

## Report: Education and Country Income Levels

### 1. Introduction

This study explores how **education factors** (measured by *Education Index* and *Education Level categories*) impact a country's **income classification**. Using **OLS regression**, we quantify the effect of education on income levels and visualize the relationship.

### 2. Dataset Overview

- **Sample size:** 176 countries
- **Income (response variable):**
  - Encoded as numeric:
    - Low income = 1
    - Lower middle income = 2
    - Upper middle income = 3
    - High income = 4
- **Predictors:**
  - *Education Index* (continuous, 0–1 scale)
  - *Education Level* (categorical: Very Low, Low to Moderate, Very High, etc., dummy-coded)

### 3. Regression Results

#### Model Fit

- **R-squared:** 0.765  
→ About **76% of the variation** in income level is explained by education variables.
- **Adjusted R-squared:** 0.759 (accounts for multiple predictors)
- **AIC:** 278.95, **BIC:** 294.80 (for model comparison).
- **F-statistic:** 138.9,  $p < 0.001$  → Model is highly significant overall.

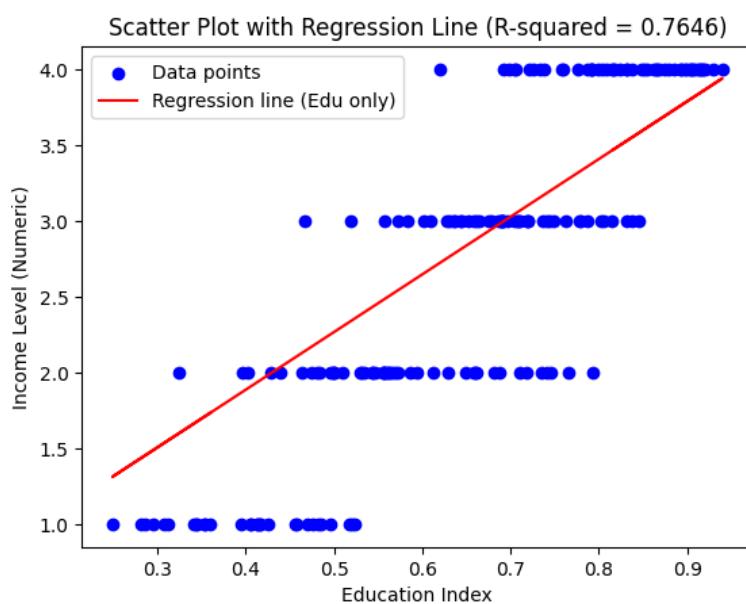
#### Coefficients

Predictor	Coefficient	p-value	Interpretation
Intercept (const)	0.365	0.499	Not significant

Predictor	Coefficient	p-value	Interpretation
<b>Education Index</b>	3.803	<0.001	Strong positive effect; higher index strongly predicts higher income level
<b>Low to Moderate Education</b>	-0.518	0.004	Significant negative effect vs. baseline (countries in this category tend to have lower income levels)
<b>Very High Education</b>	+0.201	0.211	Positive but not significant
<b>Very Low Education</b>	-0.514	0.107	Negative, marginally insignificant

