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The Effect of Low Skill Job Opportunities on Postsecondary Enrollment

Mallory Radesic
mer106@zips.uakron.edu

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The University of Akron

Department of Economics

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Abstract

This research examines the effect that low skill job opportunities have on the probability of enrollment in postsecondary institutions between men and women, namely the construction and manufacturing industries. The research is based on the human capital investment theory, which states that individuals will enroll in postsecondary institutions when the perceived benefits outweigh the costs. More job opportunity heightens the opportunity cost of enrollment, hence lowering the probability of enrollment. After running a probit model, there is evidence that enrollment is countercyclical and that enrollment decisions do not vary significantly between men and women. I find that a 1 percent increase in the state unemployment rate increases the probability of enrollment by 0.312 and 0.331 percent for men and women, respectively. It is found that an increase in the employment in the construction and manufacturing industries leads to an increased probability of enrollment in postsecondary institutions, which rejects the hypothesis in this research. However, there is a limitation to this since not all low skilled industries are accounted for.

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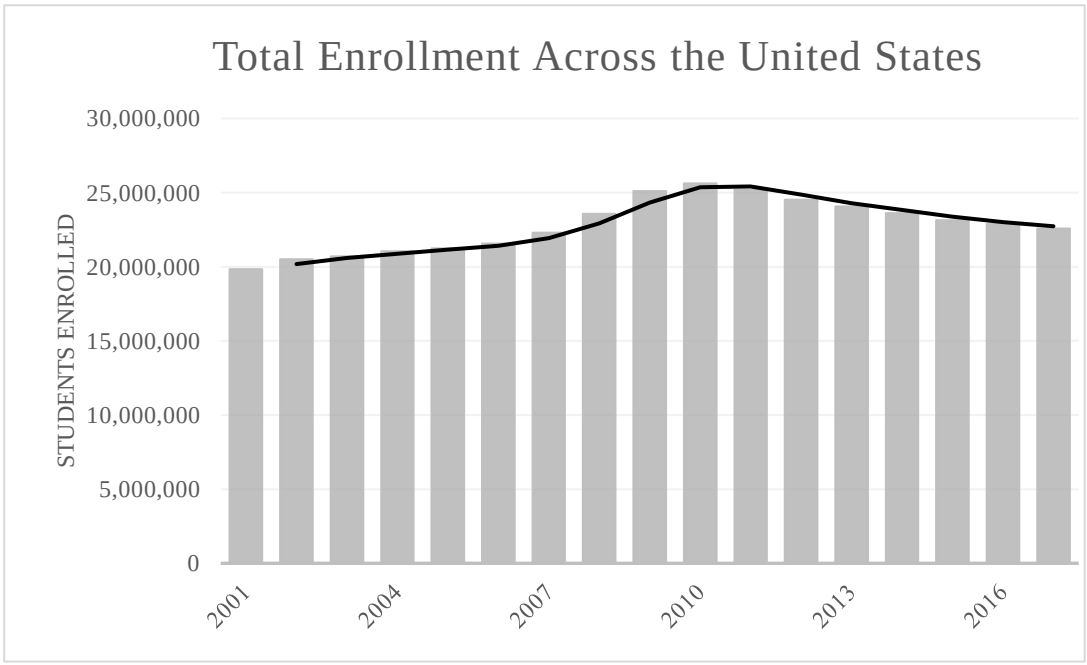
I. Introduction

Throughout the past decade, college enrollment rates have been on a steady decline across the country. Total enrollment increased by 37 percent during the previous decade, from 2000 to 2010. From 2010 to 2017, enrollment decreased by 7 percent, as shown in Figure 1. This decline could be attributed to several factors. Individuals decide to enroll in postsecondary institutions because they believe that the returns, which is their future salary, are greater than the costs. The demand for education is determined by a function of the opportunity cost of attending a postsecondary institution and the price of education. The opportunity cost of attending postsecondary institutions is usually high—individuals need to forgo full-time wages. These costs also include tuition. One of the factors why enrollment is decreasing could be due to the decreases in benefits to a college degree. Although earnings with a degree have been on the rise, the cost of tuition has far surpassed the growth of earnings. This increases the opportunity cost of attendance. From the 2006-07 school year to the 2016-17 school year, tuition has risen by 20 percent across all types of institutions (National Center for Education Statistics).

Another factor that could contribute to the decline in enrollment is due to ample overall job opportunities. Enrollment spiked during the Great Recession and reached its peak in 2010, as seen in Figure 1, as well. The national unemployment rate during the Great Recession peaked at 10 percent, demonstrating that the job market became tight (Bureau of Labor Statistics). Enrollment may increase during these periods due to a decrease in opportunity costs of attending. Forgone earnings do not play a part in the costs of attending postsecondary institutions if job opportunities are not available. Therefore, amble job opportunities, as demonstrated by a low unemployment rate, may discourage individuals from enrolling since their indirect costs, the foregone wages, to attending postsecondary institutions is higher.

