

[Final Exam]

The truth of College Wage Premium(CWP): overeducation, glass ceiling and advanced degree

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1 Introduction

With rapid social change, the perception of the CWP is also changing

CWP in National Policy



Meritocracy



The impact of the college premium is also seen in national policy. The Obama administration's education policy from 2011 to 2020 focused on increasing the share of college graduates.

Large companies such as Google, Netflix, Tesla and Apple have introduced new hiring schemes that **allow employees to be hired based on their ability to do the job rather than their degree.**

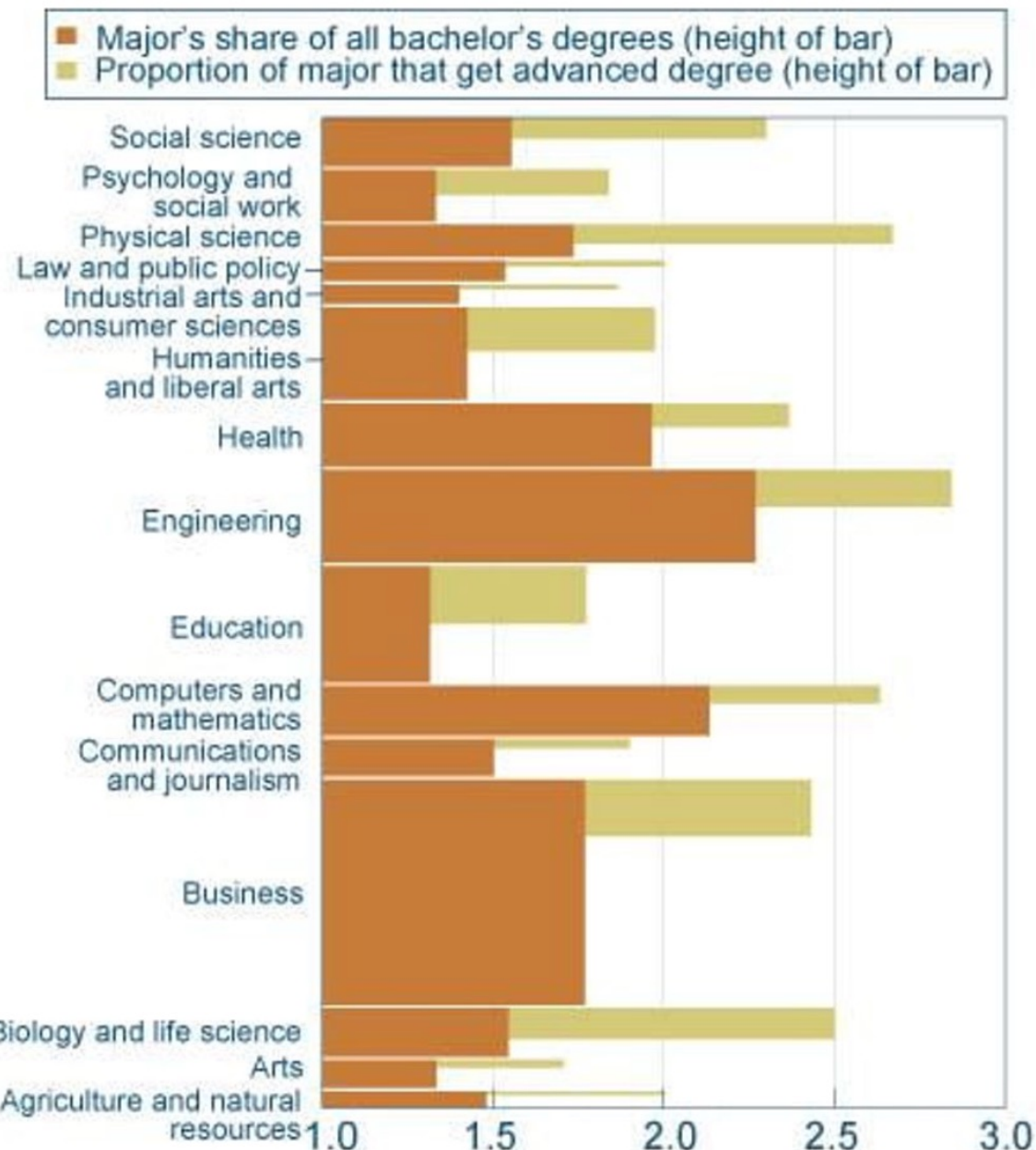
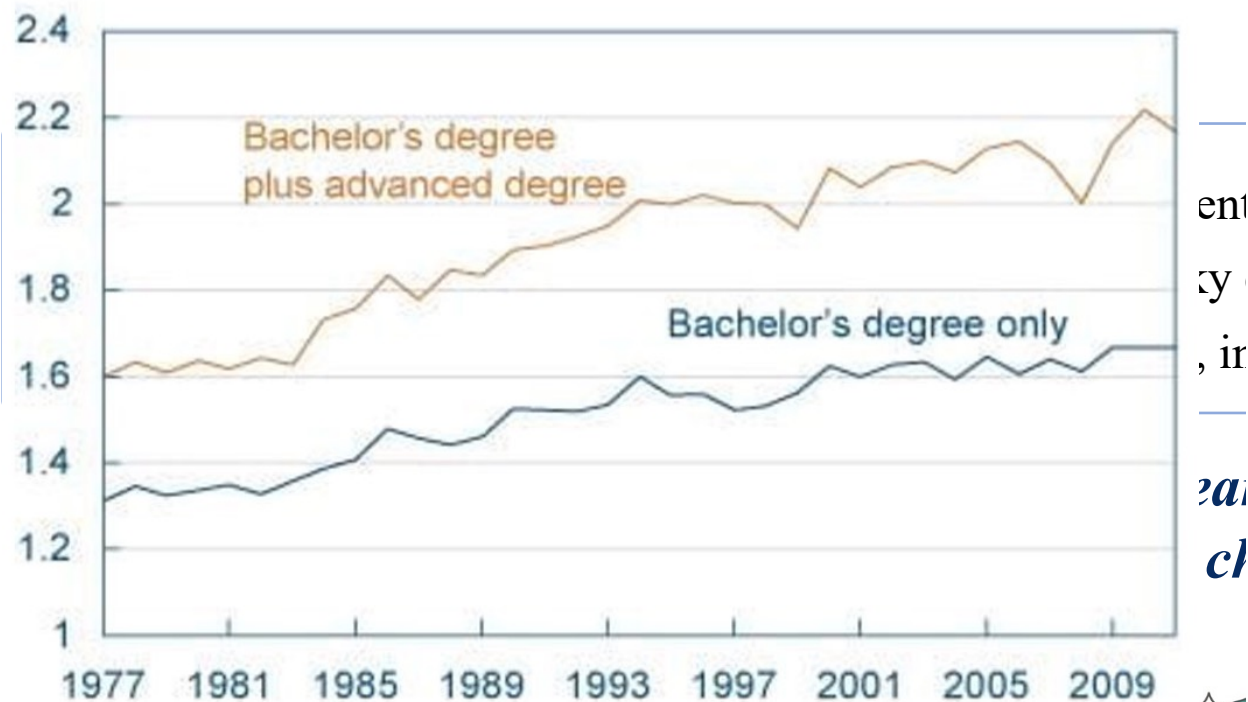
1 Introduction



Although we cannot say for sure that college graduation is very important, not only in the United States, but also in many countries, college education is required for specialized training and discovery of cutting-edge industries

This study aims to document the evolution of CWP and explore the factors that influence it.

