecture is consistent with the related literature. If the government or schools provide more financial subsidies or increase the number of positions with subsidies, more middle-income or low-income families may reconsider going to college instead of working.

For the direction of total population, I believe there is no doubt that an increase in total population will be positively associated with an increase in the number students enrolled in college. In addition, although there is no evidence that schooling and working are mutually exclusive, I still expect to find a negative relationship between the number of employees over 16 years old and total enrollment. Finally, along the same lines with students' federal loan and Pell grants, I expect to find that households median income is positively correlated with total enrollment since I think that an increase in household median income will reduce the financial burden of family member(s) in school and support people's decisions to go to college.

I next present the results from estimating this model.

VII. Regression Results

I present my results below. The fixed effects results are strong since the R-squared is 0.954, which means that my independent variables explain almost all of the variation in the dependent variable. In addition, the significance value of the F-statistic is less than 0.01, which means the joint result is statistically significant at the 99% level of confidence. More importantly, the coefficients, signs, and magnitudes for my key independent variables of interest are basically consistent with my expectations. Thus, in overall, this regression results support my hypothesis.

My regression analysis first started with the "log-log" OLS regression model. Table 2 contains the estimated coefficients with robust standard errors, t-values and p-values for these variables with the OLS method.

Table 2. "log-log" OLS Regression Results

Variable	Coefficient	Robust Standard Error	t-value	p-value
logflu	0.021	0.006	3.36	0.001***
logtuition	-0.011	0.016	-0.71	0.481
logfslamt	-0.385	0.113	-3.40	0.001***
logflsnum	0.664	0.121	5.49	0.000***
logPellamt	0.099	0.150	0.66	0.510
logPellnum	0.473	0.160	2.96	0.003***
logtotalpop	-0.273	0.214	-1.28	0.203
logabove16employ	0.376	0.212	1.77	0.078*
logHHmedInc	0.525	0.072	7.26	0.000***
Constant	-1.635	2.245	-0.73	0.467
Number of Observations：250 R-Squared ：0.9899 F-Statistic：3155.56*** Prob>F ：0.0000				

****, **, and * denote statistically significant results at the 99%, 95% and 90% level of confidence, respectively.*

The results of my OLS regression are somewhat different from my hypothesis, at least regarding as my key independent variable of interest. As described in Table2, there is a positive correlation between flu cases and total enrollment. Specifically, the result indicates that, on average, a 1% increase in flu cases is associated with an increase of 0.021% in total enrollment, holding all other variables in the regression model constant. This coefficient is statistically significant at the 99% significance level. However, this sign is not what I expected. In addition, although the sign of coefficient on **logtuition** is negative, and the magnitude is close to what I anticipated, this coefficient is not statistically significant. Similar situations occur for the variables **logPellamt** and **logabove16employ**. The coefficients on **logfslamt** and **logtotalpop** are also contrary to my expectations. My OLS analysis results also indicate that increasing financial investment in student loans will reduce enrollment, while an increase in the total population will reduce the enrollment.

However, the coefficients on **logflsnum**, **logPellnum** and **logHHmedInc** are consistent with my assumptions. Specifically, a 1% increase in number of students receiving federal student loans is associated with an increase of 0.664% in total enrollment, holding all other variables constant. This coefficient is statistically significant at the 99% significance level. At the same time, a 1% increase in the number of students awarded Pell grants is associated with an increase of 0.473% in total enrollment, holding all else constant. This coefficient is also statistically significant at the 99% significance level. The results of these two variables back up my hypothesis in terms of economic factors. Moreover, a 1% increase in household median income is associated with an

increase of 0.525% in total enrollment, ceteris paribus. This coefficient is also statistically significant at the 99% significance level.

Generally speaking, the OLS method may not be well suited for my research analysis. I assume that the omitted variable bias is an important reason for the unsatisfactory results of my OLS analysis. Considering that the data I employ are panel data, a fixed effects regression model may be more appropriate for my research. Fixed effects models control for all time-constant differences between the entities (states, in my analysis), so the estimated coefficients of fixed effects regression models are less likely to be biased because of omitted time-invariant characteristics (Torres, 2007). In other words, by including fixed effects, I am able to control for the average differences across states in any observed or unobserved predictors, such as cultural and policy factors. I present these results next.

Table 3. "log-log" Fixed Effects Regression Results

Variable	Coefficient	Robust Standard Error	t-value	p-value
logflu	-0.006	0.003	-1.84	0.072*
logtuition	-0.233	0.083	-2.81	0.007***
logfslamt	-0.066	0.081	-0.81	0.421
logflsnum	0.168	0.097	1.74	0.089*
logPellamt	-0.038	0.090	-0.42	0.677
logPellnum	0.441	0.100	4.43	0.000***
logtotalpop	1.075	0.335	3.21	0.002***
logabove16employ	-0.057	0.290	-0.20	0.846
logHHmedInc	0.308	0.164	1.87	0.067*
Constant	-8.060	2.940	-2.74	0.009***
Number of Observations：250 R-Squared ：0.9541 F-Statistic：54.04*** Prob>F ：0.0000				

****, **, and * denote statistically significant results at the 99%, 95% and 90% level of confidence, respectively.*

Table 3 describes the estimated coefficients, robust standard errors, t-values and p-values for these variables with the fixed effects method. This fixed effects model includes time fixed effects and entity fixed effects, and the results make more sense than the OLS regression. The key independent variables of interest are statistically significant, while the signs and magnitudes are also what I expected.