Figure 1:



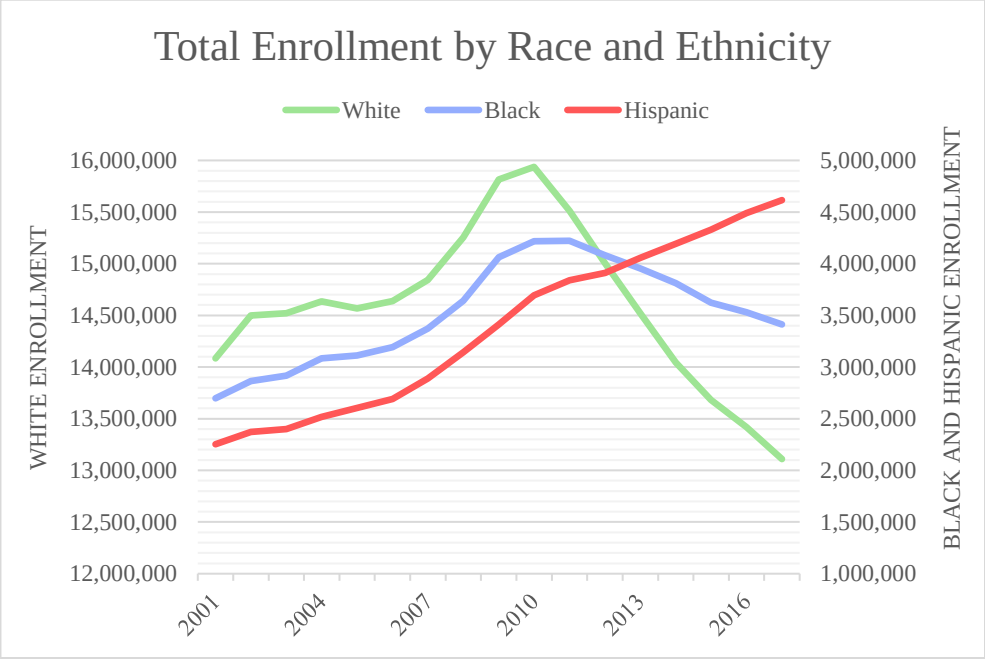
Data obtained from the National Center for Education Statistics

After high school, an individual has two choices. He could choose to attend a postsecondary institution or enter the labor force. If he decides to enter the labor force, he will enter a low skill industry since he has not accumulated the necessary human capital for high skilled industries. Although postsecondary institutions were benefiting from the recession and the counter-cyclicality of enrollment, certain industries suffered. For example, the Bureau of Labor Statistics shows that the construction and manufacturing industries lost more than 2.1 million jobs between December 2007, when the recession officially began, and 2010. These industries also tend to be male-dominated and, therefore, more men lost jobs than women (Nasiripour). These industries are also low skilled jobs, so employment growth in construction and manufacturing may draw individuals away from attending postsecondary institutions. However, does greater employment opportunity and growth in a low skill industry increase the opportunity cost of enrolling in postsecondary institutions? This research will aim to answer that

question. It will look at the employment growth rate of low skilled industries, namely the construction and manufacturing industries, and its effects on the probability of enrollment between men and women.

This analysis could provide valuable insight about the type of individuals who enroll in postsecondary institutions and whether it differs between sex, race, and ethnicity since each has a different enrollment growth rate, as seen in Figure 2. It can help postsecondary institutions understand what their potential students are deciding and how to target them. For example, schools could offer partnerships with companies in these industries, which would not only increase enrollment for the school, but provide companies that have employees with increased human capital.

Figure 2:



Data obtained from the National Center for Education Statistics

II. Literature Review

It is well accepted in economics that enrollment rates are countercyclical, meaning that enrollment increases in a recession or in a trough of the business cycle (Cameron and Heckman,

1994; Betts and McFarland, 1995; Hazarika, 2002; Dellas and Sakellaris, 2003). Therefore, much of the research done in this topic focuses on how large of an effect the business cycle (measured by unemployment rates) has on college enrollment. In addition, some research focuses on how enrollment in these periods differs across age, sex, race, and the types of institutions. Not all papers come to the same conclusion or have a conclusion in a similar magnitude.

One of the pioneering papers written about the decision to enroll in postsecondary institutions based on labor market conditions was by Betts and McFarland (1995). They use a fixed effect to estimate an income maximization model. The income maximization model states that enrollment responds to changes in the expected returns to education and the costs of education. Betts and McFarland focus on the high school graduate's decision to enroll in postsecondary institutions. Their results suggest that a 1 percent increase in the unemployment rate is associated with a 0.5 percent increase in full-time attendance at two-year institutions for recent high school graduates. They studied recessions between the late 1960s and mid-1980s.

