

Assignment 2 (DA with AI)

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Coding: https://github.com/Anton21a/DAT_AI.git

Setup

Research Question: How does GDP per capita (PPP) influence self-reported happiness across countries?

For analyzing the relationship between GDP and Happiness, the most appropriate variables from the given dataset are:

Q46 – Feeling of happiness (originally categorical: 1 = Very Happy, 2 = Quite Happy, 3 = Not Very Happy, 4 = Not At All Happy; however the dataset has continuous form of this variable, apparently adjusted for some indicator)

DP_USD_PPP_per_capita – GDP per capita adjusted for purchasing power parity (PPP)

The graph shows a positive but diminishing relationship between GDP per capita (PPP) and happiness on a log-log scale [Fig. 1]. The red regression line indicates that as GDP increases, happiness rises, but at a decreasing rate, supporting the idea of diminishing marginal utility of income.

Heterogeneity

Happiness varies across population groups, with smaller populations showing higher variability in happiness scores, while larger populations tend to have more stable and clustered happiness levels [Fig. 2]. This could reflect greater social cohesion and economic homogeneity in smaller nations, whereas larger populations experience more inequality and diverse living conditions, leading to less extreme happiness variations.

Happiness varies across continents, with Europe and Oceania showing higher and more stable happiness levels, while Africa, Asia, and the Americas exhibit greater variability, reflecting economic and social disparities [Fig. 3]. Africa has the lowest median happiness, likely due to economic challenges, while Europe tends to be the most consistent. This heterogeneity suggests that regional economic conditions, governance, and cultural factors shape happiness levels globally.

Potential Causality

GDP and happiness have a positive but diminishing relationship—higher GDP boosts happiness, but the effect weakens as income rises. The graphs show regional and population-based differences, suggesting that inequality, governance, and social factors play a big role. In larger populations, happiness varies more, meaning income alone doesn't guarantee well-being—it's also about how wealth is distributed and social conditions.

Model

The general model specification follows:

$$\ln(\text{Happiness}) = \beta_0 + \beta_1 \ln(\text{GDP}) + \varepsilon, \quad \text{i.i.d.} \quad (1)$$

The elasticity interpretation makes it easy to compare across countries, showing the percentage change in happiness for a 1% increase in GDP. Log transformation also smooths outliers, reduces skewness, and mitigates heteroskedasticity, leading to more stable variance and well-behaved residuals, improving inference reliability.

Variable	Coefficient (Std. Error)
Constant	0.3290 (0.1687)
Log(GDP)	0.0287 (0.0171)
Observations	63
R^2	0.0441
Adjusted R^2	0.0284
F-statistic	2.8117
p-value (F-stat)	0.0987

Table 1: Regression Results: Log of Happiness vs Log of GDP

Results

A 1% increase in GDP per capita is associated with only a 0.0287% increase in happiness, showing a weak positive effect. The low R^2 (4.4%) suggests GDP alone poorly explains happiness, implying other factors like income distribution and social conditions matter more. The effect is marginally insignificant ($p = 0.099$), meaning GDP's impact on happiness is not strongly supported by the data.

Conclusion

The analysis explored the relationship between GDP per capita and happiness, using a log-log regression model to account for diminishing returns. The results indicate a weak positive correlation ($\beta_1 = 0.0287$), suggesting that while higher GDP increases happiness, its impact is limited. It is mainly explained by a small sample size. The low R^2 (4.4%) highlights that GDP alone does not fully explain happiness, with factors like income distribution, governance, and social conditions playing a crucial role. Regional and population-based heterogeneity further reinforces that happiness is shaped by more than just economic prosperity. Future research should explore social and psychological determinants.

Appendix

Figure 1:

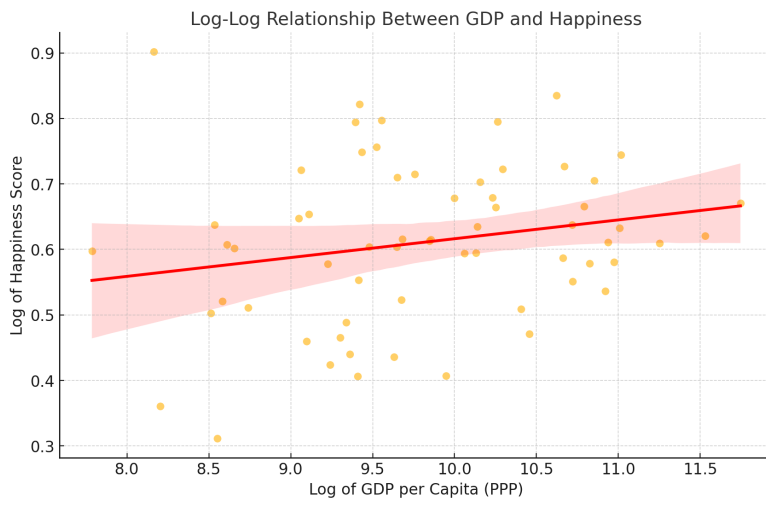


Figure 2:

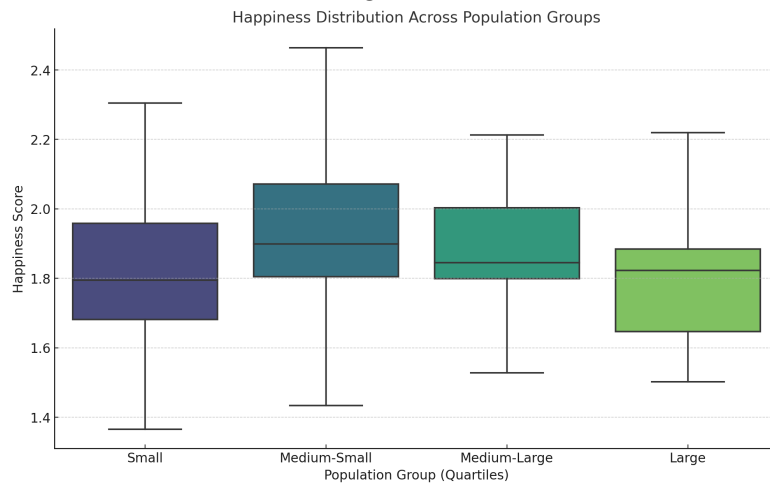


Figure 3:

