Educational Access and Economic Mobility in the Americas (1970-2023)

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1 Introduction

This study investigates the relationship between educational access and economic mobility in various regions across the Americas. Specifically, it addresses the question: How does educational access, measured by primary school enrollment, influence economic mobility, measured by GDP per capita? Understanding this relationship is crucial because educational attainment is often seen as a key driver of individual development and national economic growth. This analysis aims to uncover whether a clear correlation between these two important indicators exists across the Americas from 1970 to 2023.

2 Data Sources

For this analysis, we utilized two CSV datasets obtained from the World Bank Open Data: rimary School Enrollment (% gross)[1] and GDP per capita (current US$)[2]. The datasets were processed through an automated ETL pipeline. The Primary School Enrollment dataset provides gross enrollment ratios for primary education from 1970 to 2023, covering countries across the Americas. Similarly, the GDP per capita dataset offers annual GDP per capita values, measured in current US dollars, from 1960 to 2023, with a similar geographic scope (primarily the Americas) . Thus, the datasets capture different features related to economic development and primary education, providing a comprehensive view of their relationship and temporal trends.

The data pipeline ensures that both datasets are cleaned and transformed as required for the analysis. The final datasets (pipeline output) are complete with no missing values (after mean imputation) and contain only relevant features. Both datasets are structured with temporal, categorical (Country Name and Code) and continuous (yearly values) features. The Enrollment_Mean and GDP_Mean variables represent a mean of the temporal data across all the available years (from 1970 to 2023).

While the Primary School Enrollment dataset includes gross enrollment ratios for primary education, the GDP per capita dataset includes economic data in current US dollars (as shown in Fig. 1 and Fig. 2).

Data Source	World Development Indicators						
Last Updated	16/12/2024						
Country Nam	Country Cod	Indicator Nai	Indicator Co	1970	1971	1972	1973
Aruba	ABW	School enroll	SE.PRM.ENRR				
Africa Easter	AFE	School enroll	SE.PRM.ENR	59.6303101	59.7743301	60.5354385	61.7024384
Afghanistan	AFG	School enroll	SE.PRM.ENR	33.4200096	34.3313408	34.7526817	35.2143707
Africa Weste	AFW	School enroll	SE.PRM.ENR	43.1883202	44.8060188	46.8385811	48.4117813
Angola	AGO	School enroll	SE.PRM.ENRR		59.0612411	64.032608	66.0256424
Albania	ALB	School enroll	SE.PRM.ENRR				
Andorra	AND	School enroll	SE.PRM.ENRR				
Arab World	ARB	School enroll	SE.PRM.ENR	66.118103	66.1768417	67.5715408	68.7226868
United Arab E	ARE	School enroll	SE.PRM.ENRR		61.6533089	68.8501282	74.6328888

Figure 1: Samples from the Primary School Enrollment dataset

Data Source	World Development Indicators								
Last Updated	16/12/2024								
Country Nam	Country Cod	Indicator Nai	Indicator Co	1960	1961	1962	1963	1964	1965
Aruba	ABW	GDP per capi	NY.GDP.PCAP.CD						
Africa Easter	AFE	GDP per capi	NY.GDP.PCA	186.132432	186.947182	197.408105	225.447007	209.005786	226.883067
Afghanistan	AFG	GDP per capi	NY.GDP.PCAP.CD						
Africa Weste	AFW	GDP per capi	NY.GDP.PCA	121.938353	127.452629	133.825452	139.006714	148.547736	155.563837
Angola	AGO	GDP per capi	NY.GDP.PCAP.CD						
Albania	ALB	GDP per capi	NY.GDP.PCAP.CD						
Andorra	AND	GDP per capi	NY.GDP.PCAP.CD						
Arab World	ARB	GDP per capi	NY.GDP.PCAP.CD		212.889661	210.805414	225.800629	243.897431	256.180141
United Arab E	ARE	GDP per capi	NY.GDP.PCAP.CD						

Figure 2: Samples from the GDP per capita dataset

2.1 Data Structure

The Primary School Enrollment dataset includes temporal features (Year), categorical features (Country Name, Country Code), and continuous features (Gross Enrollment Ratio).

The GDP per capita dataset is also structured with temporal, categorical and continuous features. It includes temporal features (Year), categorical features (Country Name, Country Code), and continuous features (GDP per capita).

2.2 License

Both datasets are licensed under the Creative Commons Attribution 4.0 International License[3]. This license permits sharing and adapting the datasets for any purpose provided that appropriate credit is given. To comply with the licensing terms, I will ensure proper attribution is given to the World Bank and the creators of the datasets in all uses and publications. This will include citing the source in any reports, presentations, or publications resulting from this analysis. Additionally, any shared or adapted versions of the datasets will include the same CC BY 4.0 license, maintaining transparency and allowing further use by other researchers.