Dellas and Sakellaris (2003) believe that all individuals' earnings are a function of their skill level and the business cycle. They emphasize that investment in human capital is affected by the ability to pay and the willingness to purchase education. A time series model suggests that an increase in the state unemployment rate by 1 percent increases the average probability of postsecondary enrollment by 0.28 percent. Dellas and Sakellaris also use a probit model to estimate if there are differences in the probability of enrolling across gender, race, and ethnicity. They find that the enrollment cyclicality is roughly similar between males and females. However, the model provides evidence that there are differences across ethnic groups in the cyclicality of enrollment. This paper does not find a substantial increase in enrollment, but it is significant and provides evidence that investment in human capital is countercyclical.

Barrow and Davis (2012) research the effects that the Great Recession in 2007-2009 had on postsecondary enrollment and how the change compares to earlier recessionary periods. Data is obtained from the National Center for Education Statistics' *Integrated Postsecondary Education Survey* (IPEDS) and the *Current Population Survey*. A time series model calculates the change in enrollment by the change in unemployment. Results suggest that overall, regardless of a two-year or four-year institution, a 1 percent increase in the change in the unemployment rate is associated with a 0.11 percent increase in the change in the total enrollment rate. They estimated that 2.1 million more people enrolled in postsecondary institutions between 2007 and 2010 than expected based on the change in enrollment between 2004 and 2007. This study is in line with the results that Betts and McFarland and Dellas and Sakellaris found.

Barr and Turner (2015) focus on recipients of Unemployment Insurance (UI) and their propensity to attend postsecondary institutions. They use a population of individuals that are older than 20 to examine whether variation in the number of weeks of UI offered to unemployed workers affects the rates of postsecondary enrollment. It is hypothesized that as UI benefit durations increase, the value of enrolling increases more in states with a wider array of training programs that allow continued benefit receipt. With a fixed-effects model, they find that an increase in the duration of UI benefits by ten weeks increases the probability of enrollment by 20 percent. However, enrollment increases drastically more in two-year postsecondary institutions than four-year. These results do not fall in line with the other studies, in terms of the magnitude of the change; however, it is studying a specific segment of the population and a different measure—recipients and duration of UI benefits, not unemployment rates.

Bozick (2009) tests the impact that unfavorable labor conditions have on postsecondary

enrollment. He bases his research on the *warehouse hypothesis*, which suggests that favorable labor market conditions will "pull" an individual into the labor market and that schools are an alternative to work when jobs are available. A logistic regression model estimates that a 1 percent increase in unemployment is associated with a 6 percent increase in the probability of enrolling in postsecondary institutions. In addition, Bozick hypothesizes that location and local labor markets have a significant role in the decision to enroll in postsecondary institutions as well. His results suggest that a 1 percent increase in the percentage of jobs in an individual's local area requiring a bachelor's degree leads to a 5 percent increase in the probability of postsecondary enrollment. Therefore, his results are in agreement with the other papers, but provide new research and evidence about local unemployment rates and postsecondary enrollment.

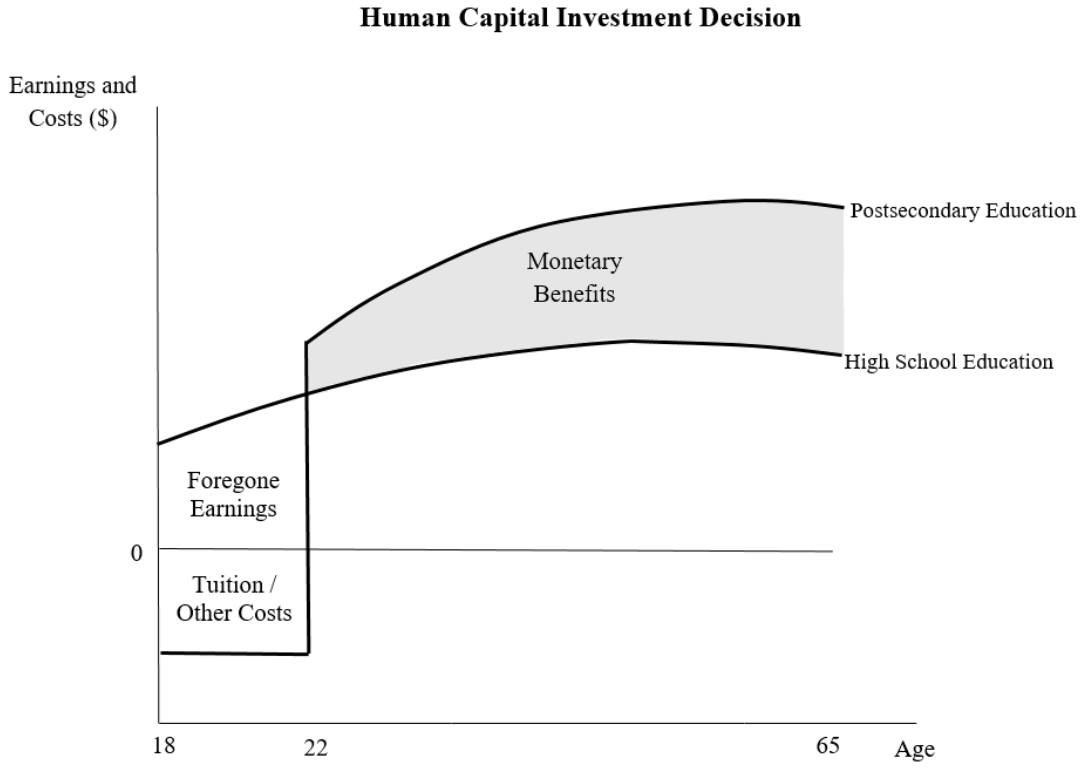
Most of these studies focus on the state unemployment rate or the national unemployment rate. The authors do make their studies unique by deciding to study different demographics, such as gender, or race and ethnicity, or study the differences between two or four-year postsecondary institutions. However, these studies do not emphasize the employment growth of low skilled industries. An individual is most likely going to enter the workforce in a low skilled industry if he decides not to attend college, so it is vital to study the relationship between enrollment and the opportunities in low skilled industries.

