

# **An Empirical Comparative Analysis of GDP, GDP per Capita, Purchasing Power Parity and Human Development**

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## **Abstract**

This study presents a cross-sectional empirical comparison of the 50 economies ranked highest by GDP per capita at purchasing power parity (PPP) for 2026. Using IMF World Economic Outlook (April 2026) macroeconomic estimates as presented in IMF-based international tables, the study integrates nominal GDP, nominal GDP per capita, GDP growth, GDP per capita PPP and population, and links these indicators to the latest comparable Human Development Index (HDI) values reported by UNDP for 2023. Descriptive statistics, Pearson correlations, multiple regression and one-way ANOVA are applied. GDP per capita PPP ranges from US\$53,769 to US\$195,372, with a mean of US\$86,186.54 and a coefficient of variation of approximately 36.76%. Population is strongly associated with total GDP ( $r=.965$ ,  $p<.001$ ), whereas total GDP is not significantly associated with nominal GDP per capita ( $r=.050$ ,  $p=.729$ ). GDP per capita PPP is not significantly correlated with HDI in this restricted high-PPP sample ( $r=.144$ ,  $p=.362$ ). In the multivariate HDI model, GDP per capita PPP has a positive but non-significant coefficient at the 5% level ( $B=.0321$ ,  $p=.086$ ), while growth and population show statistically significant associations. The findings demonstrate that economic scale, purchasing-power-adjusted prosperity and human development are complementary rather than interchangeable dimensions.

## **Keywords**

GDP; GDP per capita; purchasing power parity; GDP per capita PPP; HDI; economic prosperity; human development; cross-country analysis; 2026

## **1. Introduction**

GDP is widely used to describe the scale of economic activity, while GDP per capita provides a population-adjusted measure. Purchasing power parity improves international comparisons by accounting for differences in price levels. However, economic size and per-person prosperity can diverge substantially because economies differ in population, productivity, prices and institutions. This study examines the 50 economies ranked highest by GDP per capita PPP in 2026 and links monetary indicators to HDI, a multidimensional measure incorporating health, education and standard of living.

## 2. Research Problem and Gap

International rankings often report total GDP, GDP per capita, GDP per capita PPP and HDI separately. This can obscure how economic scale, purchasing power and human development differ within the same group of prosperous economies. The study addresses this gap through an integrated cross-sectional framework. Because the sample is concentrated in the upper tail of GDP per capita PPP, range restriction is explicitly considered when interpreting weak correlations.

## 3. Objectives

1. Describe the distribution of GDP per capita PPP among the top 50 economies.
2. Compare total GDP, nominal GDP per capita and GDP per capita PPP.
3. Examine population–GDP association.
4. Test the relationship between GDP per capita PPP and HDI.
5. Assess GDP growth in relation to GDP per capita PPP.
6. Estimate the contribution of PPP prosperity, growth and population to HDI.

## 4. Research Questions

- RQ1: How widely does GDP per capita PPP vary?
- RQ2: Does economic size correspond to nominal per-person GDP?
- RQ3: Is population significantly associated with total GDP?
- RQ4: Is GDP per capita PPP significantly associated with HDI?
- RQ5: Is GDP growth associated with GDP per capita PPP?
- RQ6: Do PPP prosperity, growth and population jointly explain HDI variation?

## 5. Hypotheses

- H1: HDI differs significantly across GDP per capita PPP quartiles.
- H2: Total GDP is significantly associated with nominal GDP per capita.
- H3: Population is positively and significantly associated with total GDP.
- H4: GDP per capita PPP is positively and significantly associated with HDI.
- H5: GDP growth is significantly associated with GDP per capita PPP.
- H6: GDP per capita PPP significantly predicts HDI after controlling for growth and population.

## 6. Conceptual Framework

Total GDP represents economic scale; nominal GDP per capita represents population-adjusted output; GDP per capita PPP represents purchasing-power-adjusted prosperity; and HDI represents broader human development. Population and GDP growth are contextual variables. The framework does not assume that monetary prosperity automatically causes human development.

## 7. Literature Review

Research on development questions whether GDP alone adequately represents social progress. Dědeček and Dudzich (2022) discuss limitations of GDP per capita as an indicator of development, while Rehman (2023) proposes effective GDP as a broader comparison concept. Djokoto (2022) reports a positive relationship between economic development and human development in a broad cross-country setting, but relationships vary by sample and development stage. UNDP's HDI methodology combines health, education and standard of living, confirming that HDI is conceptually distinct from GDP per capita.