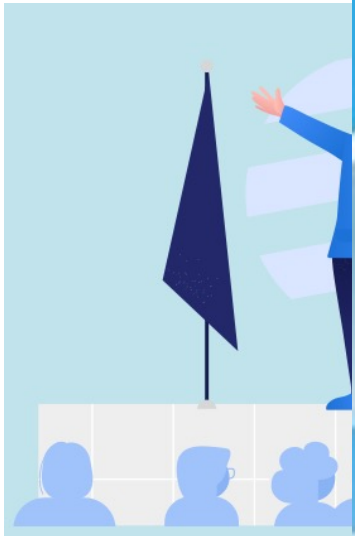
2 Background



2 Background

Factors influencing Wage changes

Education Policy



equality in EDU



3 Materials and methodology

Main Question

How has the college premium evolved over time?

Sub-Question

Examining variations in the college premium across different income groups.

High-income and
low-income groups

Interaction terms :
(college graduate * female)

Interaction terms :
(college graduate * veteran)

Methodology

T-test analysis and regression modeling

The key variables of interest included factors such as age, gender, education level, and other relevant demographic characteristics.

Specifically, to identify the effect of the education premium, we visualize the beta values and confidence intervals of the effect of the education graduation variable on wages.

3 Materials and methodology

Methodology: T-test analysis and regression modeling

T-test analysis

* See [Chapter 4 Lecture Slides]

- **t-statistic (or t-ratio)**

$$t_{\hat{\beta}_j} \equiv \frac{\hat{\beta}_j}{se(\hat{\beta}_j)}$$

The t-statistic will be used to test the above null hypothesis. The farther the estimated coefficient is away from zero, the less likely it is that the null hypothesis holds true. But what does "far" away from zero mean?

This depends on the variability of the estimated coefficient, i.e. its standard deviation. The t-statistic measures how many estimated standard deviations the estimated coefficient is away from zero.

- Distribution of the t-statistic if the null hypothesis is true

$$t_{\hat{\beta}_j} \equiv \hat{\beta}_j / se(\hat{\beta}_j) = (\hat{\beta}_j - \beta_j) / se(\hat{\beta}_j) \sim t_{n-k-1}$$

- Goal: Define a rejection rule so that, if it is true, H_0 is rejected only with a small probability (= significance level, e.g. 5%)

3 Materials and methodology

Methodology: T-test analysis and regression modeling

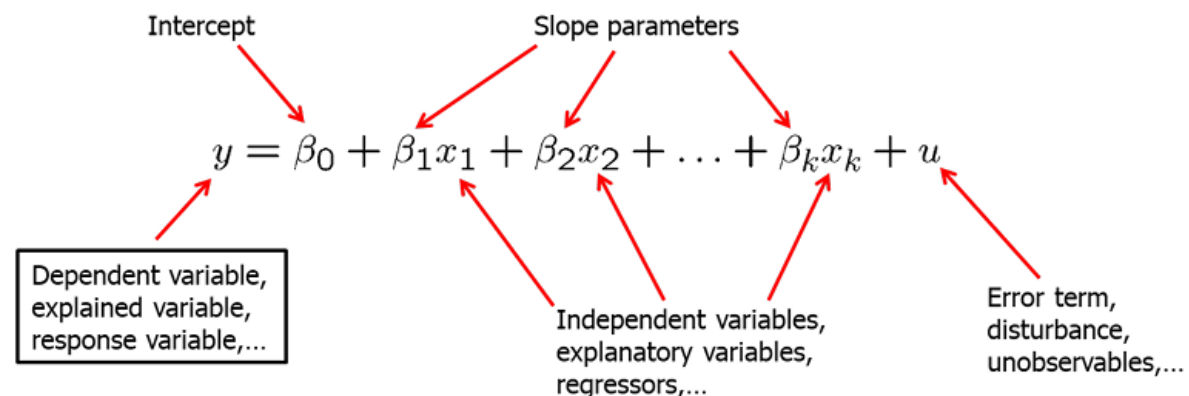
Regression modeling

** See [Chapter 3 Lecture Slides]*

Multiple Regression Analysis: Estimation (1 of 37)

- **Definition of the multiple linear regression model**

- “Explains variable y in terms of variables x_1, x_2, \dots, x_k ”



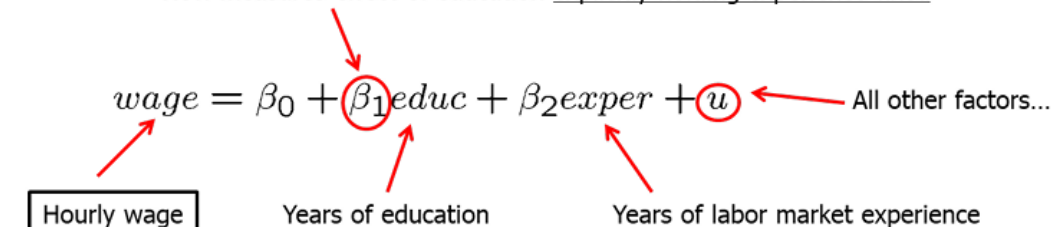
Multiple Regression Analysis: Estimation (2 of 37)

- **Motivation for multiple regression**

- Incorporate more explanatory factors into the model
- Explicitly hold fixed other factors that otherwise would be in
- Allow for more flexible functional forms

- **Example: Wage equation**

Now measures effect of education explicitly holding experience fixed



4 Results

College premium trend over time

Ratio of college graduation

The percentage of college graduates in the corresponding year increases over time