3 Analysis

3.1 Method

To investigate the relationship between education and economic mobility, mean primary school enrollment rates (Enrollment_Mean) and mean GDP per capita (GDP_Mean) were calculated for each country by averaging the annual values across the period from 1970 to 2023. The Pearson correlation coefficient was then used to quantify the linear relationship between these two mean variables. A positive correlation indicates that high enrollment is associated with high GDP, a negative correlation means the opposite and a correlation of zero indicates that they are unrelated. All the calculations are focused on countries within the Americas using the list: [”United States”, ”Canada”, ”Mexico”, ”Guatemala”, ”Honduras”, ”Costa Rica”, ”Brazil”, ”Argentina”, ”Colombia”, ”Chile”]

3.2 Results

The analysis resulted in the following key statistics:
Enrollment_Mean:

- Mean: 105.32
- Standard Deviation: 10.37
- Minimum: 70.64
- Maximum: 132.77

GDP_Mean:

- Mean: 9967.67
- Standard Deviation: 6672.35
- Minimum: 893.50
- Maximum: 29353.02

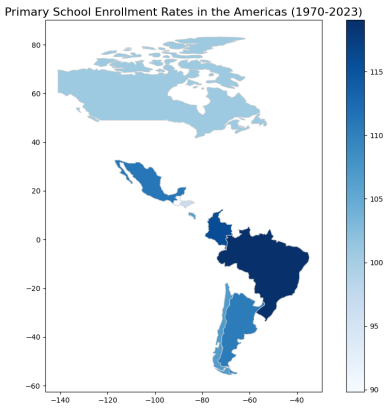

Figure 3: Enrollment rates

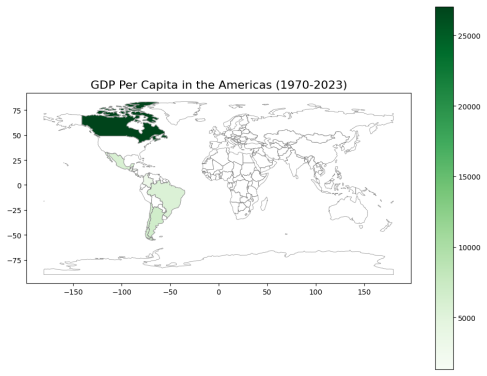

Figure 4: GDP per capita

The Pearson correlation coefficient between Enrollment_Mean and GDP_Mean was calculated as -0.11.

As specific observations, Argentina has very high enrollment (110.65) with a mean GDP of 4913.69, while the United States has lower enrollment(102.85) but much higher GDP(29353.02).

3.3 Interpretations

The calculated mean values represent the average level of primary school enrollment and GDP per capita for the given period across countries in the Americas. The standard deviation is indicative of the variability in GDP per capita. The Pearson correlation coefficient of -0.11 suggests a very weak, almost negligible, negative linear relationship between average primary school enrollment and GDP per capita. In other words, there is no clear trend between higher average primary enrollment rates and increased economic output as measured by GDP per capita. This does not imply that there is no connection, only that a simple direct linear relationship is not clearly present in the data.

4 Conclusions

The results indicate a very weak and negative correlation (-0.11) between the mean primary school enrollment and GDP per capita for the countries considered. It is important to note that this correlation does not establish a causal relationship; other factors may influence both education and economic growth independently.

4.1 Critical Reflection

This analysis could not completely determine the full scope of educational influence on economic mobility. The weak negative correlation suggests a lack of a straightforward and direct linear relationship.

- The method used to fill NA values with column-wise means could introduce bias by not accurately reflecting specific country or regional trends.
- The use of aggregated data for each country may mask variations within those countries.
- Differences in reporting standards and practices between countries could limit the comparability of the data.
- The analysis only considers primary education enrollment and does not account for factors such as the quality of education, access to higher levels of education, or other socio-economic factors that might influence economic mobility.

While this analysis provides an initial perspective on the relation between enrollment and GDP, further research is required to investigate these limitations and factors that might influence these two variables.

References

[1] World Bank. School enrollment, primary (% gross), 2024. URL https://databank.worldbank.org/reports.aspx?source=2&type=metadata&series=SE.PRM.ENRR. World Bank Open Data.

[2] World Bank. Gdp per capita (current us$), 2024. URL https://databank.worldbank.org/reports.aspx?source=2&type=metadata&series=NY.GDP.PCAP.CD. World Bank Open Data.

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