Worldbank Education Analysis

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Introduction

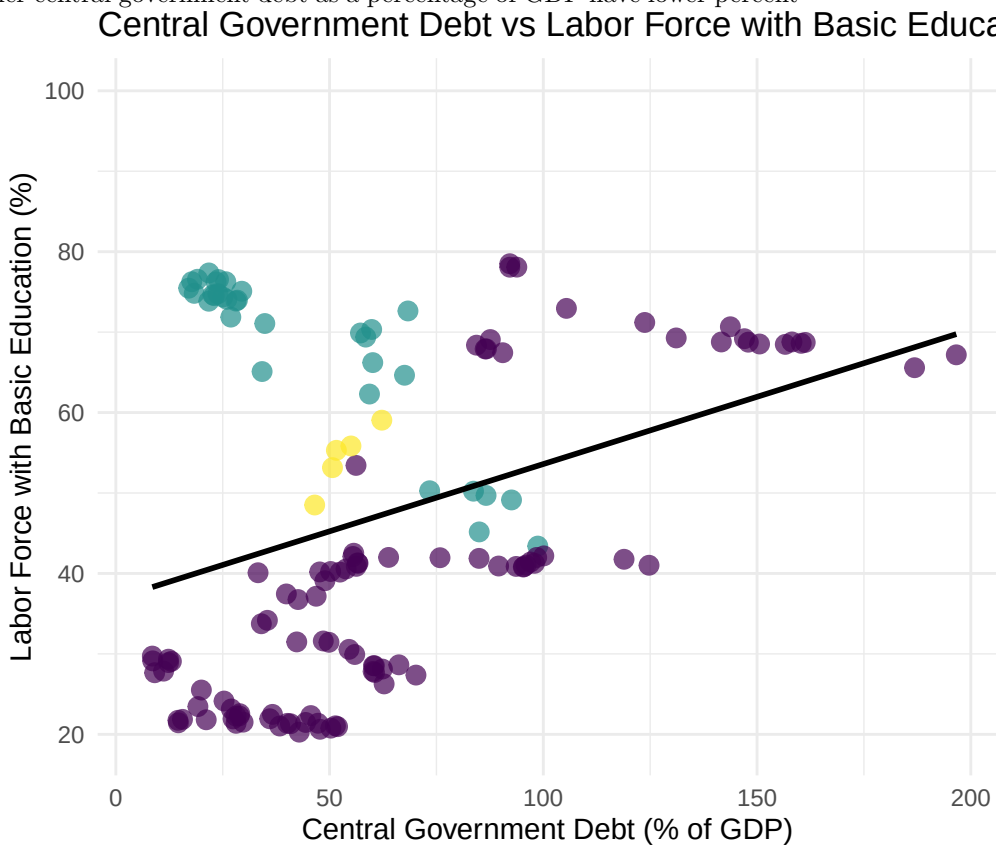
This analysis explores relationships between indicators such as central government debt, labor force education levels, and pupil-teacher ratios using World Bank data. It is divided into two main parts:

1. Relationship between central government debt and labor force education.

2. Relationship between labor force education and pupil-teacher ratios, focusing on implications for education quality.

1 Central Government Debt and Labor Force Education

We analyze whether countries with higher central government debt as a percentage of GDP have lower percentages of labor force with basic education.



