

# Economic Development Across Income Groups

Mark Arshavsky (2556041)      Chloe Guerrero (2578787)  
Tiffany Wickens (2537894)      Laura Zang (2549139)  
Chloe Zhao (2593352)

## Introduction

Global differences in economic development are a persistent and consequential feature of the global economy that shape patterns of opportunity, wellbeing, and inequality. The World Bank offers classifications that help us examine disparities across countries at different stages of development. In this project, we analyze data from the World Development Indicators (WDI) to compare patterns of economic development across income groups from 2000 to 2023. The project intends to explore these long-term dynamics.

## Data Description

### Data Sources and Indicators

This project uses data from the World Bank World Development Indicators (WDI) database. We focus on three core measures of economic development: GDP per capita (constant USD), annual GDP growth, and the employment-to-population ratio.

### Data Preparation and Cleaning

- The raw WDI data were imported into a SQLite database and reshaped from a wide format into a country-year structure. All indicators were combined into a unified dataset to support consistent cleaning and analysis.
- The dataset was filtered to the 2000–2023 period to ensure comparability across indicators. Country and indicator metadata were separated from yearly observations to streamline analysis, and countries without income group classifications were excluded from income-group-based summaries.

### Income Group Classification

Countries were categorized using World Bank income group classifications, which were linked to the country-year data using standard country codes. This

framework enables systematic comparison of economic outcomes across income levels.

### Summary of Key Variables

- Table 1 summarizes the distribution of GDP per capita, GDP growth, and employment ratios across income groups. GDP per capita differs substantially across income classifications, while GDP growth and employment ratios exhibit more moderate variation.

Table 1: Average GDP per capita, GDP growth, and employment ratios by World Bank income group (2000–2023).

	income_group	n_country_years	avg_emp_ratio	avg_gdp_growth	avg_gdp_pc
0	High income	2064	57.22	2.54	35295.24
1	Upper middle income	1296	53.23	3.57	5815.63
2	Lower middle income	1200	55.21	4.20	2030.59
3	Low income	600	61.35	3.77	703.20

- Table 2 reports yearly average values of GDP per capita, GDP growth, and employment ratios by World Bank income group over the period 2000–2023.

Table 2: Yearly averages of economic indicators by income group.

	income_group	year	avg_emp_ratio	avg_gdp_growth	avg_gdp_pc
0	High income	2000	56.10	4.85	29733.48
1	High income	2001	56.18	2.40	30204.97
2	High income	2002	56.03	2.36	30339.30
3	High income	2003	55.97	3.08	30894.56
4	High income	2004	56.21	4.83	32013.04

### Data Analysis

	income_group	avg_gdp_pc_mean	avg_gdp_pc_median	avg_gdp_pc_std	avg_gdp_pc_min
0	High income	35295.24	35295.24	NaN	1
1	Low income	703.20	703.20	NaN	1
2	Lower middle income	2030.59	2030.59	NaN	1
3	Upper middle income	5815.63	5815.63	NaN	1