First, as presented in Table 3, a 1% increase in number of flu cases is associated with a reduction of 0.006% in total enrollment, holding constant the time-varying controls included in the model, all state characteristics that are fixed over time, and all time-varying characteristics that are fixed across states. This coefficient is statistically significant at the 90% significance level. This result is consistent with my assumptions and the related literature. I think the outbreak of disease may lead to a decrease in enrollment for two main reasons. First, the economic reasons. The outbreak of disease will inevitably be accompanied by an increase in medical expenses for families, and especially in the case of low-income families, reducing their ability to afford high tuition fees. In addition, the outbreak of major diseases may increase the unemployment rate and make the economic situation of low-income families even worse. In fact, this situation has been more conspicuous in the COVID-19 epidemic than with flu outbreaks. Second, the health risk reasons. If an infectious disease breaks out, students and their families may worry that having classes in person would increase the risk of infection. At the same time, if the student has already been infected, he/she may postpone the time to enroll. In fact, as proposed by Startz, DeBaum and Kreuger (2020), the impact of the COVID-19 epidemic on declining enrollment stems mainly

from three aspects: the loss of international students and low-income students, and the delayed entry.

It is worth noting that, however, I employ flu cases to simulate the COVID-19 pandemic and other major diseases, considering that the COVID-19 data are not available yet. So that the simulation effect may not be completely accurate. For example, the magnitude of coefficient on flu case is not very significant. I think that is because flu is a common infectious disease compared to COVID-19 so people may know how to take precautions against it. And because there are already flu vaccines, so the influence of flu on peoples' enrollment decisions is not as significant. Perhaps, the COVID-19 epidemic may exert greater impact on enrollment decision since it is a new type of virus with limited treatments. But this hypothesis can only be confirmed after at least three years with enough data collection. However, we at least have the basic idea of the relationship between flu cases and total enrollment through this fixed effects regression result with this statistically significant coefficient, which lays a basic foundation for future analysis.

Second, the relationship between tuition and total enrollment is also in line with my hypothesis. As described in Table 3, a 1% increase in amount of tuition is associated with an reduction of 0.233% in total enrollment, holding constant the time-varying controls included in the model, all state characteristics that are fixed over time, and all time-varying characteristics that are fixed across states. This coefficient is statistically significant at the 99% significance level. The result supports the idea that increases in tuition fees, especially in private schools, is one of the important reasons for the decline in enrollment in recent years. The rapidly increasing tuition

fees may have particularly affected low-income families and influenced them to postpone or give up higher education and instead turn to work. This result supports Samuel Stebbins's assumption that the climbing tuition fees and the threat of a lifetime paying off student loans make students hesitate to continue higher education (Samuel Stebbins, 2019).

Next, this fixed effects regression result also show the importance of student federal loans and Pell grants. A 1% increase in the number of students receiving federal loans is associated with an increase of 0.168% in total enrollment, while a 1% increase in the number of students awarded Pell grants is associated with an increase of 0.441% in total enrollment, holding constant the time-varying controls included in the model, all state characteristics that are fixed over time, and all time-varying characteristics that are fixed across states. These two coefficients are statistically significant at the 90% and 99% significance levels, respectively. This result is consistent with Dynarski's experiment, which indicates that price subsidies, in the forms of grants and low tuition, would increase college enrollment (Dynarski, 2003). However, the coefficients on the amount of Pell grants and federal student loans are not statistically significant with unexpected signs. One reason for this may be distribution effects: at the state level, my data cannot account for differing amounts that students receive. Also, the number of students receiving subsidies may be more important than the amount of in subsidies.

As for demographic factors, the coefficients of total population and household median income also back up my expectations. A 1% increase in total population is associated with an increase of 1.075% in total enrollment, while a 1% increase in households' median income is associated

with an increase of 0.308% in total enrollment, holding constant the time-varying controls included in the model, all state characteristics that are fixed over time, and all time-varying characteristics that are fixed across states. These results highlight that there is a strong relationship between total population and total enrollment. However, with the acceleration of aging, the decrease of school age students may explain the decline in enrollment to a large extent. In fact, this is exactly the issue that many developed countries are facing. For household median income, this result is just the opposite of the variable of tuition. It once again proves that high tuition is a problem encountered by many families, especially low-income families. However, as presented in Table 3, there is no statistically significant relationship between the level of employment and total enrollment, although they are negatively correlated. This result indicates that working and schooling may not conflict. In fact, in American culture, working and schooling can be carried out at the same time, whether it is part-time or full-time.

In the next section, I conclude and present policy implications arising from these results.