III. Economic Theory and Testable Hypothesis

This research will apply the human capital investment theory to examine why individuals decide to attend postsecondary institutions. Gaining further education is an investment of human capital. It is important to note that it is considered an investment. This means that wages are forgone in the present for better income and monetary benefits in the future. Figure 3

demonstrates this and clearly shows the greater income achieved with a postsecondary education. In order to attend postsecondary institutions, the perceived benefits must be greater than the cost of education, such as tuition, transportation and lodging, and forgone wages (Corman, Davidson). In Figure 3, the area on the left of the graph shows the costs to individuals. However, the availability of job opportunities can affect this. The demand for education is a function of the opportunity cost of attending postsecondary institutions, the price of attending them, and an individual's income.

Figure 3:



Bozick (2009) mentions the *warehouse hypothesis*. This hypothesis relates to the opportunity cost of attending institutions. This hypothesis suggests that favorable labor market conditions give youth less incentive to stay in school. This is because jobs are readily available, and the opportunity cost of attending postsecondary institutions would be too high. There are

more wages available, and the cost of schooling is high. The hypothesis also states that when economic conditions are unfavorable, schools act as a "warehouse" for individuals and keep them out of the unstable market conditions. The hypothesis assumes that school and work are mutually exclusive, and that schooling is an alternative to work.

Overall, these different methods of measuring the decision to attend postsecondary institutions have a similar background. Individuals will make a decision that they perceive is the best at the time. The Separation Theorem for human capital investments demonstrates that schooling decisions will maximize the net present discounted value of the individual (Acemoglu, Autor).

Based upon the human capital investment theory, I hypothesize that an increase in the unemployment for low skilled jobs (i.e., construction, manufacturing) will cause an increase in postsecondary enrollment for individuals 18 to 24 years old. Additionally, I hypothesize that more women will enroll in postsecondary institutions when labor market conditions are favorable than men. This is because higher paying low skilled industries, such as construction, are male dominated. According to the BLS, in 2019, only 10.3% of the construction workforce and 29.4% of the manufacturing workforce were women. Women tend to work in lower paying low skilled industries, such as retail. These higher paying industries also create a higher opportunity cost of attending postsecondary institutions because forgone earnings are greater. All in all, the decision to enroll in postsecondary education relies on available resources and the worth, or benefit, of attending.

IV. Data

Part of the data for this research was obtained from the *American Community Survey* (ACS) via IPUMS. This data includes information about an individual's ethnicity, enrollment

status, race, and sex. These variables have been coded as dummy variables in the model. Race, sex, and ethnicity are included to determine if certain demographic populations are more affected by the low skilled employment growth rate than others. Since income is a factor in the decision to attend postsecondary institutions, total family income has been included in the dataset and was obtained through the ACS.

In order to study how postsecondary enrollment is countercyclical, a period of 10 years is selected. Three cross-sectional data sets comprising of the years 2005, 2010, and 2015 are studied, which will capture the effect of the Great Recession. The samples in this research contain each of the 50 states, excluding Washington, D.C. The data will be restricted to include only individuals aged 18-24, therefore accounting for high school graduate and young adults' decisions to attend postsecondary institutions.

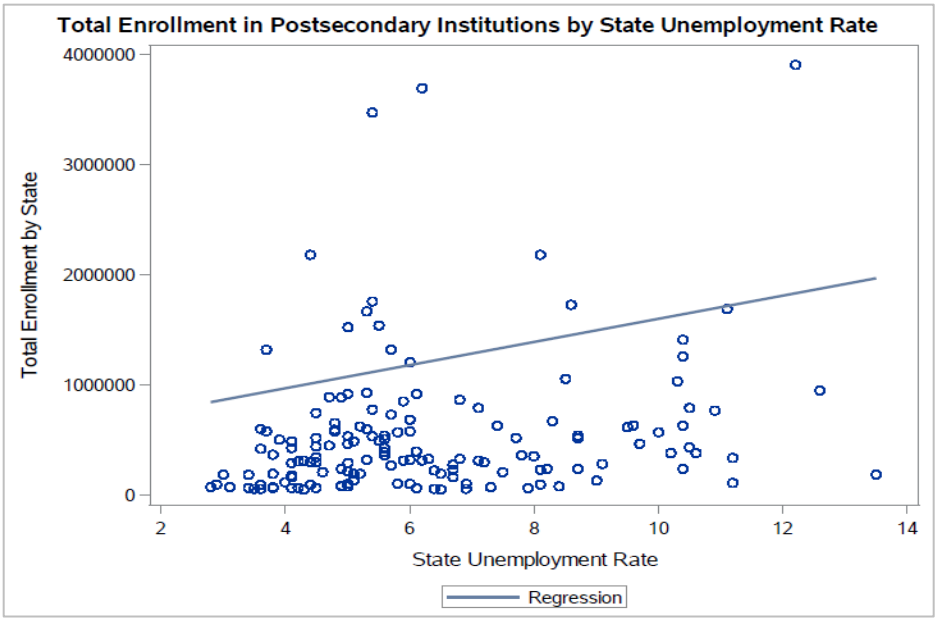
To be able to answer the research question if low skilled industries' growth rates affect the enrollment rates between men and women, this research will use the employment growth rate of the construction and manufacturing industries as a proxy for low skilled industries. State-level data is used. These values were calculated using the percent change in employment between these industries from the previous year and the year of study. For example, 2005's industry growth rate was calculated between 2004 and 2005. Industry employment numbers were obtained from the Bureau of Labor Statistics' (BLS) State and Metro Area Employment archives. Annual state unemployment rates were also obtained from the BLS under their Local Area Unemployment Statistics. Variable definitions can be found in Table 1 in the Appendix.

When examining the descriptive statistics, nothing abnormal is observed. Table 2 in the Appendix gives additional information for each variable. The mean for the industry growth variable is -0.247 percent, which means, on average, over the three selected years, the

construction and manufacturing industries have shrunk across the 50 states. Of course, this is not the case with all states over the selected years. The average unemployment rate is relatively high at 6.78 percent; however, 2010, which was the peak of the Great Recession, is included in this data. About 36 percent of the individuals in the sample are an undergraduate enrolled in a postsecondary institution. 11.5 percent are black, and 18.5 percent are Hispanic.

Since the theory behind this research believes that enrollment is countercyclical, the relationship between total state enrollment and the state unemployment rate is interesting to study. Figure 4 below shows this relationship. Theory states that enrollment should increase when the unemployment rate increases, since there is less job opportunity. The scatterplot and regression line suggest this relationship to be true. However, the correlation coefficient is 0.234, which does not represent a strong relationship. Upon second examination, most of the observed data points are below one million. This is not an entirely accurate representation of these measures due to the differences in population between states. It would be difficult to determine a correlation with the data points solely below one million.

Figure 4:



Data obtained from the National Center for Education Statistics and the BLS

The dependent variable, enrollment in postsecondary institutions, is measured as a binary variable. This means that an individual is either enrolled as an undergraduate in school, or he is not. A linear probability model would incorrectly report results since it can include "probabilities" above 1 or below 0. Since it is not possible to have probabilities in those ranges, a probit model must be used to provide the most correct estimates. The model below will additionally be split by sex to determine if low skill employment opportunities affect men and women differently. In the model, *i* is an individual in the data set, and *t* is the year observed.

$$\Pr(Enrolled_{it} = 1 \mid x) = \Phi(\beta_0 + \beta_1 AGE_{it} + \beta_2 BLACK_i + \beta_3 HISPANIC_i + \beta_4 LOGFTOTINC_{it} + \beta_5 IND\_GROWTH_{t-1,t} + \beta_6 UNEMP_t + \beta_7 YEAR_t) \quad (1)$$

ENROLLED is the dependent variable. It measures the probability if an individual is enrolled as an undergraduate in a postsecondary institution or not.

AGE is the age of the individual. This data set has been restricted to only use ages of individuals 18-24 years old. Since individuals typically graduate around age 22, I expect that this coefficient will be negative. As age increases, there is a higher probability of being a graduate from a postsecondary institution. I also suspect that those who have taken gap years have a decreased likelihood of enrolling in postsecondary institutions.

