

Racial and Gender Disparities in Wages and Employment: Analyzing Trends Across Education Levels in USA (1979–2022)

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January 16, 2025

1 Introduction

Education plays a pivotal role in shaping economic outcomes, yet disparities in wages and employment persist in racial and gender demographics in the United States. Investigating the level of education attained is important for determining the key factors that explain the change in wages and employment ratio. This report focuses on analyzing the wages and employment-to-population ratios of Black and White men and women from 1979 to 2022, with particular emphasis on the role of the education level attained as a determinant of economic participation and earnings. To facilitate this analysis, an ETL pipeline was developed to integrate and preprocess data from multiple sources. This pipeline streamlines the exploration of datasets by education level, enabling a comprehensive examination of employment ratio and average hourly wage patterns across the two groups. Two main questions will be analyzed by identifying and finding key trends in the datasets:

- “What is the impact of education level on wages and employment ratio for men and women among black and white populations?”
- “What is the relationship between wages and employment ratio for men and women?”

2 Used Data

The pipeline generates a SQLite database file which has the table named `wages_and_employment_data`. The analysis focuses on the period from 1979 to 2022 and uses columns that display the average hourly wage and employment ratio for men and women across different levels of education by merging the two datasets for wages and employment ratios.

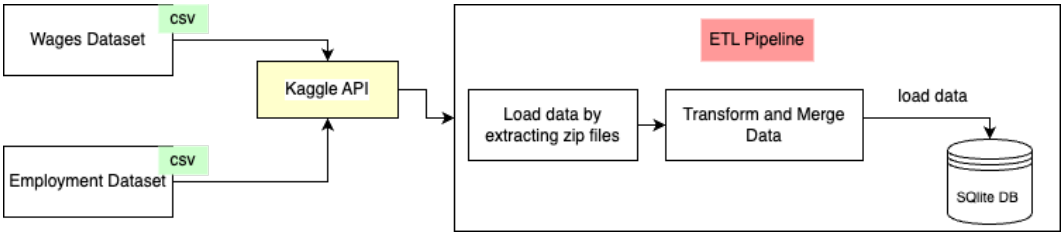


Figure 1: ETL Pipeline Flow Diagram

Figure 1 shows the ETL pipeline for the datasets. The final output after applying this transformation is a clean and transformed merged dataset stored in a table in a SQLite file with no missing and null values. The output table consists of 66 columns, including data on **year**, **average hourly wage**, **employment ratio** (as a percentage) and **percentage gap** for both the variables for white and black men and women, categorized by different education levels and mean columns across all the education levels. Figure 2 illustrates these explained variables for various years.

	year	total_population	White_Men_Less_Than_High_School_Hourly_Wage	White_Men_HS_Hourly_Wage	White_Women_Avg_Employment_Ratio	Black_Women_Avg_Employment_Ratio	White_Men_vs_Black_Men_Employment_Gap
0	2022	333287557	17.14	25.92	51.95	54.74	1.42
1	2021	332031054	18.13	26.03	49.12	53.00	2.68
2	2020	331511512	18.97	26.73	52.82	57.82	1.40
3	2019	328329953	17.66	25.58	52.76	58.00	1.64
4	2018	326838189	17.96	25.49	52.74	57.50	1.82
5	2017	325122128	17.82	25.14	52.58	56.38	2.36
6	2016	323071795	16.96	24.73	52.55	55.98	3.50
7	2015	320738994	17.16	24.55	52.64	55.04	3.34
8	2014	318385239	16.55	24.45	52.88	54.40	4.20
9	2013	316065047	16.99	24.84	53.00	54.00	0.90

Figure 2: Sample Output of Merged Dataset

2.1 Data License

The datasets utilized for this analysis are licensed under **CC0: Public Domain**, which allows for free use, modification, and distribution without any copyright restrictions. The CC0 license explicitly waives all copyright claims, granting users full rights to

use the data for any purpose. These two datasets are originally taken from the Economic Policy Institute’s State of Working America Data Library, which is publicly available at <https://www.epi.org/data/>.

3 Analysis

For this analysis, this study made use of **Pandas**, **Seaborn** and **Matplotlib** to dive deep down into the data to find key trends and patterns with several high-level visualizations.