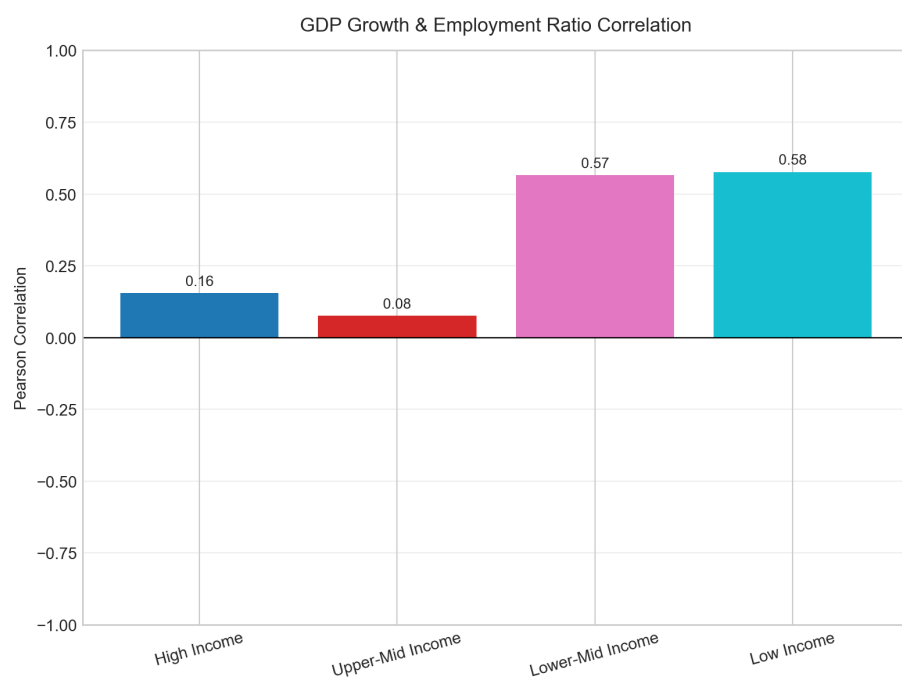


Figure 1: Correlation between GDP growth and employment-to-population ratios by income group.

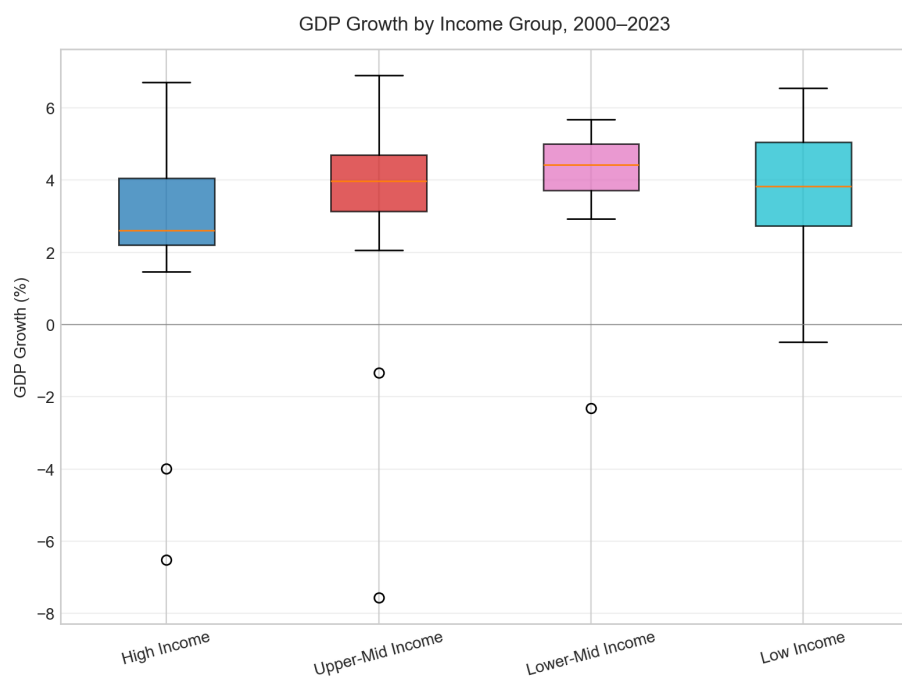


Figure 2: Distribution of annual GDP growth rates by income group, 2000–2023.

