

Gender Trend of Labor Force, Employment and Unemployment across World Bank Regions

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Data Visualization Project (BSDS 6301)

Introduction

In the current wave of economic gender equality among male and female, it is imperative to view the trend and dynamics of employment across male and female for evidence-based policy formulation. This project focuses on looking at the evolution of employment and unemployment across different regions with a focus on seeing how they differ between male and female. It is very important to understand more about this equality as this will enable us to provide a more focused, sustainable solution and recommendation to this inequality.

This project seeks to understand

- How do male and female labor force participation rates differ across global regions, and which regions exhibit the largest gender disparities?
- How have employment rates for men and women changed over the past two decades, and if gender differences shrinking or widening over time?
- How do economic factors like unemployment, sector type, relate to employment levels for men and women?
- Also, in recent years what is the trend of employment and unemployment in Sub-Saharan Africa.

Data Source, Variables, Time span, Coverage, Key cleaning steps.

The dataset used for this project was obtained from the publicly available dataset from the World Bank Gender Data Portal (Gender Stats CSV). The dataset contains annual indicators from 1960 to 2024. This dataset contains six files (Gender_Statcountry-series.csv, Gender_StatsCountry.csv, Gender_StatsCSV.csv, Gender_Statsfootnote.csv, Gender_Statseries-time.csv, and Gender_StatsSeries.csv). The main data file (Gender_StatsData.csv) contains statistical indicators across all available countries, while the supplementary file (Gender_StatsCountry.csv) was used to obtain geographic (Region) and economic (Income Group) classifications for the countries. The following variables were used for this project (Table I)

Data Extraction and Cleaning Steps

The data was extracted and cleaned based on the steps listed below

- Dataset (Zip) was download directly from the website to python using the zipfile library. This file contained six datafile (Gender_Statcountry-series.csv, Gender_StatsCountry.csv, Gender_StatsCSV.csv, Gender_Statsfootnote.csv, Gender_Statseries-time.csv, and Gender_StatsSeries.csv).
- The main data file (Gender_StatsData.csv) was merged with the country-level metadata file (Gender_StatsCountry.csv) using the Country Code for mapping the join.
- The data was filtered to only include values from the selected indicators (Labor Force, Employment, Employment by sector, and Unemployment) which was based on the objectives of this study.
- The data which was originally in a wide format with separate columns for years was reshaped to a long format, which would allow us to perform our intended visualizations.

Methods & Design

All visualizations used in this project was produced using Python. The following tools and libraries were used to obtain the visualizations

- Pandas: This was used for the data cleaning, transformation, filtering for specific indicator to use from the world bank data, creating the time-series structure for the dataset and computing averages across regions.
- Matplotlib: This library allows us to create a customizable chart, heatmaps, and some multi-panel plots. We also employed this library in setting our figure sizes (plt.figure), add titles (plt.title), axes labels (plt.xlabel, plt.ylabel), control layouts (plt.tight_layout), add data sources (plt.figtext), and save figures (plt.savefig).
- Seaborn: used to create the visualization

The Visualization Type and Encoding Choice is shown in Table II below

TABLE 1. LIST OF KEY VARIABLES AND WORLD BANK INDICATOR CODES

Indicator Group	Key Variables	World Bank Code
Labor Force	Labor force participation rate, female (% ages 15+) Labor force participation rate, male (% ages 15+)	SL.TLF.CACT.FE.ZS SL.TLF.CACT.MA.ZS
Employment (modeled ILO estimate)	Employment to population ratio, 15+, female (%) Employment to population ratio, 15+, male (%)	SL.EMP.TOTL.SP.FE.ZS SL.EMP.TOTL.SP.MA.ZS
Employment per Sector	Employment in agriculture (female/male) Employment in industry (female/male) Employment in services (female/male)	SL.AGR.EMPL.FE.ZS SL.AGR.EMPL.MA.ZS SL.IND.EMPL.FE.ZS SL.IND.EMPL.MA.ZS SL.SRV.EMPL.FE.ZS SL.SRV.EMPL.MA.ZS
Unemployment	Unemployment, female (%) Unemployment, male (%)	SL.UEM.TOTL.FE.ZS SL.UEM.TOTL.MA.ZS
Other Variables	Income Group Region Country Name Year	—