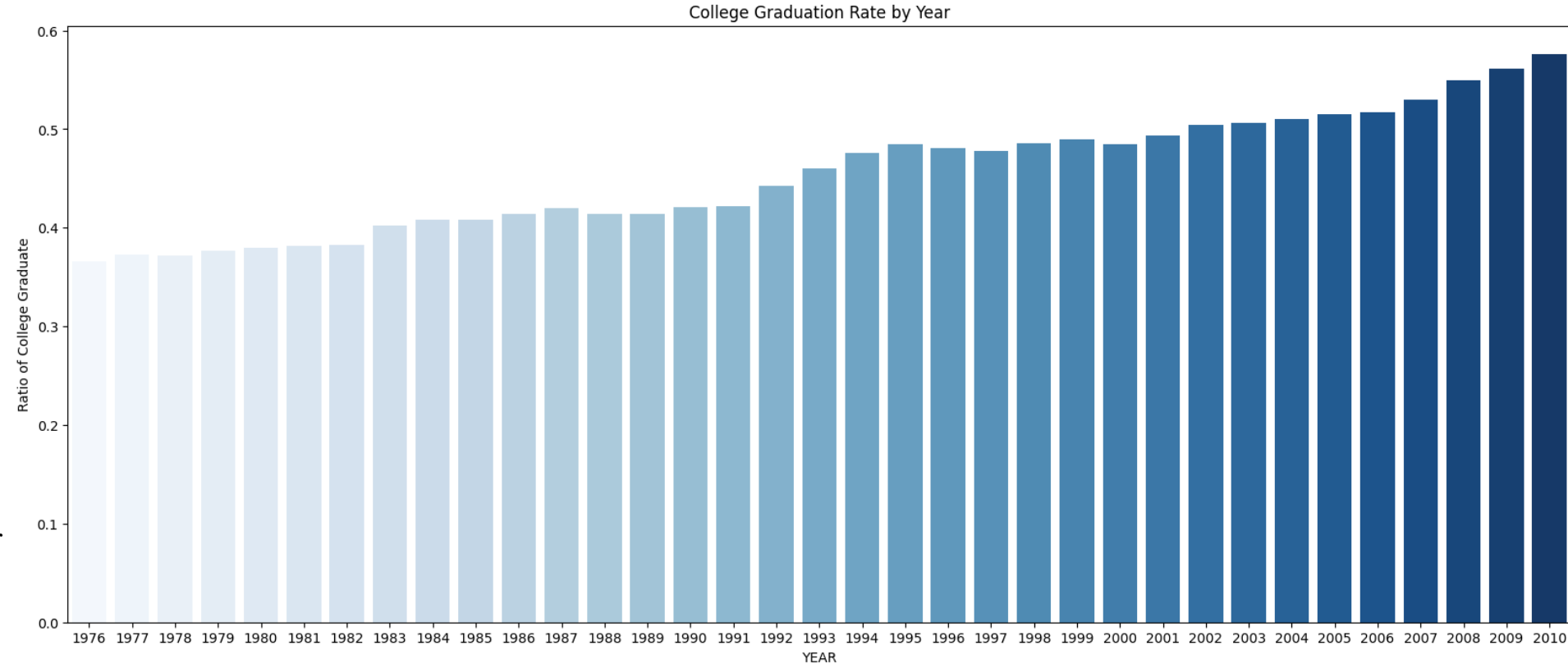


Fig 1. Ratio of college graduation over time

4 Results

College premium trend over time

Independent samples t-test

The wage disparity between college graduates and non-graduates from 1976 to 2010.

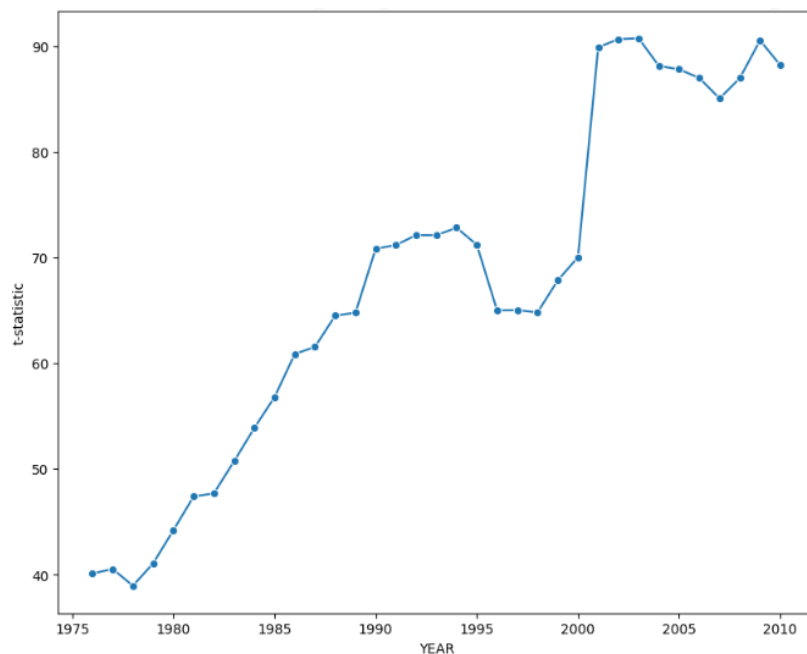


Fig 2. T-statistics of the difference in log(weekly wages) between college graduates and non-graduates

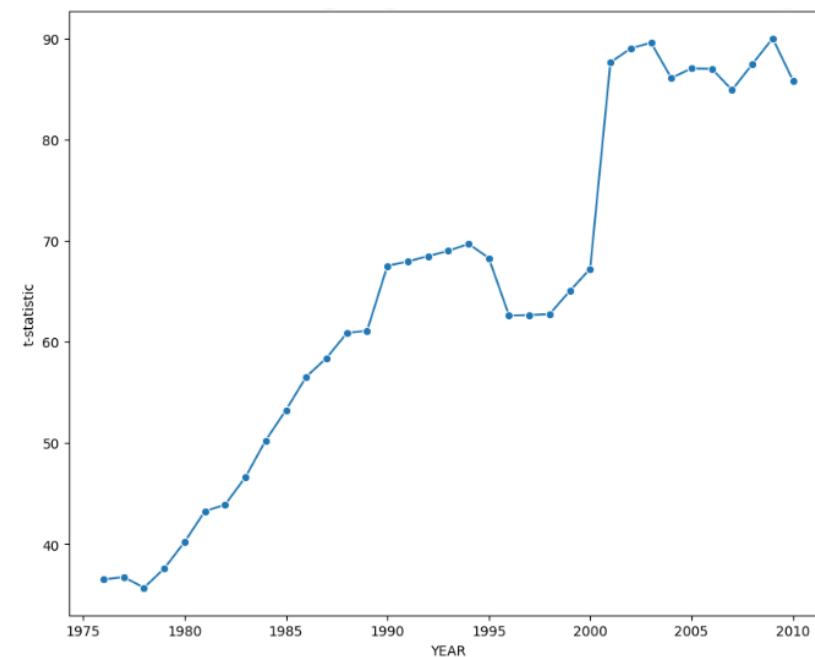


Fig 3. T-statistics of the difference in log(hourly wages) between college graduates and non-graduates

4 Results

College premium trend over time

Regression analysis result

A regression analysis was conducted to examine the effect of college graduation on wages from 1976 to 2010.

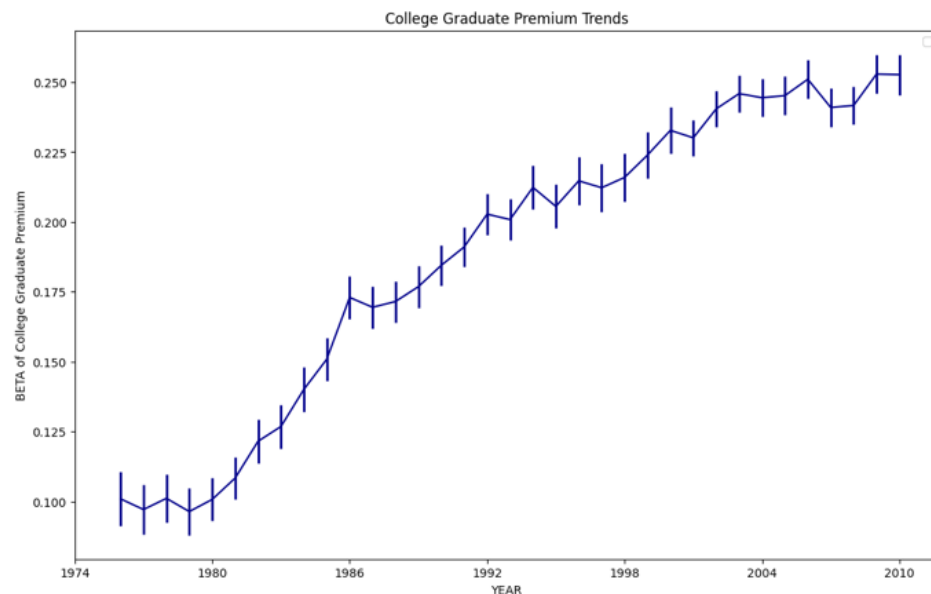


Fig 4. Beta of the college graduates in a linear regression model inferring yearly log(weekly earns)

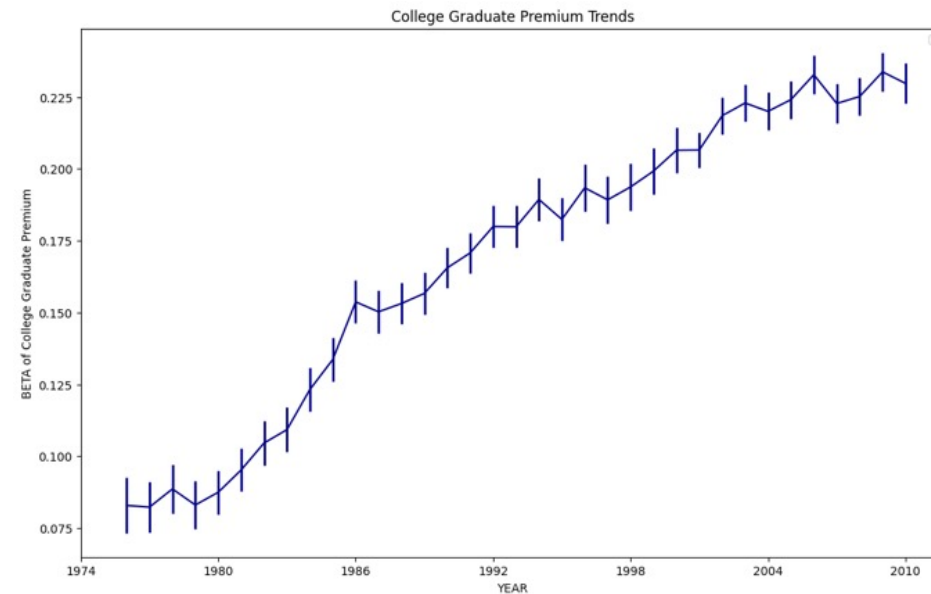


Fig 5. Beta of the college graduates in a linear regression model inferring yearly log(weekly earns)

4 Results

Wage disparity and college premium

T-test analysis result

The wage disparity between college graduates and non-graduates within the high-income group.

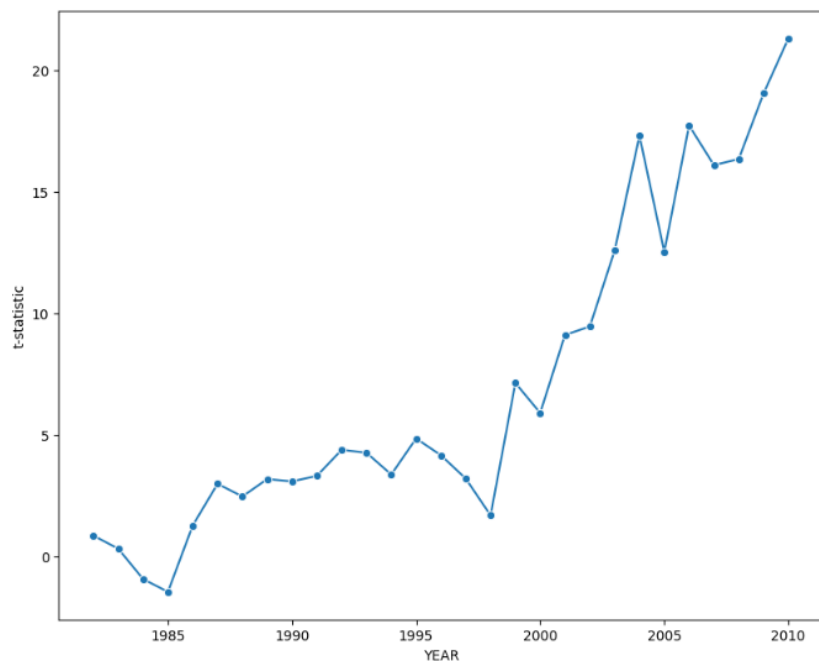


Fig 6. T-statistics of the difference in log(weekly wages) between college graduates and non-graduates

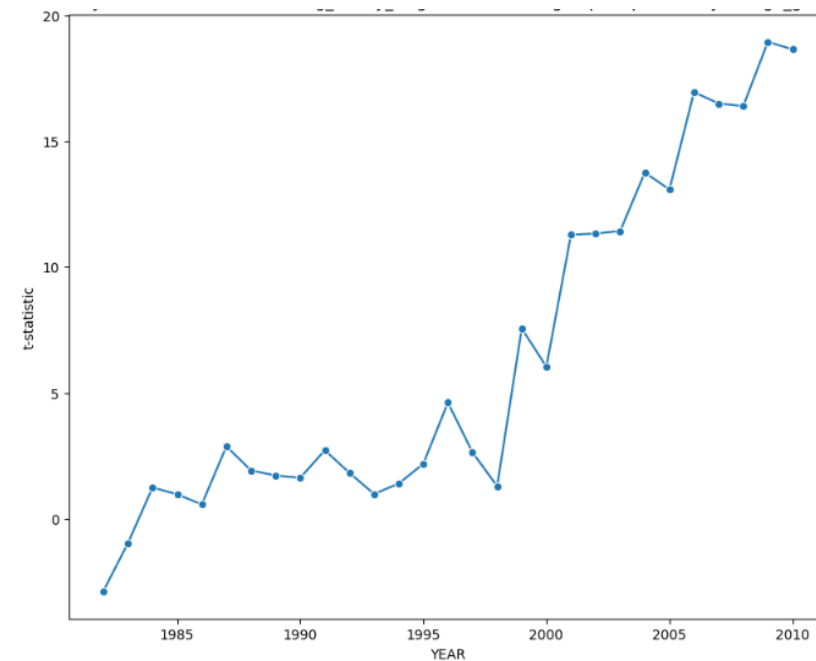


Fig 7. T-statistics of the difference in log(weekly wages) between college graduates and non-graduates

4 Results

Wage disparity and college premium

T-test analysis result

The wage gap between college graduates and non-graduates within the low-income group.

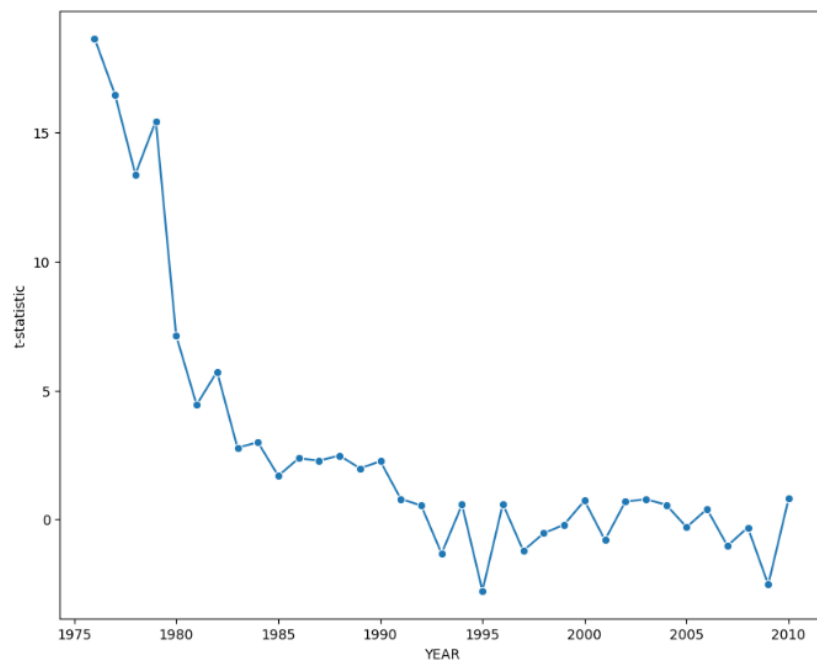


Fig 8. T-statistics of the difference in log(weekly wages) between college graduates and non-graduates among low-income group (90 percentile)

