##### STATS 506

**FINAL PROJECT REPORT**

## Objective

This study investigates whether free trade agreements cause reductions in the wages and employment of industries exposed to high levels of import competition. We would expect these effects to be stronger for industries that already had relatively low profit margins.

## Methodology

It uses several datasets merged and cleaned on trade, GDP per capita, export shares, and growth percentages. The removal of missing values from the merged dataset is subsequent in R. Linear and nonlinear relationships between various variables were analyzed using appropriate advanced statistical modeling and machine learning techniques, such as Ridge and Lasso regression.

* **GDP per capita**
* **Share of merchandise exports in GDP**
* **Annual trade value**
* **Growth percentage**

Key exploratory data analysis (EDA) was performed to visualize relationships and identify trends, while Variance Inflation Factor (VIF) analysis confirmed no significant multicollinearity among predictors.

**Results**

1. **Regression Analysis**:
   * Linear regression models show weak explanatory power, with low R2 values (Adjusted R2≈0.001).
   * Only GDP per capita displayed marginal statistical significance (p-value ≈ 0.0476 in a simplified model).
   * The share of merchandise exports had a marginal positive effect but was not statistically significant at conventional thresholds (p-value ≈ 0.09).
2. **Ridge and Lasso Regularization**:
   * Ridge and Lasso models highlighted the weak influence of predictors. Coefficients for Annual Trade Value were negligible, suggesting minimal impact on growth percentage after accounting for regularization.
3. **Interaction Effects**:
   * Interaction terms (e.g., between GDP per capita and growth percentage) did not improve model performance, with adjusted R2 values remaining below 0.1.
4. **EDA Insights**:
   * A weak positive correlation (r ≈ 0.31) was observed between GDP per capita and export shares of GDP, indicating richer countries are slightly more export-reliant.
   * Longitudinal analysis revealed no consistent trend in export shares over time, complicating the attribution of trends to FTAs.

**Interpretation**

The results indicate that the variables considered explain little of the variation in wages or employment proxies (e.g., growth percentage). While GDP per capita is negatively associated with growth percentage, the effect is modest and not robust. Similarly, the relationship between export shares and growth percentage is weak and statistically marginal. These findings do not provide strong evidence to reject the null hypothesis.

**Limitations**

* **Omitted Variables**: Key industry-level factors, such as labor market rigidity and sector-specific policies, were not included.
* **Data Quality**: Significant missing data in Annual Trade Value and Growth Percentage reduced the scope of analysis.
* **Model Fit**: The low R2R^2R2 values suggest other, unmeasured factors likely drive the observed economic trends.

**Conclusion**

The analysis provides limited support for the hypothesis that FTAs systematically reduce wages or employment in import-exposed industries. Future research can incorporate richer industry-level data and consider alternative modeling frameworks to capture complex, non-linear effects.

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