VIII. Conclusions and Policy Recommendations

1. Summary

In this paper, I examined existing research on the several factors on the level of U.S. postsecondary enrollment, including average tuition fees, Pell grants, federal student loans, total population, employment status, household median income, and flu disease cases. By implementing fixed effects regression analysis, I determined that enrollments will decline if flu disease cases increase in that year; specifically, a 1% increase in the number of flu cases is associated with a reduction of 0.006% in total enrollment. This finding confirmed my initial conjecture that a major disease outbreak will exert a negative impact on people's decision-making on enrollment. However, although this result is significant, the magnitude of the change is not as large as I expected, indicating that people's decision-making on enrollment is not very responsive to flu disease.

In addition, the regression analysis shows that increases in tuition fees have a negative impact on enrollment; specifically, a 1% increase in the amount of tuition is associated with a reduction of 0.233% in total enrollment. This result is statistically significant, and the magnitude is relatively large, which suggests that tuition fees have an important impact on people's decision-making on enrollment. My analysis also shows that an increase in the number of students receiving the Pell grants and federal student loans will increase enrollment, which indicates that families, especially low-income families, are particularly dependent on the financial subsidies. It is worth noting that, as presented in the regression results section, perhaps the number of students receiving subsidies may be even more important than the level of the subsidies.

Furthermore, as for demographic factors, the level of enrollment will decrease along with the decrease of the total population, while the average household income and the number of enrollments is positively correlated. These results show that, first of all, the problem of aging is becoming prominent. The decline in school-age students may explain the continuous decrease in the postsecondary institutions' enrollment. Second, the fact that family income cannot offset high tuition fees is also a problem encountered by many U.S. families, especially for low-income families. Finally, there is no evidence to confirm that a relationship exists between employment status and enrollment, suggesting that in the US working and schooling may not conflict. In fact, a large proportion of students in U.S. colleges and universities work at full-time or part-time jobs.

Based on such results, policymakers should take immediate actions to deal with the combined effects of the disease pandemic, federal budget cuts, and the aging problem that will affect postsecondary enrollment. I will recommend the following corresponding measures to reverse the decline in the higher education enrollment.

2. Policy Recommendations

My analysis suggests that, to reverse enrollment decline, the federal government should increase financial support to states and universities to help them reduce or eliminate tuition charges for low-income families, and also limit tuition fees for families in the middle class and above within a reasonable income share. These funds should not only cover tuition fees but also include living expenses, such as accommodation, food, and transportation. In addition, I suggest that the government should increase the maximum Pell grants amount and grow the total quota of

students receiving Pell grants to help reverse enrollment decline. One idea is what Ben Miller proposed, which is providing much more generous Pell grants, for example, doubling the award (Miller, 2020). Universities can also attract students by increasing scholarships, setting free-tuition programs, reducing campus living costs, and improving campus living environments.

Although the use of flu cases to simulate the COVID-19 epidemic and other major diseases may not be completely accurate, but my results indicate clearly that the outbreak of major diseases will negatively affect people's decision-making on enrollment to some extent. The impact of the COVID-19 epidemic outbreak may be irreversible in all sectors of society, especially in the education sector. It is foreseeable that the number of university applicants, especially the number of international students, will drop significantly in the next one or two years. Some scholars even believe that recovering from this trend will take at least 10 years. Students hitting pause on their educations can be largely explained by their doubts about the effectiveness of the virtual teaching method. Therefore, colleges and universities should work to lower the admission threshold and to improve the online instruction environment. More importantly, schools should work with individual students and families to solve their specific financial problems, and try to make the best use of limited resources (Clark and Fritz , 2020). At this point, many schools have started to take actions. For example, to mitigate foreseeable declining enrollment, the University of Nebraska debuted the Nebraska Promise Program, which offers to waive tuition and fees for resident Nebraska students who are Pell grant eligible (Whitford, 2020). A similar tuition discount program was launched by the University of Maine. In fact, the majority of schools have canceled the planned tuition increase but reduce the tuition fees, and are offering subsidies and

tuition freezes, including Georgetown University. I believe that these policies definitely increase the school financial burdens, but this seems to be the only feasible way forward under the "disaster".

Furthermore, the aging school population is the issue faced by most developed countries. In this regard, the US can learn from the experience of other countries to deal with this problem. Japan, for example, has very serious aging problem, but Japanese universities are still maximizing enrollment and attracting all-age students to higher education. For example, many colleges moved their campuses back to the city to attract urban-orientated students and also to recruit talented teaching staff (QS report, 2019). Separately, Germany's immigration policy favors international students to improve the sustainability of its education sector, allowing those who choose to stay and contribute to the Germany economy. In addition, I think a series of campaigns are also necessary. For example, Department of Education could organize educational campaigns in local high schools to encourage college-year students to take higher education. Furthermore, the government could also encourage political elites to convey the idea of the necessity of higher education in public speeches and on social media platforms. Finally, the media can also employ public service advertisements to promote the idea that the higher education should not be age-restricted.

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