## 8. Methodology

Design: quantitative, comparative, cross-sectional secondary-data research.

Sample: the 50 economies ranked highest by 2026 GDP per capita PPP. Macroeconomic observations use the IMF World Economic Outlook April 2026 vintage. HDI uses UNDP Human Development Report 2025, whose latest comparable observations refer to 2023. Eight selected economies lack comparable HDI observations in the cited UNDP dataset; therefore HDI analyses use N=42 without imputation.

Population is calculated as nominal GDP divided by nominal GDP per capita where required for internal consistency, and PPP GDP is population multiplied by GDP per capita PPP. These are derived consistency measures.

## 9. Variable Operationalization

Total GDP: nominal GDP in US\$ billion.

GDP per capita: nominal GDP per person.

GDP growth: 2026 real GDP growth estimate.

GDP per capita PPP: purchasing-power-adjusted GDP per person in international dollars.

Population: million persons. HDI: UNDP composite index ranging from 0 to 1.

## 10. Descriptive Analysis

GDP per capita PPP has N=50, mean US\$86,186.54, median US\$78,470.50, sample SD US\$31,679.55, minimum US\$53,769 and maximum US\$195,372.

The range is US\$141,603 and the maximum/minimum ratio is 3.63.

The coefficient of variation is approximately 36.76%, indicating substantial dispersion despite the deliberately high-income/PPP sample.

## 11. Correlation Analysis

Population and total GDP:  $r=.965$ ,  $p<.001$ .

Total GDP and nominal GDP per capita:  $r=.050$ ,  $p=.729$ .

GDP per capita PPP and HDI:  $r=.144$ ,  $p=.362$ .

The strong population–GDP relationship is consistent with the scale structure of aggregate output, while the near-zero GDP-size/per-capita relationship demonstrates that large economies need not have the highest per-person output.

## 12. Regression Analysis

Model 1:  $\ln(\text{GDPpcPPP}) = \beta_0 + \beta_1 \ln(\text{GDP}) + \beta_2 \ln(\text{Population}) + \beta_3 \text{Growth} + \varepsilon$ .

$R^2=.612$ ; adjusted  $R^2=.587$ ; overall model  $p<.001$ .

Model 2:  $\text{HDI} = \beta_0 + \beta_1 \ln(\text{GDPpcPPP}) + \beta_2 \text{Growth} + \beta_3 \ln(\text{Population}) + \varepsilon$ ,

$N=42$ .  $R^2=.258$ ; adjusted  $R^2=.199$ ;  $F(3,38)=4.398$ ,  $p=.009$ .

Coefficients:  $\ln(\text{GDPpcPPP})$   $B=.0321$ ,  $p=.086$ ;  $\text{Growth}$   $B=-.0045$ ,  $p=.015$ ;  $\ln(\text{Population})$   $B=.0057$ ,  $p=.043$ .

Thus the overall HDI model is significant, but the PPP-per-capita coefficient is not significant at the 5% level.

## 13. ANOVA

A one-way ANOVA comparing HDI across four GDP per capita PPP quartiles produced  $F=1.525$ ,  $p=.224$ . Therefore, the sample does not provide evidence of statistically significant mean HDI differences across the four PPP quartiles at the 5% level.

## 14. Hypothesis Testing Summary

H1 Not supported (ANOVA  $p=.224$ ).

H2 Not supported ( $r=.050$ ,  $p=.729$ ).

H3 Supported ( $r=.965$ ,  $p<.001$ ).

H4 Not supported ( $r=.144$ ,  $p=.362$ ).

H5 Not supported at the 5% level.

H6 Not supported at the 5% level ( $B=.0321$ ,  $p=.086$ ).

## 15. BRICS Comparison

The 2026 GDP per capita PPP values used for an illustrative comparison are: United Arab Emirates 87,774; Russia 52,479; China 31,596; Brazil 24,428; Egypt 23,321; Iran 20,279; Indonesia 18,973; South Africa 16,740; India 12,801; Ethiopia 4,974. This comparison is descriptive and illustrates the difference between membership in a major economic grouping and per-person purchasing power.

## 16. Discussion

The results reinforce the distinction between economic scale and per-person prosperity. Population explains a large share of variation in aggregate GDP, but aggregate GDP has virtually no linear relationship with nominal GDP per capita in this sample. The weak PPP-per-capita/HDI relationship should not be generalized to all economies because the sample is range-restricted and HDI captures dimensions beyond income. The positive but non-significant regression coefficient supports a cautious interpretation rather than a claim that income and human development are unrelated.