3.1 Impact of Education Attained on Wages

First, this study aims to explore the impact of different education levels on wages across the two groups from 1979-2022

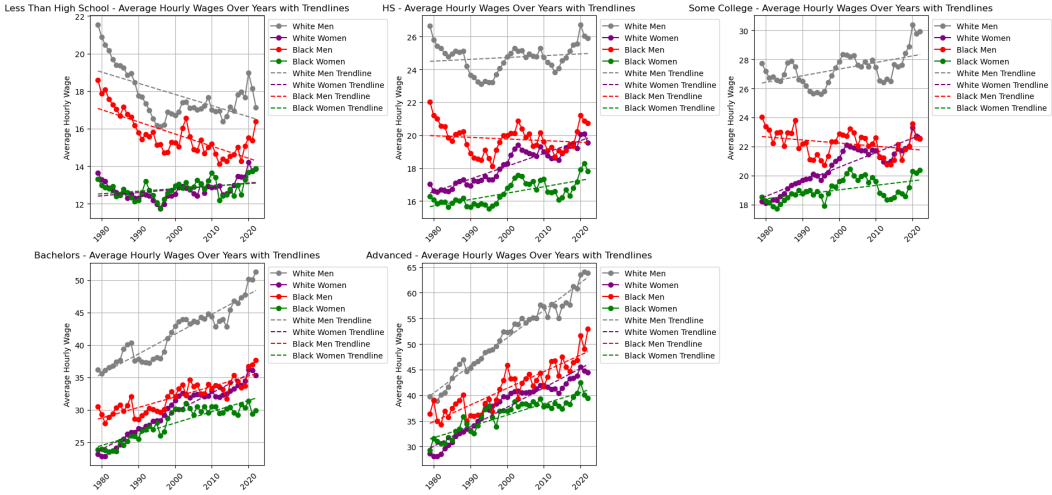


Figure 3: Average Hourly Wage of Men and Women for various education levels (1979-2022)

The above figure reveals persistent wage disparities across race and gender, with **White men consistently earning more** than all other groups at all education levels with highest hourly wage of **64 USD** with advanced degree. At the bachelor’s level, White men earn on average **30-40%** more than Black women. As education increases, an increase in hourly wages is also visible and the gaps remained widened for White Men irrespective of education level, as shown with trendlines. Overall, there is a clear gap between wages of men and women with White and Black Men among the top two earners. Moreover, **Black women shows the slowest wage growth** but with higher education level, that trend has also seen some improvement in the recent years.

Furthermore, the average hourly wages across all years were calculated for each gender and racial group. This revealed that the gap between White Men and all other groups have **increased significantly** as the years have gone by and shows signs of increasing further more in the future, indicating a clear disparity based on race. Overall, in terms of wages, **white population dominated the black population for each gender**. The following two plots shows this difference with and without averaging wages of for all years.

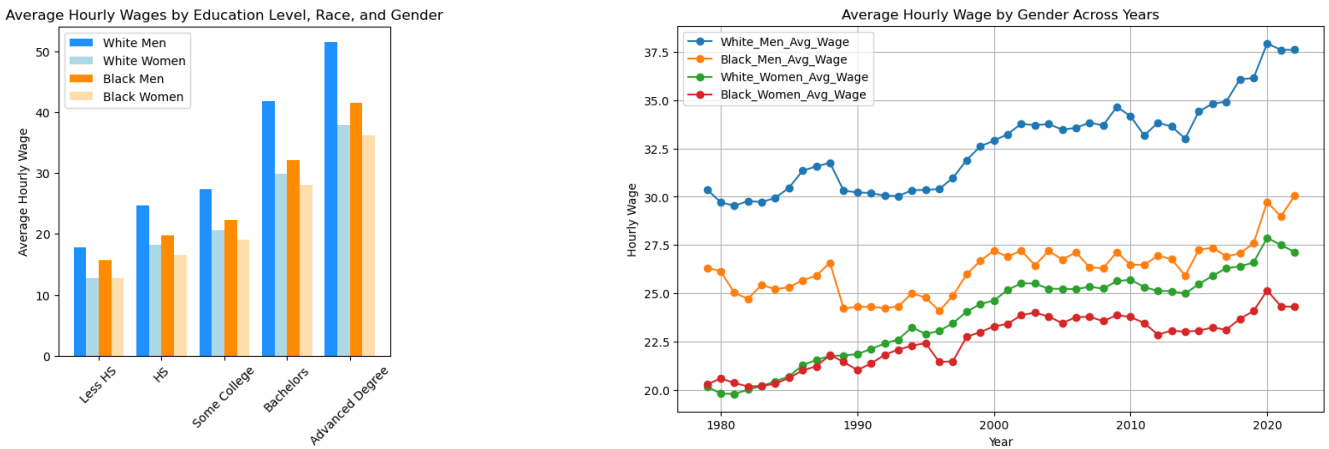


Figure 4: Average Hourly Wage of Each Gender across each year and education level

3.2 Employment Ratio vs. Education Level

By visualizing the trends in employment ratios across various education levels attained for each gender across the years, a **decreasing correlation** was observed in the employment ratio for each gender. Also, another key finding which is observed with

this analysis is that with high level of education, **black population(both men and women)** had a higher employment ratio than white population. Below figure demonstrates these points.