TABLE 2. VISUALIZATION TYPES, ENCODING CHOICES, AND RATIONALE

Visualization Type	Encoding Choice / Tool	Rationale
Labor Force Participation Rate (Static Comparison) across regions	Grouped horizontal bar plot (sns.barplot)	Horizontal orientation improves readability of region names. Grouping bars by gender enables direct male-female comparison within each region.
Gender gap in labor force across World Bank regions	Horizontal bar plot (sns.barplot)	Allows negative values to be clearly visualized, making gender differences visually intuitive.
Employment distribution by sector and sex across regions	Heatmap (sns.heatmap)	Enables simultaneous comparison of employment distribution across sectors, gender, and regions.
1) Labor force participation rate over time 2) Employment in agriculture over time 3) Employment in industry over time 4) Employment in services over time	Faceted line plots (sns.FacetGrid sns.lineplot)	Line plots show temporal trends, while faceting by gender allows direct comparison between male and female patterns across regions.
1) Employment Rate Dashboard in Sub-Saharan Africa (2023) 2) Unemployment Rate Dashboard in Sub-Saharan Africa (2023)	Horizontal bar plot + individual line plots	Bar plots rank the top 10 countries. Line plots provide 15-year historical trends for the top two ranked countries.
1) Employment Rate Dashboard by sector in Sub-Saharan Africa (2023) 2) Unemployment Rate Dashboard by sector in Sub-Saharan Africa (2023)	Horizontal bar plots	Used to rank the top 10 countries by sector and to show the income group classification for each country.

Result and Discussion

The bar plot below (figure 1) shows a comparison of labor force participation for both male and female across regions. Latin America & Caribbean and South Asia show the highest

male labor force participation, both around 75%. East Asia & Pacific has the highest female LFP, with about 60%. The Middle East & North Africa region has the lowest female LFP, around 25%.

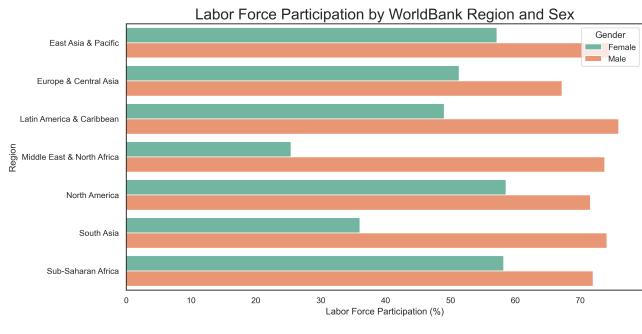


Figure 1. Labor Force Participation by world bank region and sex

The bar chart (figure 2) shows the gender gap in labor force participation (female minus male) across regions. The plot showed that the gap is negative in all regions, indicating that male labor force participation is higher than female labor force participation in all regions. The Middle East & North Africa region has the largest gender gap at -48.4 percentage points. This indicates that male labor force participation rate nearly double that of the female labor force participation rate. North America shows the smallest gender gap at -13.0 percentage points. South Asia and Latin America & Caribbean also show observable gaps, both exceeding -25 percentage points.

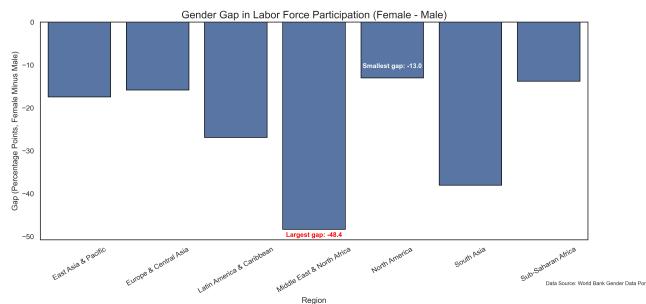


Figure 2. Gender gap in labor force across world bank regions

Figure 3 shows the trend of Labor Force Participation rate across region and gender over time. Labor Force Participation rate for males consistently exceeds that for females over the entire 1990–2020 period. East Asia & Pacific, North America, and Sub-Saharan Africa generally showed high overall Labor Force Participation rate for both genders. The Middle East & North Africa region showed a lower female Labor Force Participation rate, with a wide difference between male and female. Same was also observed in South Asia. Male Labor Force Participation rate shows a slight, gradual decrease in most regions especially East Asia & Pacific, Europe & Central Asia, North America and Sub-Saharan Africa. Female Labor Force Participation rate shows a slight increase in some regions, although still below male rates.