BLACK is a dummy variable that measures race, in this case, if an individual is Black. *HISPANIC* is a dummy variable that measures ethnicity and if an individual is Hispanic. The National Center for Education Statistics, which obtains its data through the Current Population Survey, compiles enrollment statistics. Based on these studies, the percentage of 18 – to 24-year-old Black and Hispanic individuals enrolled in postsecondary institutions has increased over the

timespan from 2000 to 2017. From this information, I would expect the coefficients of these variables to be positive. However, this does not relate to the scope of the research—if low skilled employment growth affects enrollment. 2019 employment data from the BLS shows that 88.1% of employed individuals in the construction industry and 79.5% employed in the manufacturing industry were White. Therefore, I do not expect that job opportunities in these industries will affect the Black or Hispanic population and draw them into the labor market.

LOGFTOTINC is the log of the family total income of an individual. Since schooling costs money, the demand for education also includes consumer income. If a family has more available income, the physical dollar cost of education should be less of a barrier than an individual or family that does not have income readily available. This would then decrease the total costs of attending postsecondary institutions. I would expect this coefficient to be positive—if a family has a higher total income, then the probability of enrolling in school will increase.

IND_GROWTH is the combined growth rate of the construction and manufacturing industries at the state level. The growth rate is calculated between the year of study and the year before it. If this rate increases, that shows that the industry has more employment and is growing. A growing industry provides more opportunities and can draw individuals into the labor market and decrease their probability of enrolling in school; therefore, based on the hypothesis, I would expect this coefficient to be negative.

UNEMP is the average annual state unemployment rate. Since it is well established that enrollment rates are countercyclical, this coefficient is expected to positive. This means that an increase in the state unemployment rate will increase the probability that an individual will enroll in school. This is because opportunities now have been diminished due to a higher

unemployment rate.

VI. Empirical Results

In order to study the relationship between low skill employment and the probability of postsecondary enrollment between men and women, a probit model must be used. As established, the linear probability model is not an accurate model since it can create negative probabilities and probabilities above 1. Therefore, it is necessary to use a probit with a binary dependent variable.

The model was run twice. The first run calculated the probabilities of men enrolling, and the second run calculated probabilities for women. In the male run, each of the coefficients are significant at the 99 percent confidence level. This model suggested that a 1 percent increase in the employment growth rate of low skilled industries would increase the probability of enrolling by 0.31 percent. Because this coefficient is significant, it rejects the hypothesis that an increase in employment growth rates would lead to a decreased probability of enrolling in postsecondary institutions. For women, this result was nearly the same— a 1 percent increase in the employment growth rate of low skilled industries suggests that the probability of enrolling is increased by 0.33 percent. The difference is too small to comfortably suggest that men and women are affected differently by the low skill industry employment growth rate.

The Hispanic and Black coefficients in the male run also suggested that if individuals were that race or ethnicity, they would have a decreased probability of enrollment, which contradicts historical data, and what the expected signs were. The Black and Hispanic variables had a greater effect on men than women. If a man was black or Hispanic, his probability of enrollment decreases by about 2 percent more than it would for women. For example, a black man has a decreased probability of enrollment by 7.7 percent, but a black woman has a decreased

probability of enrollment by 5.4 percent. This is valuable information for postsecondary institutions because it shows which demographics are more unlikely to enroll.

The state unemployment rate variable is as expected. It states that a 1 percent increase in the state unemployment rate would increase the probability of enrollment by 0.957 percent for males. For females, a 1 percent increase in the state unemployment rate increases the probability of enrollment by 0.999 percent, almost 1 percent. This supports the hypothesis and may show some evidence to suggest that enrollment rates are countercyclical. Again, the difference between men and women is minimal, which means both men and women react similarly to the state unemployment rate. In addition, the log of the family total income variable had expected results. Its coefficient is positive, which would suggest that a percentage increase in family total income would increase the probability of enrollment. Women had a slightly higher probability than men with the same percentage increase in family income, but only by 0.06 percent. More available income lowers the opportunity costs of attending postsecondary institutions because the costs are a smaller percentage of income, so this makes sense.

The age variable is as expected, and significant for both men and women. As a man becomes a year older, his probability of enrollment decreases by 2.5 percent. This is because there is a greater chance that these individuals could have graduated already. When a woman becomes a year older, her probability of enrollment decreases by 4.1 percent.

Overall, the male and female runs of the model were very similar. Table 3 in the Appendix shows full results. The coefficients had the same signs on both models, and the marginal effects were very close to each other. It is difficult to say that men and women react differently to the variables in the model since they were so similar. Despite this, valuable information is obtained from both runs. The decline in enrollment could be attributed to job

opportunity, as measured by the state unemployment rate, and that enrollment is countercyclical. The model also demonstrates the tendencies for enrollment based on race or ethnicity.