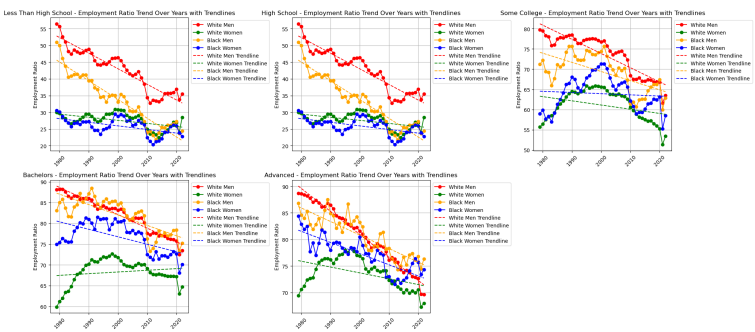


Figure 5: Employment Ratio based for each Gender based on education level(1979-2022)

Additionally, we calculated the mean employment ratio across all education levels for each year and observed that the gap **between all groups has significantly decreased** in recent years. This indicates positive progress in employment rates for all genders, regardless of race. However, it is important not to neglect the fact that the datasets used for this study **lacked actual number of population for both genders** and hence the employment ratios derived do not fully reflect this change because of lack of data.

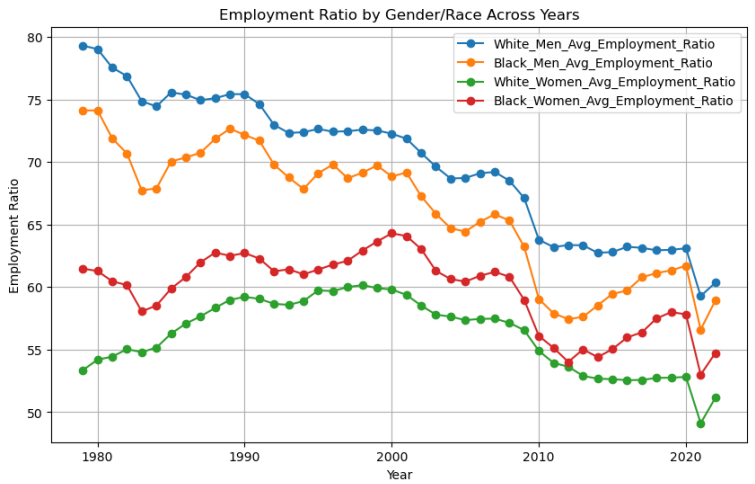


Figure 6: Employment Ratio by Gender (1979-2022)

3.3 Employment Ratio and Wage Gap between Men and Women

The wage gap between White men and women decreased from **41% to 32%**, while for Black men and women, it narrowed from **26% to 22%**. Similarly, the employment ratio gap reduced from **39% to 16%** for White men and women and from **19% to 7%** for Black men and women. Overall, significant improvement was observed with a reduction in both wage and employment ratio gaps across both the races, regardless of gender, indicating positive progress toward equality in the future. This gap is shown by the plots given below

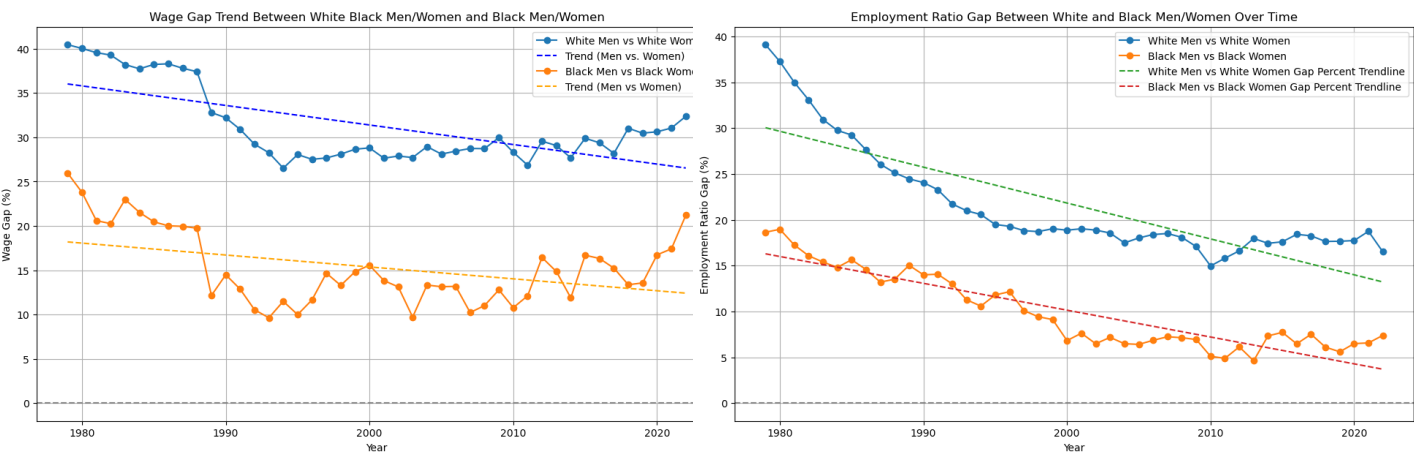


Figure 7: Reduction in Wage and Employment Gaps by Race and Gender

3.4 Correlation between wages and employment ratio

By studying the relationship between wages and employment ratio for each gender, it is observed that there is a **positive increase in wages** for both the genders regardless of their race but a **decline in employment ratio** is also observed at the same moment. The final results indicate a **negative correlation between wages and employment ratios** between the two variables. However, again for a fully accurate interpretation, it is important to acknowledge the absence of actual population data for both genders in the available datasets. Following visualizations and correlation matrix highlights these observations.

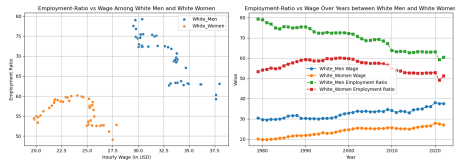


Figure 8: Average Hourly Wages vs. Employment Ratio for White Population

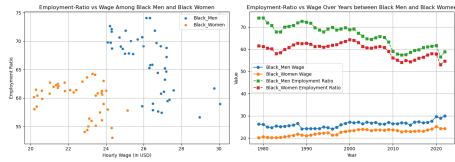


Figure 9: Average Hourly Wages vs. Employment Ratio for Black Population

The **correlation matrix** indicates a strong negative relationship between wages and employment ratios between all groups, with white and black men showing much higher negative correlation **-0.88** and **-0.64**. On the other hand, for women this coefficient was below -0.50, suggesting not so much strong evidence but still not negligible. This suggests that as wages increase, employment ratios tend to decrease with time, indicating potential inequalities, affecting higher earners.

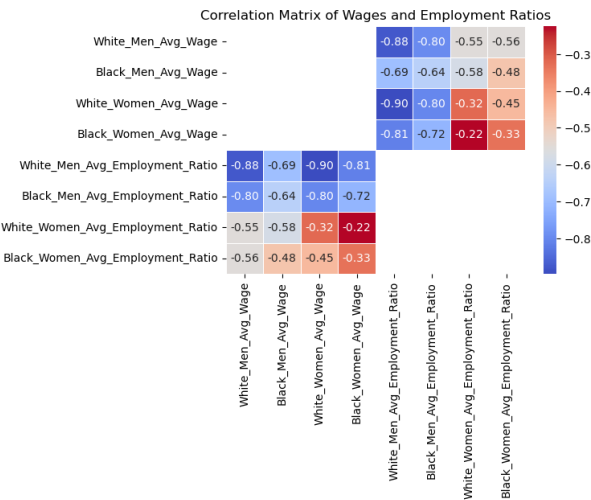


Figure 10: Correlation Matrix of Wages and Employment Ratios)

4 Conclusion

Our analysis revealed that education levels **significantly influenced** wages and employment among men and women across both racial groups. White men consistently demonstrated the **highest average hourly wages** and employment ratios over the years. Additionally, a notable disparity in wages and employment ratios was observed between genders, with **men surpassing women in both measures** despite having similar education levels.

In recent years, however, there has been a **considerable reduction in the wage and employment ratio gap** between both the groups, suggesting progress toward greater equality. Furthermore, this study showed a negative correlation between wages and employment, with higher earners more at the risk of unemployment. However, this trend is considered to be more significant among men. In contrast, the effect is milder for women, suggesting the presence of additional factors influencing their employment ratios.

Finally, this study also addresses some **limitations**. As the datasets presented in this study didn't contain actual number for the population of both groups, it may not reflect the fully correct analysis for both the variables. Having these numbers in future could potentially yield different outcomes.