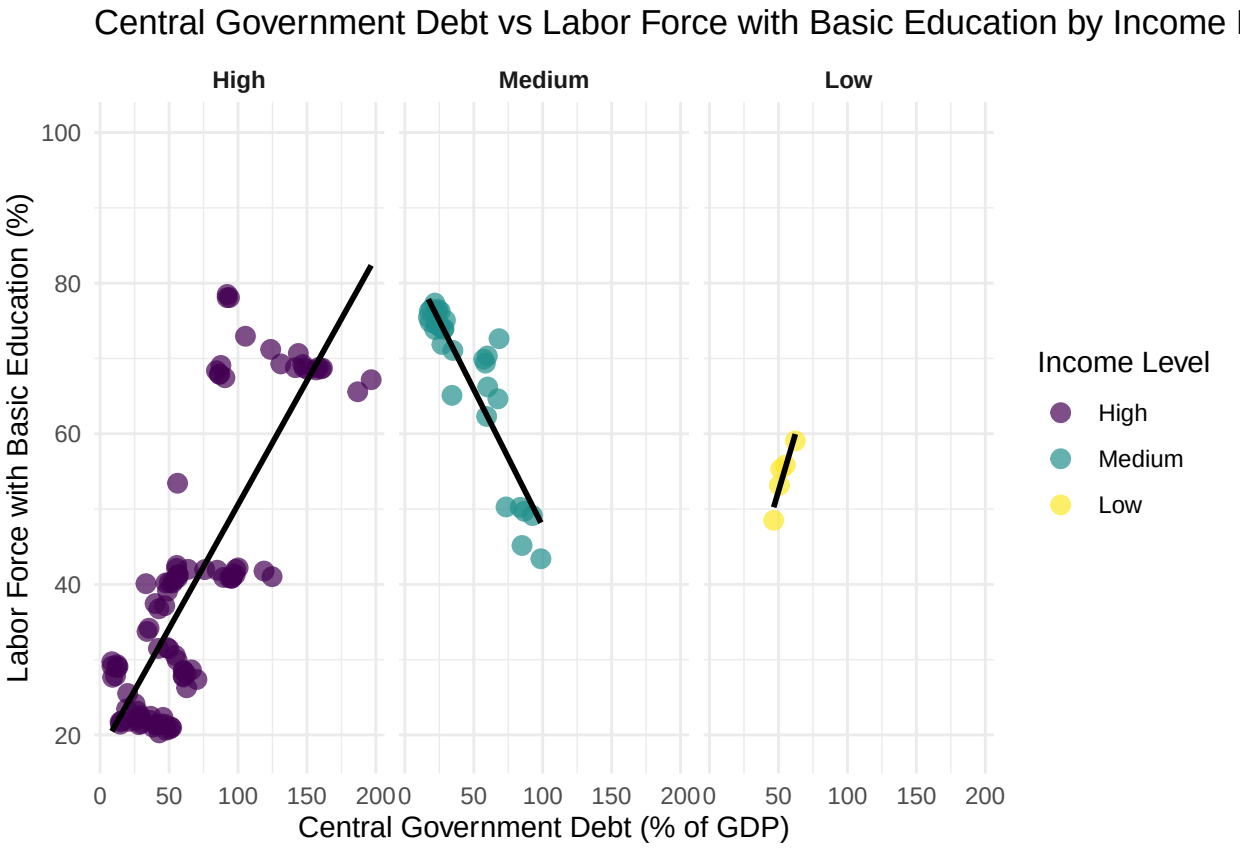

```
## [1] "Count of missing data points and share of total data points by income level"
```

```
##   income_level total_rows missing_debt missing_debt_share missing_education
## 1         High        176           66              37.50                62
```

```
## 2       Medium         176          118              67.05                 85
## 3          Low         198          175              88.38                124
##   missing_education_share
## 1                   35.23
## 2                   48.30
## 3                   62.63
```

Further questions and interpretations:

- High income countries can be further divided into high income/low debt & high income/high debt where latter seems to result in higher basic education
- Overall trend: higher debt % positively correlates with higher % of basic education
- medium income countries seem to suggest an opposite trend
- High share of missing data, predominantely for low income countries