VII. Conclusion and Suggestions for Future Study

The hypothesis that an increase in the employment growth rate of low skilled industries decreases the probability of enrolling in postsecondary institutions is rejected based upon the model. The economic theory behind this paper, enrollment rates are countercyclical, is supported since the model suggests that an increase in the state unemployment rate would lead to an increase in probability of enrollment. However, this data only uses 2005, 2010, and 2015 data, so it is difficult to make that conclusion when not studying an entire business cycle.

Despite the rejection of my hypothesis, the information the research provides is valuable. As stated, black and Hispanic individuals, regardless of sex, have a decreased probability of enrollment. Therefore, postsecondary institutions can make an effort to target these groups to increase their probability of enrollment. Also, when unemployment is low, postsecondary institutions can develop partnerships with various companies to try to keep enrollment up since they know enrollment will decrease during these periods.

There are several limitations to this research. Firstly, the ACS does not provide information about tuition, so a portion of the function for the demand for education is not included in my research. Tuition is a considerable cost of attending postsecondary schools, so its omission leaves bias in the study. In addition, unemployment is a self-reported status, so it could not be entirely accurate. Another limitation that will potentially be addressed in future drafts is the level of data and the amount of data. Metro area data will provide more detailed information about each local labor market instead of a more generalized state labor market. More years added to the dataset would allow me to study the effects of enrollment throughout the business cycle

and make me confident to conclude that there is evidence that enrollment is countercyclical.

Future studies can focus more intensely on low skilled industries. There is no exact definition of a low skilled job; it can be up to interpretation depending on the individual. Therefore, a future study could find the specific jobs that do not require a college degree and compile them all, instead of using a general proxy, as I am. I believe this is why I did not see the desired results since I was only examining two industries. Besides, it could be possible that individuals are not entering these two industries, but other industries instead.

Another potential future study could examine how postsecondary institutions are affected by the coronavirus pandemic. Will postsecondary institutions see higher enrollment for the fall semester since the job market has virtually no opportunities as of now, and unemployment is soaring? However, it is most likely not true that they will see higher enrollment since some individuals would not want to attend online schooling. This study would be interesting to see if enrollment is truly countercyclical, even in extreme, and unique situations such as the pandemic.

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

Appendix

Table 1: Variable Definitions and Sources

Variable	Definition	Source
Enrolled	Whether an individual is an undergraduate enrolled in a postsecondary institution [0, 1]	American Community Survey via IPUMS
Age	Age of an individual [18, 24]	American Community Survey via IPUMS
Black	Whether an individual is Black [0, 1]	American Community Survey via IPUMS
Hispanic	Whether an individual is Hispanic [0, 1]	American Community Survey via IPUMS
Logftotinc	Log of family total income for an individual [0, 14.4]	American Community Survey via IPUMS
Unemp	Average unemployment rate for year by state [2.8, 13.5]	Bureau of Labor Statistics
Ind_growth	Construction and manufacturing employment growth by calculating the change in employment for each year in the data set by state [-20, 11.27]	Bureau of Labor Statistics

Table 2: Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum	N	Expected Sign
Year	2010	4.046	2005	2015	675838	
Enrolled	0.357	0.479	0	1	675838	
Age	21.01	2.025	18	24	675838	-
Black	0.115	0.319	0	1	675838	+
Hispanic	0.185	0.389	0	1	675838	+
Logftotinc	10.587	1.120	0	14.4	656594	+
Ind_growth	-0.247	3.964	-20	11.27	666058	-
Unemp	6.78	2.463	2.8	13.5	674446	+

Table 3: Probit Model by Sex

Dependent Variable: Probabilty of Enrollment	Male			Female		
Regressor	*β*	*(SE)*	*Marginal Effect*	*β*	*(SE)*	*Marginal Effect*
Construction and Manufacturing Industries State Employment Growth Rate	0.00886*	(0.0009)	0.00312	0.00890*	(0.0009)	0.00331
Age of Individual	-0.0712*	(0.0012)	-0.0251	-0.1102*	(0.0012)	-0.0410
State Unemployment Rate	0.0272*	(0.0014)	0.00957	0.0268*	(0.0014)	0.00999
Log of Family Total Income	0.0098*	(0.0020)	0.00346	0.1120*	(0.0018)	0.00417
Year	0.0032*	(0.0006)	0.00113	0.0003	(0.0006)	0.00012
Black	-0.2194*	(0.0077)	-0.0773	-0.1443*	(0.0072)	-0.0537
Hispanic	-0.2146*	(0.0061)	-0.0756	-0.1560*	(0.0060)	-0.0581
Intercept	-5.6705*	(1.2843)		1.1257	(1.2073)	
Summary Statistics						
N	325778			321301		