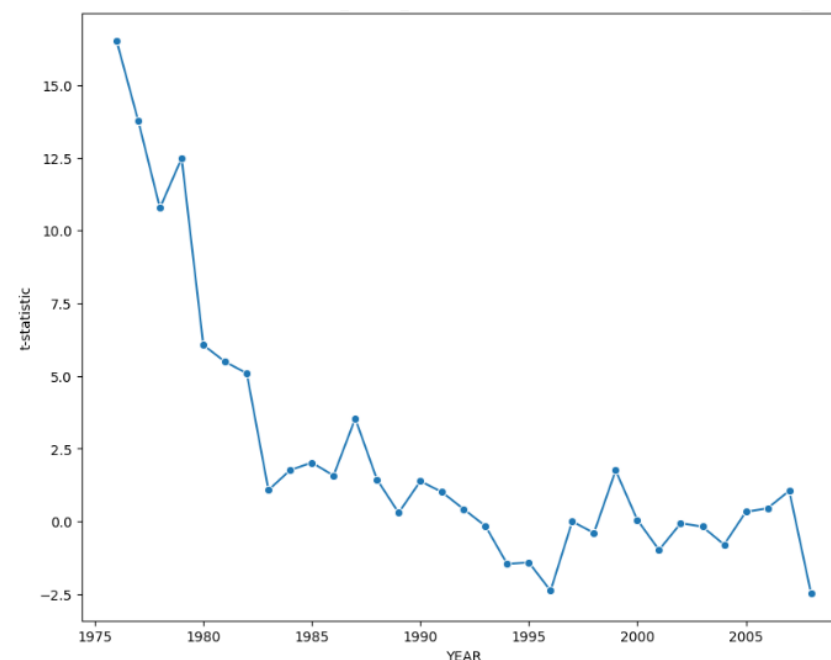


Fig 9. T-statistics of the difference in log(hourly wages) between college graduates and non-graduates among high-income group (90 percentile)

4 Results

Wage disparity and college premium

Regression analysis result

The beta values of college graduation within the high-income group obtained from the linear regression model.

$\log(\text{weekly earns})$

$$= \beta_0 + \beta_1 \text{college grad} + \beta_2 \text{female} + \beta_3 \text{marital status} \\ + \beta_4 \text{full time} + \beta_5 \text{veteran} + \beta_6 (\text{female} \cdot \text{college grad}) \\ + \beta_7 (\text{veteran} \cdot \text{college grad}) + \mu$$

$\log(\text{hourly wages})$

$$= \beta_0 + \beta_1 \text{college grad} + \beta_2 \text{female} + \beta_3 \text{marital status} \\ + \beta_4 \text{full time} + \beta_5 \text{veteran} + \beta_6 (\text{female} \cdot \text{college grad}) \\ + \beta_7 (\text{veteran} \cdot \text{college grad}) + \mu$$

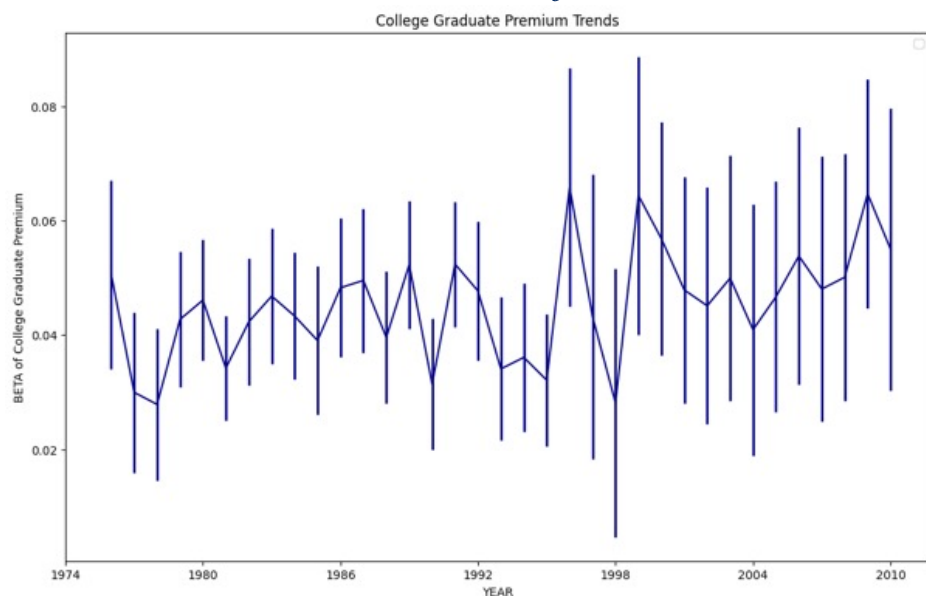


Fig 10. Beta of the college graduates in a linear regression model inferring yearly $\log(\text{weekly earns})$ in the high-income group (90 percentile)

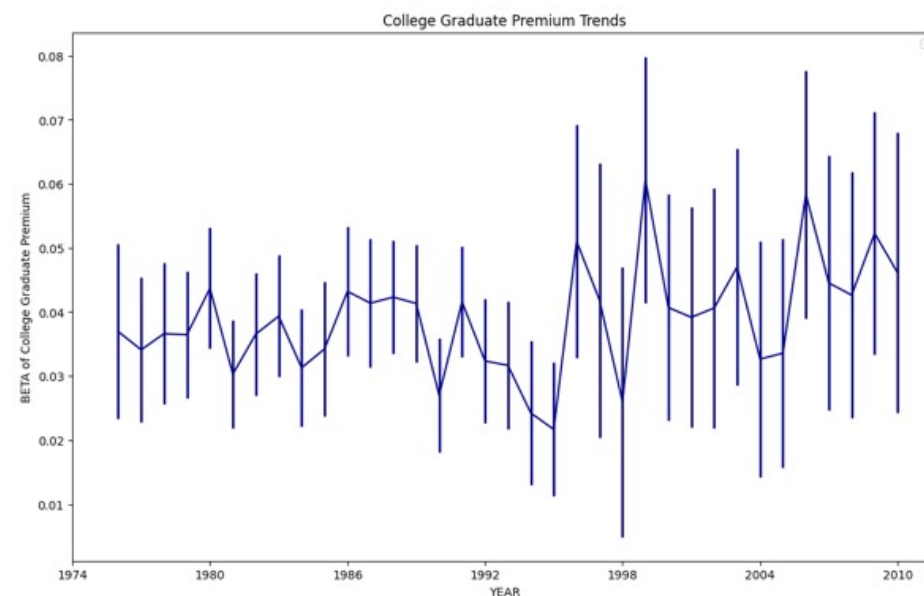


Fig 11. Beta of the college graduates in a linear regression model inferring yearly $\log(\text{hourly wages})$ in the high-income group (90 percentile)

4 Results

Wage disparity and college premium

Regression analysis result

The beta values of college graduation within the low-income group derived from the linear regression model.