## 17. Implications

Economic reporting should present total GDP and per-capita measures separately. PPP-adjusted measures are useful for purchasing-power comparisons but should be complemented by health, education and distributional indicators. Business analysis can use GDP for market scale and GDP per capita PPP for purchasing-power context. Researchers should account for sample selection and range restriction in international comparisons.

## 18. Limitations and Future Research

The study is cross-sectional and does not establish causality. 2026 macroeconomic figures are estimates/projections and may be revised. HDI is latest comparable for 2023 rather than 2026. Several selected economies lack comparable HDI observations. Derived variables depend on the consistency of the underlying nominal and per-capita series. Future studies should use panel data, inequality-adjusted indicators, broader samples and alternative well-being measures.

## 19. Conclusion

The study provides an integrated empirical comparison of 50 high GDP-per-capita-PPP economies in 2026. Economic scale, nominal per-person output, purchasing-power-adjusted prosperity and human development should be treated as complementary indicators. Population is strongly associated with total GDP, while total GDP is not significantly associated with nominal GDP per capita. GDP per capita PPP is not significantly related to HDI at the 5% level in this restricted sample. The findings highlight the importance of indicator selection, sample design and conceptual clarity in global economic comparison.

## 20. Top 50 Economies by GDP per Capita PPP, 2026

| Rank | Economy              | GDP per Capita (US\$) | GDP per Capita PPP (Intl\$) |
|------|----------------------|-----------------------|-----------------------------|
| 1    | Liechtenstein        | 226,809               | 195,372                     |
| 2    | Singapore            | 107,758               | 173,708                     |
| 3    | Ireland              | 140,186               | 159,129                     |
| 4    | Luxembourg           | 158,733               | 156,719                     |
| 5    | Macao                | 76,446                | 140,423                     |
| 6    | Bermuda              | 142,250               | 124,253                     |
| 7    | Norway               | 105,877               | 115,548                     |
| 8    | Qatar                | 68,138                | 112,312                     |
| 9    | Switzerland          | 126,177               | 105,680                     |
| 10   | Taiwan               | 42,103                | 98,051                      |
| 11   | Brunei               | 36,288                | 97,858                      |
| 12   | Guyana               | 33,167                | 95,477                      |
| 13   | United States        | 94,430                | 94,430                      |
| 14   | Denmark              | 83,445                | 89,667                      |
| 15   | Cayman Islands       | 104,293               | 88,428                      |
| 16   | United Arab Emirates | 54,214                | 87,774                      |
| 17   | Netherlands          | 79,918                | 87,773                      |
| 18   | San Marino           | 70,187                | 87,141                      |
| 19   | Hong Kong            | 59,640                | 84,212                      |
| 20   | Iceland              | 110,048               | 82,730                      |
| 21   | Malta                | 53,560                | 82,421                      |
| 22   | Faroe Islands        | 74,175                | 81,909                      |
| 23   | Greenland            | 58,499                | 78,841                      |
| 24   | Saudi Arabia         | 37,811                | 78,815                      |
| 25   | Belgium              | 65,112                | 78,607                      |
| 26   | Austria              | 67,761                | 78,334                      |
| 27   | Sweden               | 70,676                | 77,094                      |
| 28   | Germany              | 65,303                | 76,747                      |
| 29   | Andorra              | 53,475                | 75,988                      |
| 30   | Australia            | 75,648                | 74,755                      |
| 31   | Bahrain              | 29,569                | 70,165                      |
| 32   | Canada               | 60,305                | 70,006                      |
| 33   | Finland              | 60,130                | 68,861                      |
| 34   | South Korea          | 37,412                | 68,624                      |
| 35   | France               | 52,083                | 68,567                      |
| 36   | Cyprus               | 45,409                | 67,796                      |
| 37   | United Kingdom       | 61,056                | 67,585                      |
| 38   | Italy                | 46,505                | 65,761                      |
| 39   | Czechia              | 39,795                | 63,550                      |
| 40   | Lithuania            | 36,545                | 61,052                      |
| 41   | Slovenia             | 40,630                | 60,664                      |
| 42   | Poland               | 31,336                | 59,792                      |
| 43   | Japan                | 35,703                | 59,207                      |
| 44   | Spain                | 41,563                | 59,187                      |

|    |              |        |        |
|----|--------------|--------|--------|
| 45 | Israel       | 69,804 | 59,095 |
| 46 | Aruba        | 42,862 | 58,480 |
| 47 | New Zealand  | 52,023 | 58,308 |
| 48 | Croatia      | 30,030 | 54,359 |
| 49 | Kuwait       | 33,164 | 54,303 |
| 50 | Sint Maarten | 42,978 | 53,769 |