** Coefficient is significant at the 99% level.*

SAS Code

```
/***** sorting datasets to merge them *****/

DATA IPUMS_05;
SET work.ipums_data2005;
PROC SORT
      DATA = IPUMS_05;
      BY STATEFIP;
RUN;

DATA Industry_05;
      SET work.ind_data2005;
      UNEMP = UR2005;
      IND2004 = CON2004 + MAN2004;
      IND2005 = CON2005 + MAN2005;
      Ind_growth = ((IND2005 - IND2004) / IND2005)*100;
PROC SORT
      DATA = industry_05;
      BY STATEFIP;
RUN;

DATA tot_enroll2005;
      SET work.enroll2005;
PROC SORT
      DATA = tot_enroll2005;
      BY STATEFIP;
RUN;

/***** merging data sets *****/

DATA Senior_proj_05;
      MERGE IPUMS_05 Industry_05 tot_enroll2005;
      BY STATEFIP;
run;
/***** sorting datasets to merge them *****/

DATA IPUMS_10;
SET work.ipums_data2010;
PROC SORT
      DATA = IPUMS_10;
      BY STATEFIP;
RUN;

DATA Industry_10;
      SET work.ind_data2010;
      UNEMP = UR2010;
      IND2009 = CON2009 + MAN2009;
      IND2010 = CON2010 + MAN2010;
      Ind_growth = ((IND2010 - IND2009) / IND2010)*100;
PROC SORT
      DATA = industry_10;
      BY STATEFIP;
RUN;
DATA tot_enroll2010;
```

```
      SET work.enroll2010;
PROC SORT
      DATA = tot_enroll2010;
      BY STATEFIP;
RUN;

/***** merging data sets *****/

DATA Senior_proj_10;
      MERGE IPUMS_10 Industry_10 tot_enroll2010;
      BY STATEFIP;
run;


/***** sorting datasets to merge them *****/

DATA IPUMS_15;
SET work.ipums_data2015;
PROC SORT
      DATA = IPUMS_15;
      BY STATEFIP;
RUN;

DATA Industry_15;
      SET work.ind_data2015;
      UNEMP = UR2015;
      IND2014 = CON2014 + MAN2014;
      IND2015 = CON2015 + MAN2015;
      Ind_growth = ((IND2015 - IND2014) / IND2015)*100;
PROC SORT
      DATA = industry_15;
      BY STATEFIP;
RUN;
DATA tot_enroll2015;
      SET work.enroll2015;
PROC SORT
      DATA = tot_enroll2015;
      BY STATEFIP;
RUN;


/***** merging data sets *****/

DATA Senior_proj_15;
      MERGE IPUMS_15 Industry_15 tot_enroll2015;
      BY STATEFIP;
run;

/***** APPEND Procedure *****/

PROC APPEND
      BASE = senior_proj_05
      DATA = senior_proj_10 force;
RUN;

PROC APPEND
      BASE = senior_proj_05
```

```
      DATA = senior_proj_15 force;
RUN;


/***** Creating dummy variables *****/

DATA Filtered_proj;
SET Senior_proj_05;
IF FTOTINC = 9999999 THEN DELETE;
IF FTOTINC < 0 THEN DELETE;
IF AGE < 18 THEN DELETE;
IF AGE > 24 THEN DELETE;
IF SEX = 1 THEN Male = 1;
            ELSE Male = 0;
IF RACE = 2 THEN Black = 1;
            ELSE Black = 0;
IF GRADEATT = 6 THEN Enrolled = 1;
            ELSE Enrolled = 0;
IF SCHLTYPE = 2 THEN Pub_school = 1;
            ELSE Pub_school = 0;
IF HISPAN = 9 THEN DELETE;
IF HISPAN ^= 0 THEN Hispanic = 1;
            ELSE Hispanic = 0;

/***** taking log of ftotinc *****/

logftotinc = log(ftotinc);

RUN;

/***** means *****/

proc means
data = filtered_proj;
      var enrolled year ind_growth age unemp logftotinc black hispanic;
      run;

/***** probit *****/

PROC QLIM DATA = filtered_proj;
      MODEL Enrolled =  Year ind_growth Age UNEMP logftotinc Black Hispanic /
discrete (d=probit);
      BY sex;
      OUTPUT out = outme marginal;
RUN;
QUIT;

PROC SORT
      DATA = outme;
      BY sex;

PROC MEANS DATA = outme n mean;
      VAR meff_p2_year meff_p2_ind_growth meff_p2_age meff_p2_unemp
meff_p2_logftotinc meff_p2_black meff_p2_hispanic;
RUN;
QUIT;
ods pdf file="g:plot.pdf";
```

```
PROC SGPLOT
      DATA = filtered_proj;
      Title 'Total Enrollment in Postsecondary Institutions by State
Unemployment Rate';
      Reg y = total_enrollment x = unemp / alpha=0.05;
      XAXIS label = 'State Unemployment Rate' VALUES = (2, 4, 6, 8, 10, 12,
14) ;
      YAXIS label = 'Total Enrollment by State';
RUN;
ods pdf close;

proc corr data = filtered_proj;
run;
```