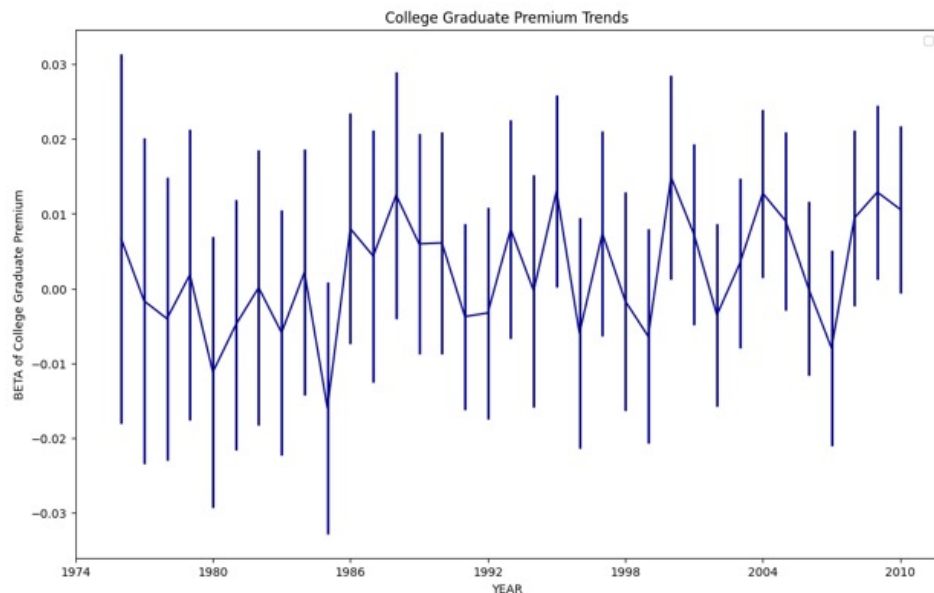


Figure 12. Beta of the college graduates in a linear regression model inferring yearly log(weekly earns) in the low-income group (90 percentile)

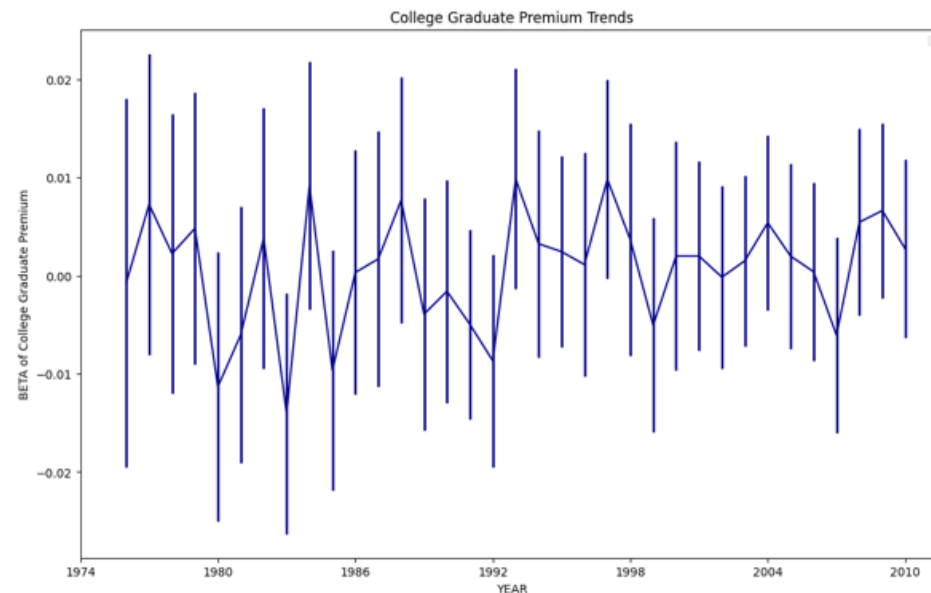


Figure 13. Beta of the college graduates in a linear regression model inferring yearly log(hourly wages) in the low-income group (90 percentile)

4 Results

Political regime and college premium

Regression analysis result

The college graduation beta values obtained from the linear regression model, organized by the ruling party.

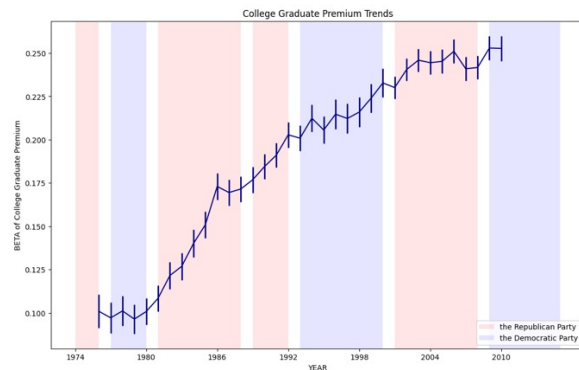


Figure 14. the US ruling party and Beta of the college graduates in a linear regression model inferring yearly log(weekly earns)

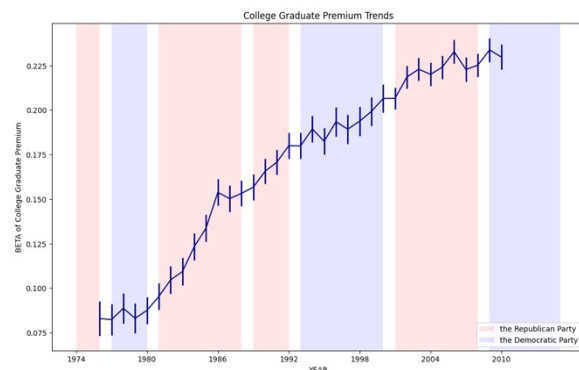


Figure 15. the US ruling party and Beta of the college graduates in a linear regression model inferring yearly log(weekly earns)

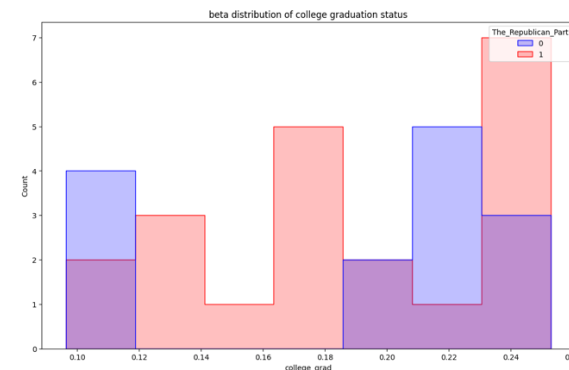


Figure 16. College graduation beta distribution of a linear regression model that infers log (weekly earns) according to the US ruling party

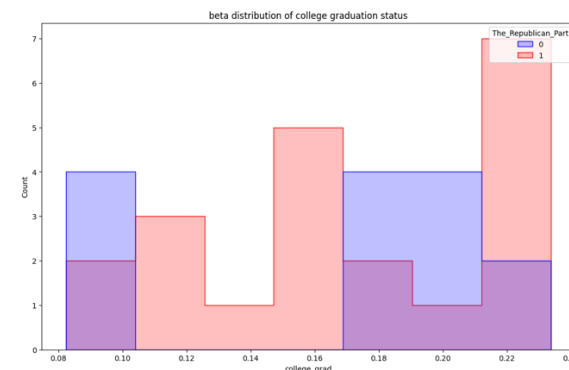


Figure 17. College graduation beta distribution of a linear regression model that infers log (hourly wages) according to the US ruling party

4 Results

Political regime and college premium

Regression analysis result

The distribution of college graduation beta in the linear regression model, predicting log (weekly earnings) within the high-income group

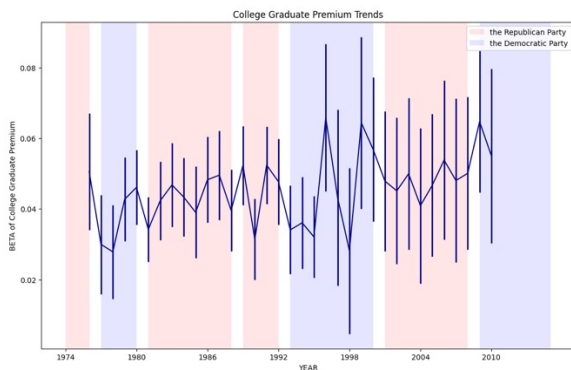


Figure 18. the US ruling party and Beta of the college graduates in a linear regression model inferring yearly log(weekly earns) in the high-income group (90 percentile)