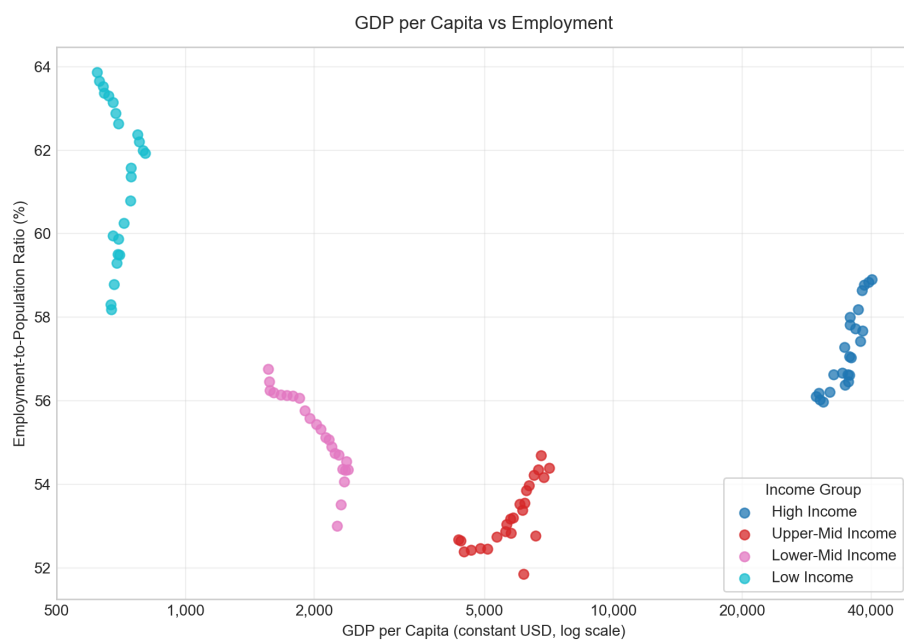


Figure 3: Relationship between GDP per capita and employment-to-population ratios by income group.

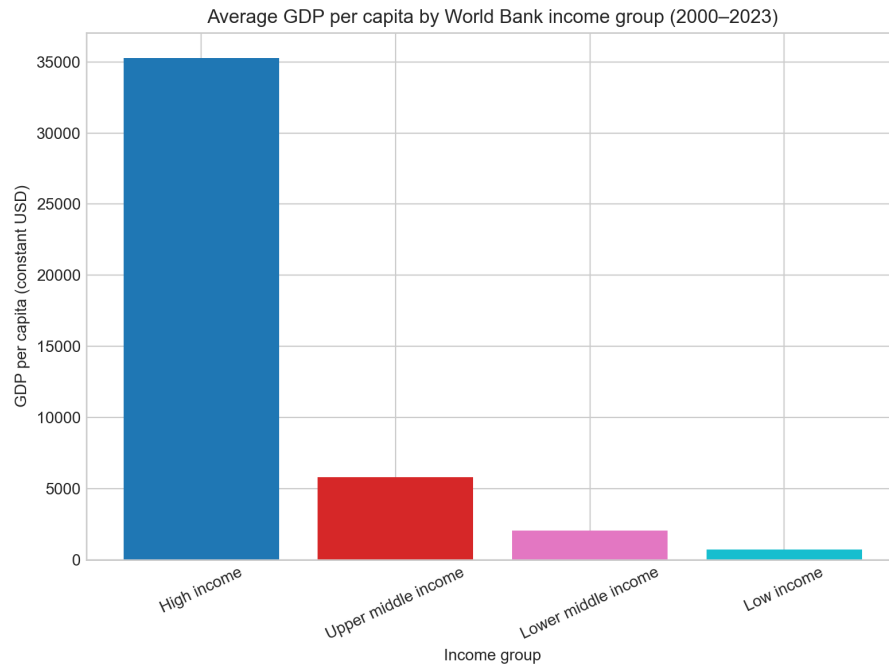


Figure 4: Average GDP per capita by World Bank income group, 2000–2023.

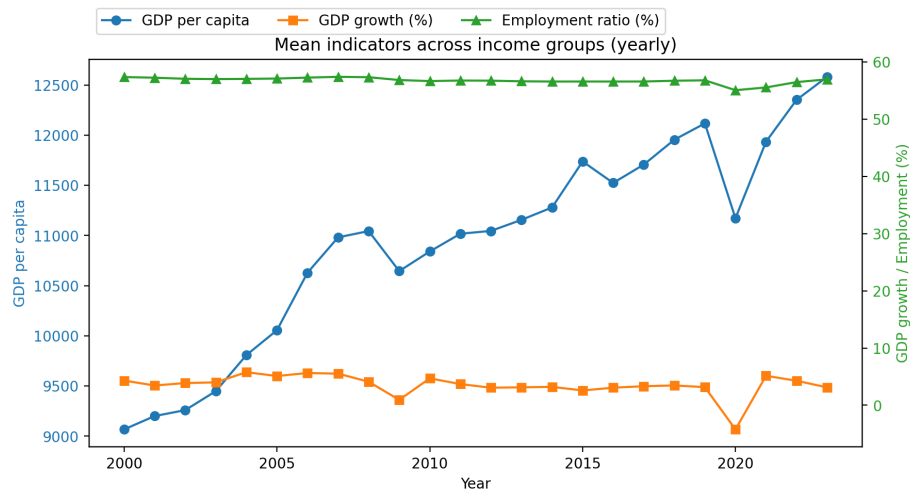


Figure 5: Global mean GDP per capita, GDP growth, and employment ratios over time.