The heatmap below (figure 4) shows the divide in employ-

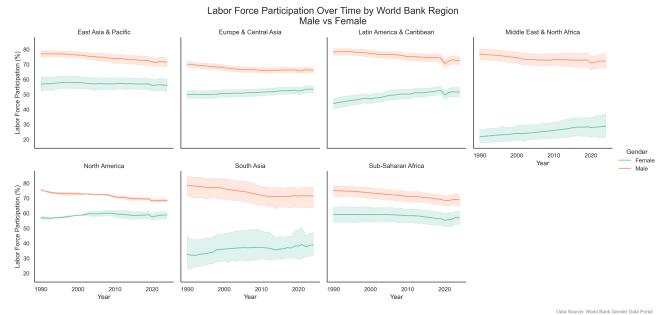


Figure 3. Trend of Labor force participation across gender and region

ment across region, sector, and gender. We observed a clear regional and gender patterns differences in employment distribution across agriculture, industry, and services. In South Asia and Sub-Saharan Africa, both women and men showed the highest employment in agricultural, with female agricultural participation having about 54% in both regions and male participation in agriculture having 50% in Sub-Saharan Africa and 43% in South Asia. In contrast, agricultural employment was the lowest in North America, where less than 3% of both genders worked in this sector.

Employment in industry showed modest gender differences within each region. Europe & Central Asia (33.4%) and North America (31%) gave the highest male employment in industry, female industry employment across most of the regions is between 9% and 17%. The services sector was dominated with most of the higher-income regions. North America showed the highest percentage of employment in services for both genders (89% for female and 66% for male). Similarly, Latin America & the Caribbean, Europe & Central Asia also has a strong service-sector dominance, with female having 78.6% and males having 51.1% employment in the service sector in Latin America. East Asia & Pacific, and Middle East & North America, also showed high employment in service across female and male. However, for both South Asia and Sub-Saharan Africa, employment in services were obviously very low.

This result showed that region wise, more of the employment in Agriculture was seen in South Asia and Sub-Saharan Africa, more of service employment in North America, Latin America & the Caribbean, Europe & Central Asia, East Asia & Pacific, and Middle East & North America, while there was a similar trend in employment across the service region.

Based on the result observed in figure 4 above, we looked at the regional trend (figure 5, 6 & 7) of all the three sectors (Agriculture, Industry and Services) from 1990 to 2024. The trend over time showed a decline in agriculture employment over time, with highest decline across both male and female seen in South Asia. In regions such as Europe & Central Asia, Sub-Saharan Africa, East Asia & Pacific, Middle East



Figure 4. Figure 4: Heat plot showing employment distribution by sector, sex across regions

& North Africa, there were some little differences in employment with both converging in recent years. There was a high Reliance on agriculture employment in developing Regions: South Asia and Sub-Saharan Africa show the highest initial and final percentages of employment in agriculture, although both regions experienced sharp declines. In regions with high agricultural employment like South Asia and Sub-Saharan Africa, the percentage of female employment in agriculture is consistently higher than male employment. Agriculture constitutes a very small portion of employment in North America and Europe & Central Asia for both genders over time, remaining below 5%.