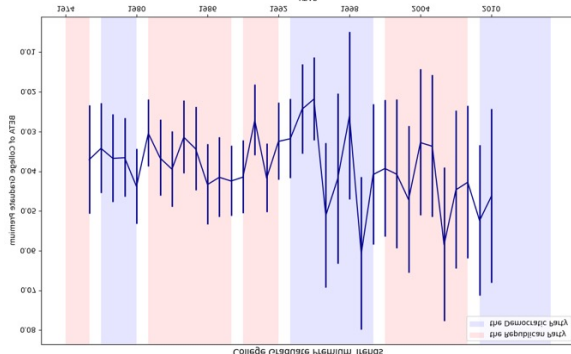


Figure 19. the US ruling party and Beta of the college graduates in a linear regression model inferring yearly log(hourly wages) in the high-income group (90 percentile)

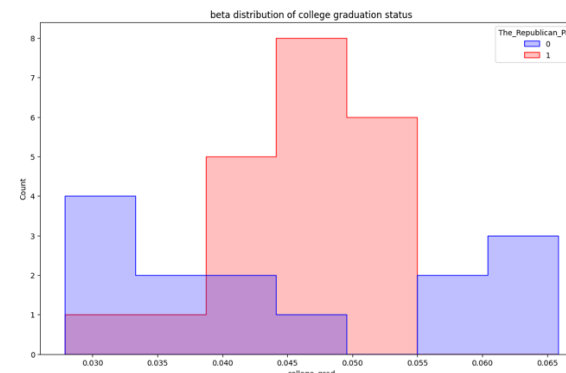


Figure 20. College graduation beta distribution of a linear regression model that infers log (weekly earns) in the high-income group (90 percentile) according to the US ruling party

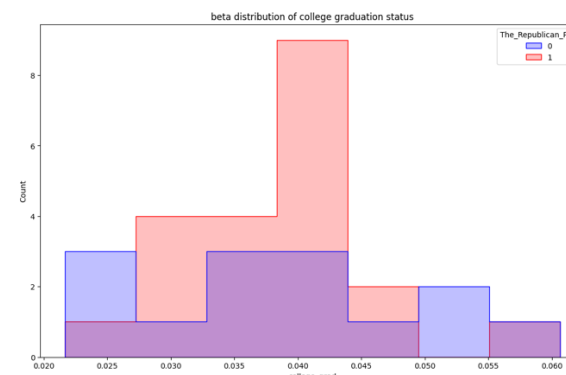


Figure 21. College graduation beta distribution of a linear regression model that infers log (hourly wages) in the high-income group (90 percentile) according to the US ruling party

4 Results

Political regime and college premium

Regression analysis result

The distribution of college graduation beta in the linear regression model, predicting log (weekly earnings) within the low-income group

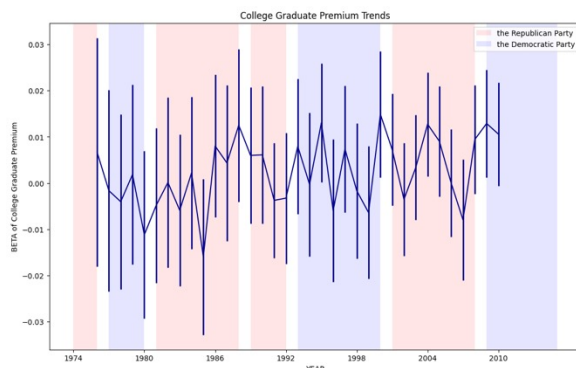


Figure 22. the US ruling party and Beta of the college graduates in a linear regression model inferring yearly log(weekly earns) in the low-income group (90 percentile)

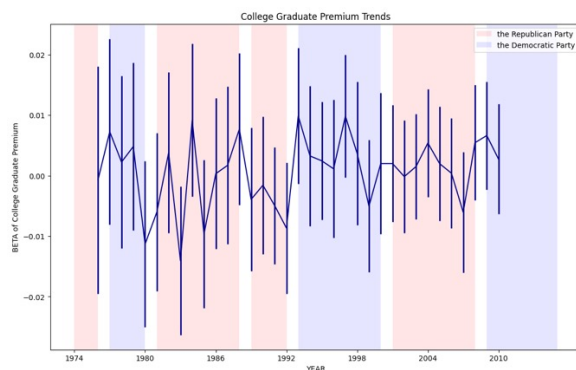


Figure 23. the US ruling party and Beta of the college graduates in a linear regression model inferring yearly log(hourly wages) in the low-income group (90 percentile)

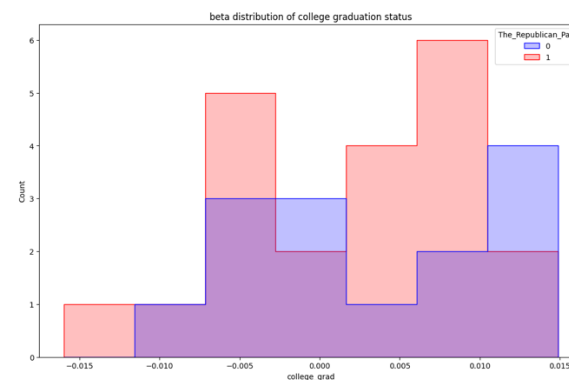


Figure 24. College graduation beta distribution of a linear regression model that infers log (weekly earns) in the low-income group (90 percentile) according to the US ruling party

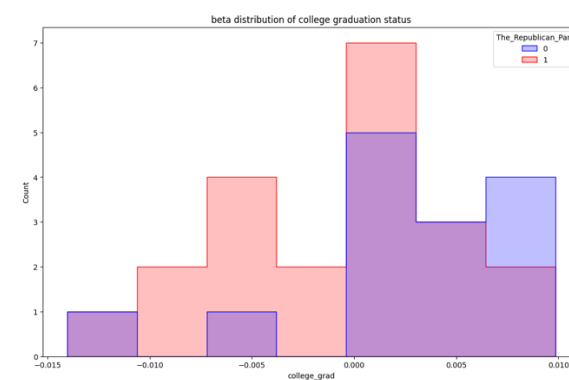


Figure 25. College graduation beta distribution of a linear regression model that infers log (hourly wages) in the low-income group (90 percentile) according to the US ruling party

4 Results

Beta trend of other variables

Regression analysis result

The trend of the independent variable beta in the linear regression model based on the dependent variable and income level

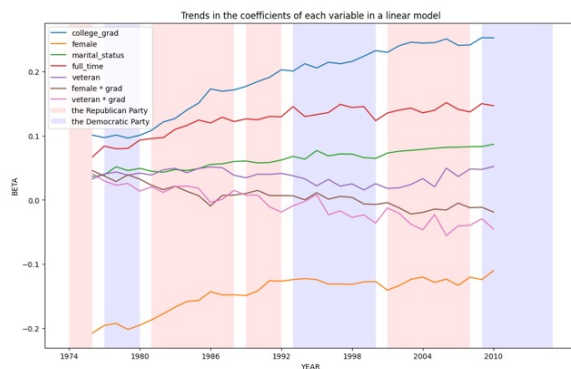


Figure 26. Trend of beta of the independent variables in a linear regression model with log(weekly earns) as the dependent variable