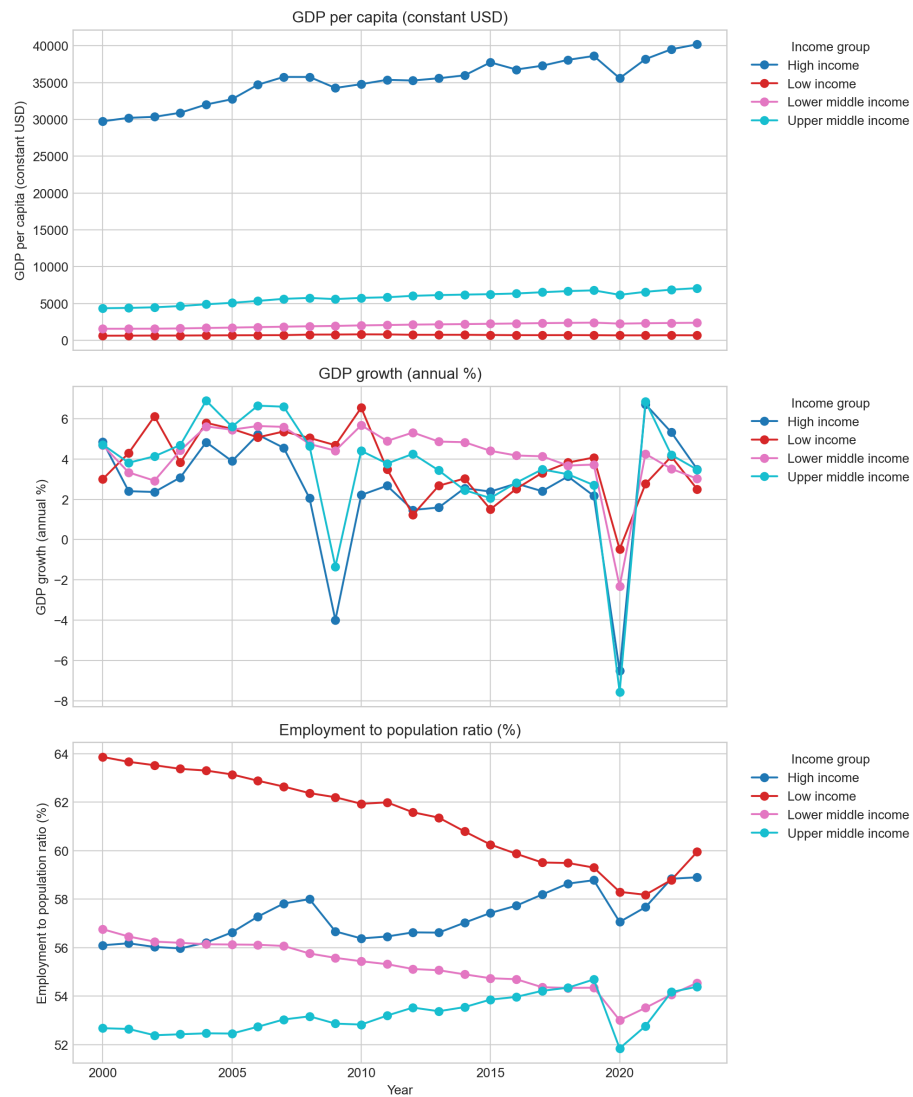


Figure 6: Trends in economic indicators over time by World Bank income group.

Table 4: Yearly averages of key economic indicators aggregated across income groups.

	year	avg_gdp_pc	avg_gdp_growth	avg_emp_ratio
0	2000	9066.7200	4.3100	57.3500
1	2001	9199.7850	3.4575	57.2375
2	2002	9259.0250	3.8800	57.0475
3	2003	9448.0750	4.0025	56.9925
4	2004	9807.7050	5.7800	57.0300
5	2005	10055.6025	5.1075	57.0900
6	2006	10628.8725	5.6350	57.2550
7	2007	10981.2725	5.5225	57.3925
8	2008	11043.9625	4.1150	57.3250
9	2009	10644.8775	0.9400	56.8300
10	2010	10840.4850	4.7050	56.6450
11	2011	11017.3600	3.7050	56.7425
12	2012	11045.4650	3.0650	56.7150
13	2013	11156.0475	3.1375	56.6075
14	2014	11279.1900	3.2150	56.5675
15	2015	11737.8825	2.5850	56.5700
16	2016	11524.0525	3.0725	56.5675
17	2017	11706.4900	3.3300	56.5725
18	2018	11954.5600	3.4650	56.7050
19	2019	12117.4825	3.1650	56.7800
20	2020	11171.2475	-4.2175	55.0550
21	2021	11934.8850	5.1425	55.5350
22	2022	12352.6750	4.2875	56.4675
23	2023	12581.7650	3.1200	56.9475