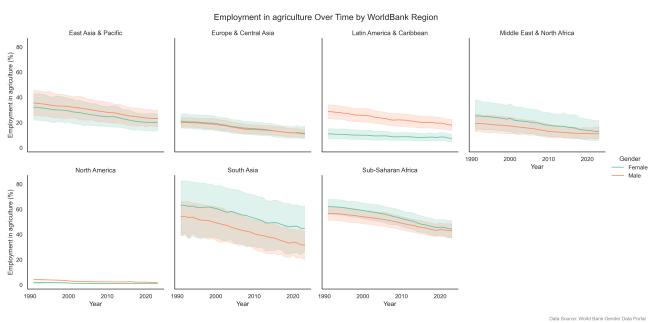


Figure 5. Figure 5: Trend of employment in agriculture across regions and sex

The trend of employment in the industry sector varies across regions. Male employment in industry is consistently higher than female employment. This gender gap is the most pronounced across the three sectors. Across gender, North America, Europe & central Asia has a very clear difference in gender employment. Regions such as Europe & Central Asia and North America showed a relatively high industry share for males (around 35%) which kind of remained a little stable over the period. South Asia and Sub-Saharan Africa show a noticeable increase in the proportion of the workforce employed in industry over the period, which could suggest a possible late industrial transition. However, industry remains the smallest sector in Sub-Saharan Africa.

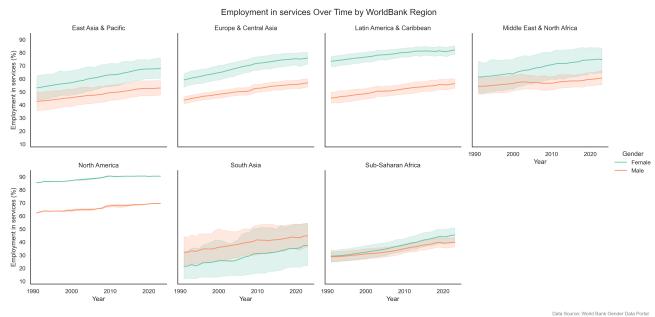


Figure 6. Figure 6: Trend of employment in industry across regions and sex

The plot shows that employment in the services sector showed a consistent increase across all the regions. In North America, services employment is the highest for both genders, with females dominating this sector. Other regions like Latin America & Caribbean and Europe & Central Asia also show high rates. In regions such as East Asia & Pacific, Europe & Central Asia, Latin America & Caribbean, Middle East & North Africa, and North America, the percentage of female employment in services exceeds those of male employment. However, in south Asia percentage of male in services were higher than female over time. In Sub-Saharan Africa, we saw similar distribution across male and female but divide between them started to grow slowly.

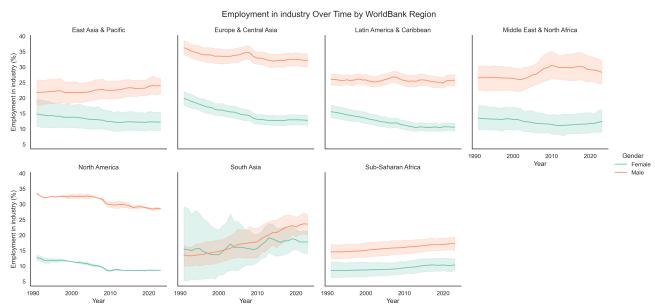


Figure 7. Figure 7: Trend of employment in services across regions and sex

Across all world bank regions except North America, unemployment rates were highest among females than male. The largest gender difference was observed in the Middle East & North Africa, where female unemployment approached 15%, almost doubling the rate of unemployment in male. Sub-Saharan Africa, Latin America & the Caribbean, and South Asia also showed noticeable gender gaps, with female rates exceeding male unemployment rate. Countries like North America, Europe & Centra Asia East, Asia & Pacific showed the smallest difference between both genders, with both male and female unemployment close to each other. Overall, the results show a high global pattern of unemployment especially among women, with their magnitude varying from region to region.

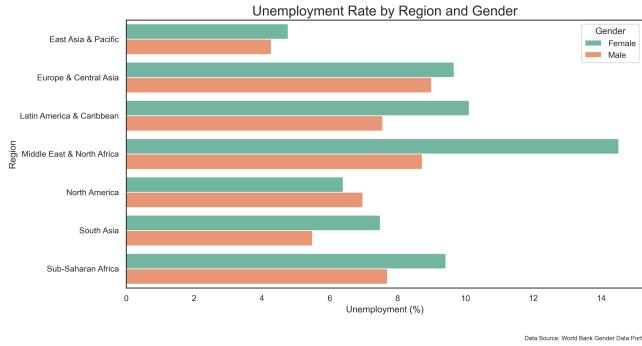


Figure 8. Unemployment by regions and gender

Based on the overall differences observed across all the Regions, this project narrows this down to see what was going on in Sub-Saharan Africa in the year 2023.

Overall Employment to Population Ratios in Sub-Saharan Africa

As observed in figure 9 and 10 below, in 2023, Sub-Saharan Africa showed large variation in employment-to-population ratios across their respective countries and the gender of the population. Males have the highest employment to population ratio in the following countries: Tanzania, Madagascar, and Niger, each exceeding 80%. Also, we observed that Uganda, Nigeria, Eritrea, and Liberia also showed high male employment rates. We observed some close trends in Female employment rates in several countries such as Madagascar, Burundi, and Nigeria all ranked top three, with employment levels near or above 75%. Countries that both have high employment rate for both woman and men include Tanzania, Madagascar, Uganda, Nigeria, Eritrea, Liberia and Mozambique, each of these countries appears in both genders.

The time series plot for the top two countries with the highest employment to population ratio showed that males in Tanzania exhibit almost stable employment rate since 2008 staying above 82%. Largest drop was observed in 2020, which could be due to COVID-19 pandemic. Madagascar showed slightly more volatility, peaking around 2012–2013 before stabilizing near 85% in 2022. Female employment trends also showed the same pattern as males from Madagascar, there was a drop from 2012 to 2020, picked up but remained low compared to the value prior to COVID, however they remained comparatively high compared to other countries. Burundi showed a high employment rate among women as male never made the top 10 list. The trend showed a steady growth until a brief drop around 2019 and picked up again after COVID.

The plot below (figure 10) shows the distribution of employment across three sectors (Agriculture, Industry, and Services). The agriculture, followed by services sector dominates employment for both genders in many countries. For males,

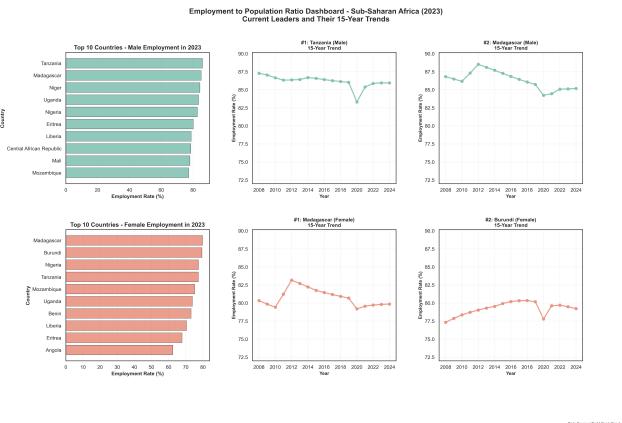


Figure 9. Dashboard showing the top 10 countries in sub-Saharan Africa employment to population ratio

Niger, Madagascar, and Mali recorded agricultural employment above 60%. Among females, Burundi, Mozambique and Uganda showed the highest agricultural participation with values from 70% and above. In the service sector, Liberia, Nigeria and Eritrea has the highest service-sector employment for men, with values above 50%. For females, Benin, Nigeria, and Liberia has the highest with service employment having between 50% and 60%. This showed more female presence in the service sector. We observed that in sub-Saharan Africa, industry has the least employment rate especially among females. Nigerian males showed the highest industrial employment (about 18%), followed by Mozambique and Eritrea, while female industrial employment was very low in other countries except for Benin and Nigeria. Most of the countries that were in the top ten have low income with only Nigeria, Tanzania, Angola, Benin, and Niger belonging to the Low middle income group.

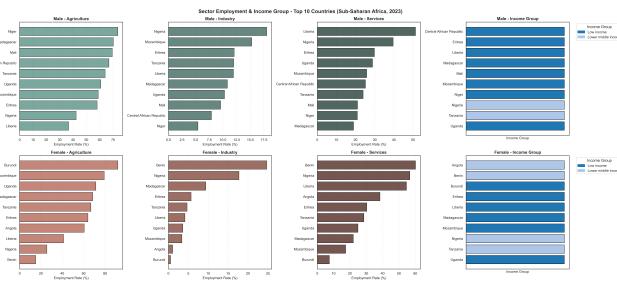


Figure 10. Dashboard showing the top 10 countries in sub-Saharan Africa employment by sector