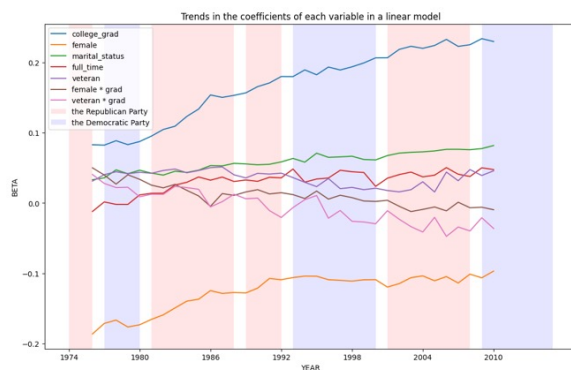


Figure 27. Trend of beta of the independent variables in a linear regression model with log(hourly wages) as the dependent variable

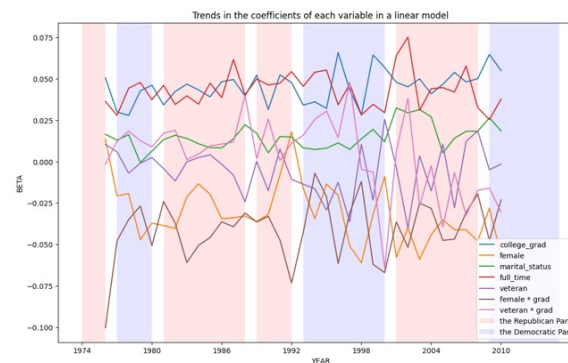


Figure 28. In the high-income group (90 percentile), Trend of beta of the independent variables in a linear regression model with log(weekly earns) as the dependent variable

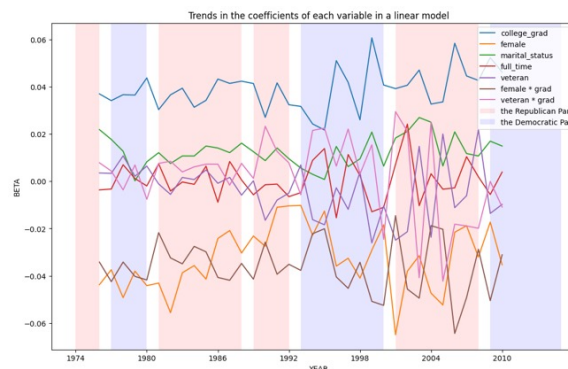


Figure 29. In the high-income group (90 percentile), Trend of beta of the independent variables in a linear regression model with log(hourly wages) as the dependent variable

4 Results

Beta trend of other variables

Regression analysis result

The trend of the independent variable beta in the linear regression model based on the dependent variable and income level

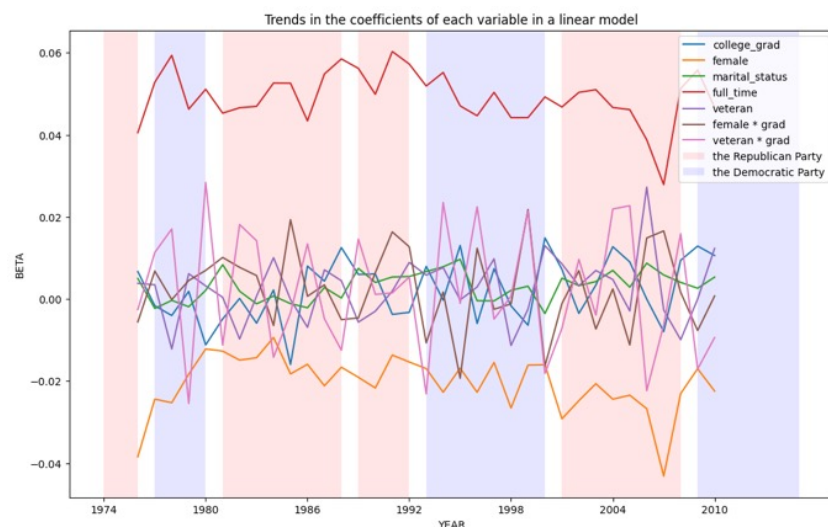


Figure 30. In the low-income group (90 percentile), Trend of beta of the independent variables in a linear regression model with log(weekly earns) as the dependent variable

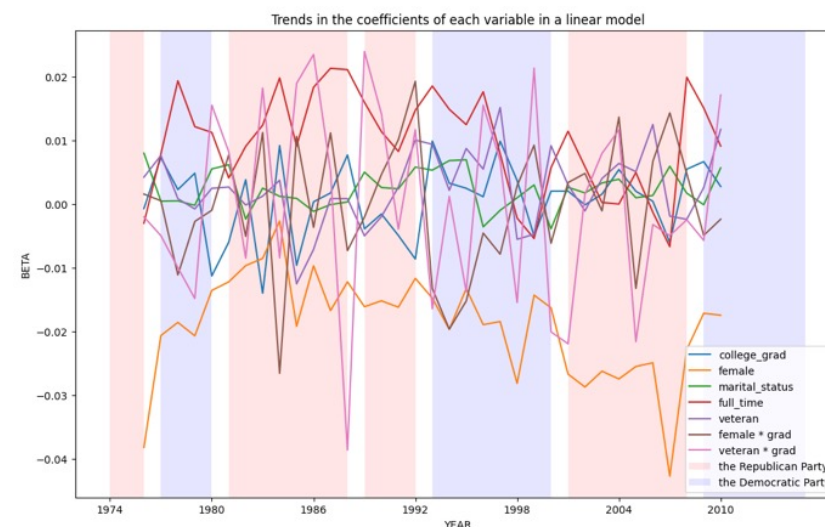


Figure 31. In the low-income group (90 percentile), Trend of beta of the independent variables in a linear regression model with log(hourly wages) as the dependent variable

5 Discussion and Conclusion

This study focuses on examining the changes in the college premium over a specific time period.

- Our analysis spans from 1976 to 2010, during which the proportion of college graduates in the U.S. labor market consistently increased, reaching approximately 58% by 2010.
- Additionally, we observed a widening wage gap between individuals with a college degree and those without as the years progressed.

T-test result

- A time series t-test comparing wages between college graduates and non-graduates within the high-income group reveals a widening wage gap over time.
⇒ These findings align with previous research indicating that the college wage premium is notably higher for individuals in the top quartile (high-income group), particularly as the level of educational attainment advances (Martins & Pereira, 2004).
- On the contrary, the time series t-test conducted on wages between college graduates and non-graduates within the low-income group reveals a decreasing wage gap over time, with non-graduates earning higher wages in certain years.

5 Discussion and Conclusion

Time series regression analysis result

- When examining the time series regression analysis for the entire population, we observe a consistent association between being female and lower wages over the span of 35 years.
- Being a college graduate mitigates the gender wage gap to a significant extent. On the contrary, this trend differs in the high-income and low-income groups.
- In the high-income group, there is no observable wage gap between men and women.
- In the low-income group, women tend to earn lower wages compared to men, although this gap is mitigated by the presence of a college degree.

5 Discussion and Conclusion

Limitations

- However, there are also studies (Federal Reserve Bank of Cleveland, 2012; Martins and Pereira, 2004; James, 2012) that show that the advanced degree premium occurs in jobs that require specialized skills in a rapidly changing society. Therefore, it is necessary to go beyond the possession of a college degree and further distinguish between advanced degrees. In the high-income group, there is no observable wage gap between men and women. In the low-income group, women tend to earn lower wages compared to men, although this gap is mitigated by the presence of a college degree.
- Furthermore, given the temporal scope of this study, from 1976 to 2010, there are limitations in terms of policy implications.

5 Discussion and Conclusion

Expectations

- This study is meaningful in examining changes in college premium over time and demonstrating the factors affecting high and low income groups.
- The results of this study can be used as a reference for policy discovery, and it is necessary to continue research by updating the latest data and adding detailed variables on degrees.

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Thank you