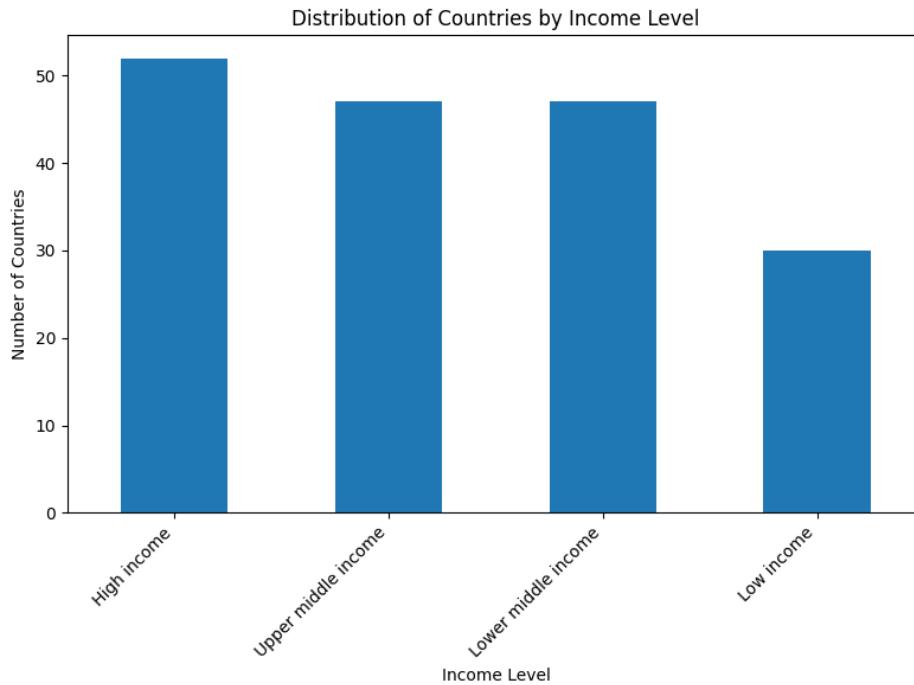
#### 4. Visualization Insights

##### a) Scatter Plot with Regression Line



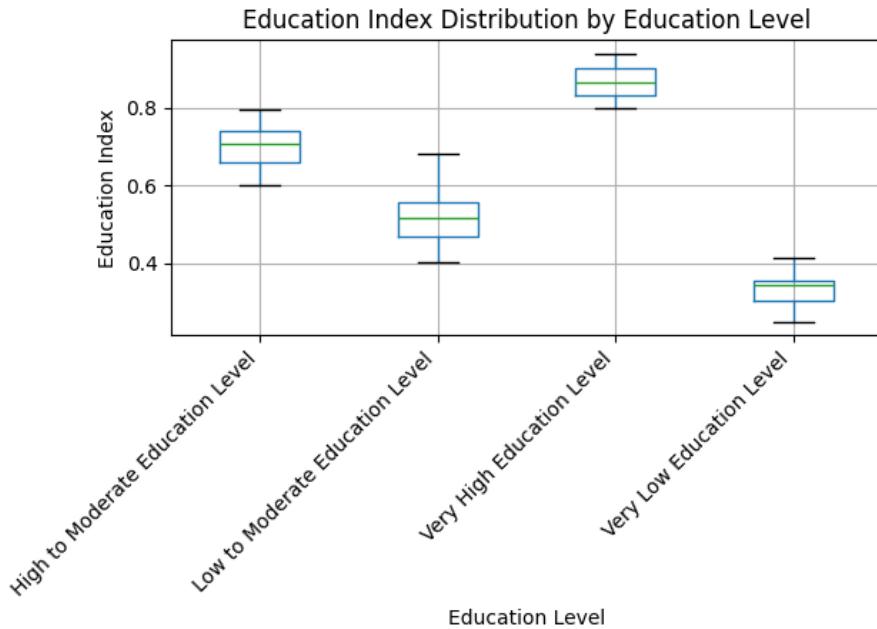
- **Blue dots:** Countries (Education Index vs Income level).
- **Red line:** Predicted income based on Education Index alone.
- **Observation:** A clear upward trend — countries with higher education index values tend to fall into higher income groups.

##### b) Income Distribution (Bar Plot)



- Majority of countries are in **Lower middle** and **Upper middle income** categories.
- Fewer in Low and High extremes.
- Shows that most of the global population lies in the middle-income spectrum.

### c) Boxplot of Education Index by Education Level



- Median **Education Index** rises with higher education levels.
- Wide variation exists, but advanced education levels generally align with better scores.

- Confirms the strong relationship between quality/level of education and national income.

## 5. Interpretation

1. **Education Index is the strongest predictor:** With a coefficient of 3.8 and  $p < 0.001$ , improvements in the index translate directly into higher income classifications.
2. **Education Level matters:** Being in a “Low to Moderate” category significantly reduces income levels compared to the baseline.
3. **Not all dummies are significant:** “Very High” and “Very Low” categories were not statistically significant, possibly due to smaller sample sizes or overlapping effects with Education Index.
4. **High explanatory power:** With  $R^2 \approx 0.76$ , education variables explain most of the variation in income categories.

## 6. Conclusion

- Strong evidence that education drives income levels across countries.
- **Policy implication:** Investment in both *education access* and *quality* is key to lifting countries into higher income brackets.
- The regression confirms that improving the Education Index has the most consistent and statistically significant impact.