EVALUATING WAGE DISPARITIES BY GENDER ACROSS INDUSTRIES USING STATA

1. Background and Problem Statement

Gender-based wage inequality remains a persistent issue globally. While numerous studies have highlighted the existence of a gender pay gap, industry-level differences often go unnoticed in generalized national statistics. A national labor organization commissioned this study to uncover whether wage disparities between male and female employees persist after controlling for factors such as education, experience, job role, and region, with an added emphasis on how these disparities differ across industries.

The organization provided an anonymized dataset covering 50,000 salaried individuals across five major industries: finance, healthcare, education, manufacturing, and technology. The primary aim was to perform industry-wise wage gap estimation while accounting for key demographic and professional variables.

2. Objectives

- To quantify the gender pay gap across five major industries in the country.
- To identify whether wage differentials persist after controlling for confounding factors such as education, experience, and job type.
- To generate industry-specific regression models explaining variation in wages.
- To produce a comprehensive and actionable report for internal HR benchmarking and external advocacy.

3. Methodology

3.1 Data Description

- **Sample size:** 50,000 individuals (random stratified sample)
- **Key variables:**
    - wage_monthly (dependent variable)
    - gender (binary dummy: 1 for female, 0 for male)
    - experience_years
    - education_level (categorical: high school, undergraduate, postgraduate)

- job_type (managerial, administrative, technical)
- industry (finance, healthcare, education, manufacturing, technology)
- region

3.2 Statistical Analysis Using Stata

- Descriptive statistics and boxplots were generated for wage distributions by gender within each industry.
- One-way ANOVA was used for preliminary comparison of mean wages across industries.
- Multiple linear regression models were constructed:
  - **Model 1:** Base wage ~ gender + experience + education + job type
  - **Model 2:** Added interaction terms between gender and industry
  - **Model 3:** Industry-wise separate regression models to observe coefficient variability
- Diagnostic tests:
  - VIF test for multicollinearity
  - Breusch-Pagan/Cook-Weisberg test for heteroskedasticity
  - Ramsey RESET test for model specification

4. Key Results

Descriptive Analysis:

- Mean monthly wage (males): $5,320
- Mean monthly wage (females): $4,870
- Gender pay gap: 8.47% unadjusted average across all industries

Regression Findings:

- **Model 1:**
  - gender coefficient = -$365 ($p < 0.001$), suggesting a significant wage gap
  - experience and education both positively and significantly associated with wage
- **Model 2 (with interactions):**

    - Gap largest in **finance** (-$530) and **technology** (-$410); smallest in **education** (-$110)

- **Model 3 (industry-specific regressions):**
    - **Finance**: Adjusted $R^2 = 0.52$; gender coefficient = -\$497
    - **Healthcare**: Adjusted $R^2 = 0.47$; gender coefficient = -\$286
    - **Education**: Adjusted $R^2 = 0.43$; gender coefficient = -\$103
    - **Manufacturing**: Adjusted $R^2 = 0.45$; gender coefficient = -\$309
    - **Technology**: Adjusted $R^2 = 0.51$; gender coefficient = -\$419

5. Interpretation and Insights

- The pay gap persists even after controlling for education, experience, and job role.
- Industries with higher base salaries (finance, tech) show greater unexplained pay differences by gender.
- The gender pay gap is smallest in the education sector, possibly due to standardized pay structures and stronger representation of women in mid-to-senior roles.
- Interaction effects reveal that gender alone is not the sole driver its effect varies significantly with industry context.

6. Recommendations

- Finance and tech companies should undergo internal pay audits and consider revising promotion and compensation structures to reduce gender-based disparities.
- Policy incentives can be offered for sectors implementing transparent pay frameworks and reporting pay gap metrics.
- Develop an HR toolkit for companies to self-evaluate wage equality using similar models.
- Conduct qualitative interviews to understand promotion trajectories by gender, especially in high-gap industries.

7. Deliverables

- **Stata .do file** with data cleaning, analysis, and regression syntax
- **Formatted regression tables** (APA style) in Word

- **PowerPoint summary slides** with industry-specific insights
- **Comprehensive PDF report** with results, interpretation, and policy recommendations
- **Excel export of predicted wage gaps** by industry and job role

8. Stakeholder Relevance

Academic:

- Ideal use case for teaching gender economics, labor market segmentation, or regression with interaction terms.

Corporate:

- Directly actionable for HR departments seeking to meet ESG goals or improve gender pay parity.

Policy:

- Can support government labor ministries or think tanks drafting guidelines for pay gap transparency laws.