## Results & Discussion

### Differences in Economic Outcomes Across Income Groups

Figure 4 illustrates substantial differences in average GDP per capita across World Bank income classifications over the 2000–2023 period. High-income countries exhibit by far the highest average GDP per capita, exceeding \$35,000 (constant USD), while upper-middle-income countries average approximately \$6,000. Lower-middle-income and low-income countries trail significantly behind, with average GDP per capita below \$3,000 and \$1,000 respectively. These disparities highlight persistent global inequality in income levels and economic capacity.

In contrast, employment-to-population ratios show relatively modest variation across income groups (Table 1). While low-income countries tend to exhibit slightly higher employment ratios than high-income countries, the differences are small relative to income gaps. This suggests that employment rates alone do



not capture differences in economic well-being, as employment in lower-income countries may be concentrated in lower-productivity and lower-wage activities.

### **Global Trends in Economic Indicators Over Time**

Figure 5 presents average global trends in GDP per capita, GDP growth, and employment-to-population ratios. GDP per capita increases steadily from 2000 through 2019, reflecting sustained global economic expansion. A sharp decline occurs in 2020, coinciding with the economic impacts of the COVID-19 pandemic, followed by a partial recovery in subsequent years.

GDP growth rates display greater year-to-year volatility than GDP per capita, fluctuating around 2–4% for most of the sample period. The most pronounced contraction appears in 2020, when global growth becomes strongly negative. Employment-to-population ratios remain relatively stable over time, though a noticeable decline around 2020 indicates widespread labor market disruptions during the global downturn.

### **Income-Group-Specific Dynamics**

Disaggregating trends by income group reveals important heterogeneity (Figure 6). High-income countries consistently maintain the highest GDP per capita throughout the period, with gradual long-term growth interrupted mainly by global crises such as the 2008 financial crisis and the COVID-19 pandemic. Upper-middle-income countries experience steady growth in GDP per capita, modestly narrowing the gap with high-income economies, although substantial differences remain.

GDP growth rates across income groups follow similar cyclical patterns, suggesting that global economic shocks affect countries across development levels simultaneously. However, growth volatility is more pronounced in middle- and lower-income countries, indicating greater macroeconomic vulnerability. Employment-to-population ratios differ more visibly: low-income countries generally maintain higher employment ratios, while high-income countries exhibit lower but more stable employment levels, reflecting differences in demographics, labor market institutions, and economic structure.

### **Interpretation and Implications**

Overall, the results suggest that while global economic growth has raised GDP per capita across all income groups, convergence between low-income and high-income countries remains limited. Persistent income gaps indicate that differences in productivity, technological adoption, and capital accumulation continue to play a central role in shaping global inequality. The relative similarity of employment rates across income groups further emphasizes that productivity, rather than labor force participation, is a key determinant of economic development.

### **Limitations**

This analysis relies on income-group averages, which mask substantial heterogeneity within groups and across individual countries. In addition, missing observations for some countries and years may affect the precision of summary statistics. Future work could extend this analysis by focusing on regional patterns or conducting country-level analyses to better understand specific development trajectories.

### **Conclusion**

The evidence from 2000-2003 reveals a global economy characterized by changes in developmental indicators, and we see that structural inequality across income groups persists. All groups experienced gains in GDP per capita, but there remains a substantial disparity between high- and low-income countries. GDP growth rates tend to respond similarly to major global shocks, which suggests interconnected economic dynamics, though lower- and middle-income countries face greater volatility. Employment rates remain relatively stable and more equal, highlighting that differences in productivity drive most variation in economic well-being. Thus, we find that global development has advanced, but longstanding differences in economic capacity continue to shape countries' development.