Overall Unemployment in Sub-Saharan Africa

The dashboard below (figure 11 & 12) shows the unemployment data for 10 top countries across gender. Eswatini and South Africa lead in unemployment rates for both males and females surpassing other countries. Among the top ten considered, we saw 9 countries having low unemployment across male and female. Overall, both male and female have

almost similar unemployment rate across the countries. For the two countries with highest unemployment, we looked at the trend from 2008 to 2023. The plot showed that Eswatini demonstrated a U-shaped pattern for both genders, with rates declining in 2008 to reach its lowest in 2016, before rising sharply to peak 2022 (Male and Female) and a slight decline afterwards. In contrast, South Africa exhibited showed an increase in unemployment since 2008 across both genders.

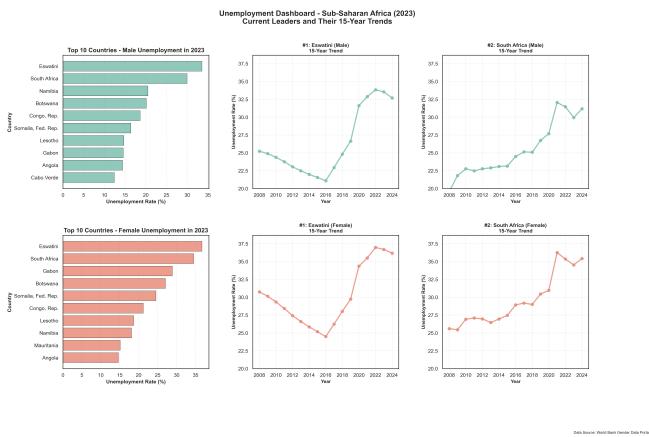


Figure 11. Dashboard showing unemployment in 10 countries in sub-Saharan Africa

For the countries with the highest unemployment, agricultural unemployment affected both males and female with Angola, Malawi, and Congo Republic each exceeding 50% unemployment among male and female agricultural workers. Unemployment was highest among in the service sector among females with Botswana, Eswatini and Namibia leading, while for male, Gabon, Eswatini, and South Africa has the largest unemployment in services. Compared to the other sector, industry has the least unemployment with Lesotho, Cabo Verde and South Africa topping for males and Lesotho, Congo, and Gabon topping for females. For the 10 countries with the highest unemployment rate, for male, half of them (Angola, Congo, Eswatini, Lesotho, and Namibia) belong to lower middle-income group, four (Botswana, Cabo Verde, Gabon, and South Africa) belong to upper middle income while one (Somalia) belong to the low-income group. For females, we saw the same country in the list with Mauritania joining the middle-income group.

Limitations and Future Works

This visualization used the modeled ILO estimate and not the direct survey for most of the visualization, this could infuse some sort of smoothing in the dataset, and we could possibly contain some estimation error compared to the real dataset. Also, our dataset is aggregated for each country, narrowing down to include factors such as rural/urban, ethnicity, household, education et al will provide us with more

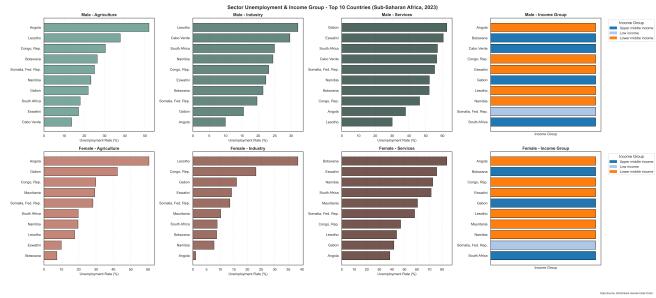


Figure 12. Dashboard showing the top 10 countries in sub-Saharan Africa unemployment by sector

specific and reliable information. This project only looks at trend and association across region, sex, country, and regions. We can't directly say what causes what, we only conclude of an association between the compared variables. Future work will drill down into each of the regions to see how they differ per year and create a dashboard which is interactive, and user can view employment, unemployment based on regions, sector, country, sex et al.

References

1. World Bank. (2024). Gender Data Portal: Gender Stats CSV (Data set). Retrieved November 28, 2025, from <https://genderdata.worldbank.org/en/home>