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## Appendix A. Master Dataset

| Economy              | GDP per Capita | GDP per Capita PPP | HDI 2023 | HDI availability         |
|----------------------|----------------|--------------------|----------|--------------------------|
| Liechtenstein        | 226,809        | 195,372            | 0.938    | Available                |
| Singapore            | 107,758        | 173,708            | 0.946    | Available                |
| Ireland              | 140,186        | 159,129            | 0.949    | Available                |
| Luxembourg           | 158,733        | 156,719            | 0.922    | Available                |
| Macao                | 76,446         | 140,423            | NA       | No comparable UNDP value |
| Bermuda              | 142,250        | 124,253            | NA       | No comparable UNDP value |
| Norway               | 105,877        | 115,548            | 0.970    | Available                |
| Qatar                | 68,138         | 112,312            | 0.886    | Available                |
| Switzerland          | 126,177        | 105,680            | 0.970    | Available                |
| Taiwan               | 42,103         | 98,051             | NA       | No comparable UNDP value |
| Brunei               | 36,288         | 97,858             | 0.837    | Available                |
| Guyana               | 33,167         | 95,477             | 0.776    | Available                |
| United States        | 94,430         | 94,430             | 0.938    | Available                |
| Denmark              | 83,445         | 89,667             | 0.962    | Available                |
| Cayman Islands       | 104,293        | 88,428             | NA       | No comparable UNDP value |
| United Arab Emirates | 54,214         | 87,774             | 0.940    | Available                |
| Netherlands          | 79,918         | 87,773             | 0.955    | Available                |
| San Marino           | 70,187         | 87,141             | 0.915    | Available                |
| Hong Kong            | 59,640         | 84,212             | 0.955    | Available                |
| Iceland              | 110,048        | 82,730             | 0.972    | Available                |
| Malta                | 53,560         | 82,421             | 0.924    | Available                |
| Faroe Islands        | 74,175         | 81,909             | NA       | No comparable UNDP value |
| Greenland            | 58,499         | 78,841             | NA       | No comparable UNDP value |
| Saudi Arabia         | 37,811         | 78,815             | 0.900    | Available                |
| Belgium              | 65,112         | 78,607             | 0.951    | Available                |
| Austria              | 67,761         | 78,334             | 0.930    | Available                |
| Sweden               | 70,676         | 77,094             | 0.959    | Available                |
| Germany              | 65,303         | 76,747             | 0.959    | Available                |
| Andorra              | 53,475         | 75,988             | 0.913    | Available                |
| Australia            | 75,648         | 74,755             | 0.958    | Available                |
| Bahrain              | 29,569         | 70,165             | 0.899    | Available                |
| Canada               | 60,305         | 70,006             | 0.939    | Available                |
| Finland              | 60,130         | 68,861             | 0.948    | Available                |
| South Korea          | 37,412         | 68,624             | 0.937    | Available                |
| France               | 52,083         | 68,567             | 0.920    | Available                |
| Cyprus               | 45,409         | 67,796             | 0.913    | Available                |
| United Kingdom       | 61,056         | 67,585             | 0.946    | Available                |

|              |        |        |       |                             |
|--------------|--------|--------|-------|-----------------------------|
| Italy        | 46,505 | 65,761 | 0.915 | Available                   |
| Czechia      | 39,795 | 63,550 | 0.915 | Available                   |
| Lithuania    | 36,545 | 61,052 | 0.895 | Available                   |
| Slovenia     | 40,630 | 60,664 | 0.931 | Available                   |
| Poland       | 31,336 | 59,792 | 0.906 | Available                   |
| Japan        | 35,703 | 59,207 | 0.925 | Available                   |
| Spain        | 41,563 | 59,187 | 0.918 | Available                   |
| Israel       | 69,804 | 59,095 | 0.919 | Available                   |
| Aruba        | 42,862 | 58,480 | NA    | No comparable<br>UNDP value |
| New Zealand  | 52,023 | 58,308 | 0.938 | Available                   |
| Croatia      | 30,030 | 54,359 | 0.889 | Available                   |
| Kuwait       | 33,164 | 54,303 | 0.852 | Available                   |
| Sint Maarten | 42,978 | 53,769 | NA    | No comparable<br>UNDP value |