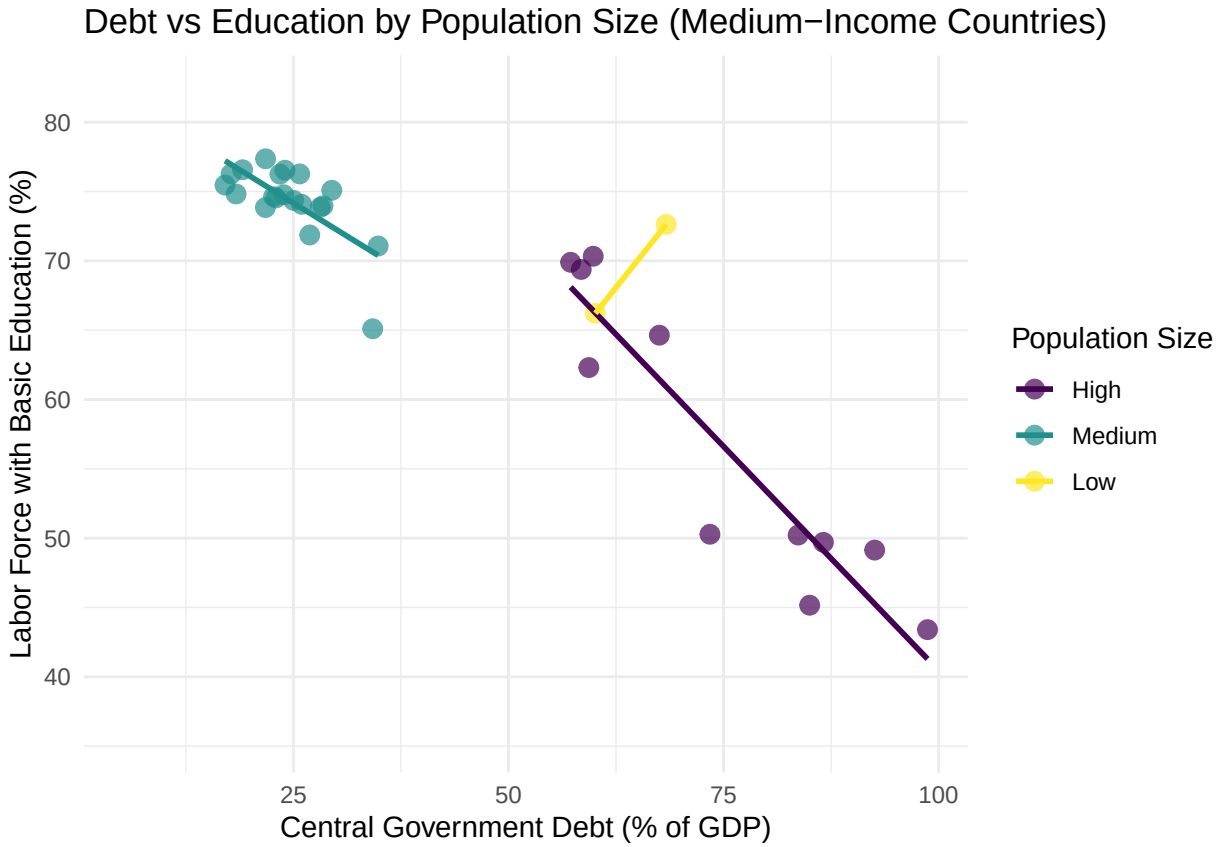



```
## [1] "Calculating correlation coefficients and data pair counts for each income level"
```

```
## # A tibble: 3 x 3
##   income_level correlation data_pairs
##   <ord>              <dbl>      <int>
## 1 High               0.801        100
## 2 Medium            -0.907         33
## 3 Low                0.934          5
```

Exploration of medium income countries

To explore why medium-income countries show an opposite (negative) trend in the relationship between central government debt and labor force education, we should consider a deeper analysis into factors that might drive this behavior.




```
## [1] "Calculating correlation coefficients and data pair counts for each population size"
```

```
## # A tibble: 3 x 3
##   population_size correlation data_pairs
##   <ord>                 <dbl>      <int>
## 1 High                -0.929         11
## 2 Medium              -0.704         20
## 3 Low                  1              2
```

High Population Countries:

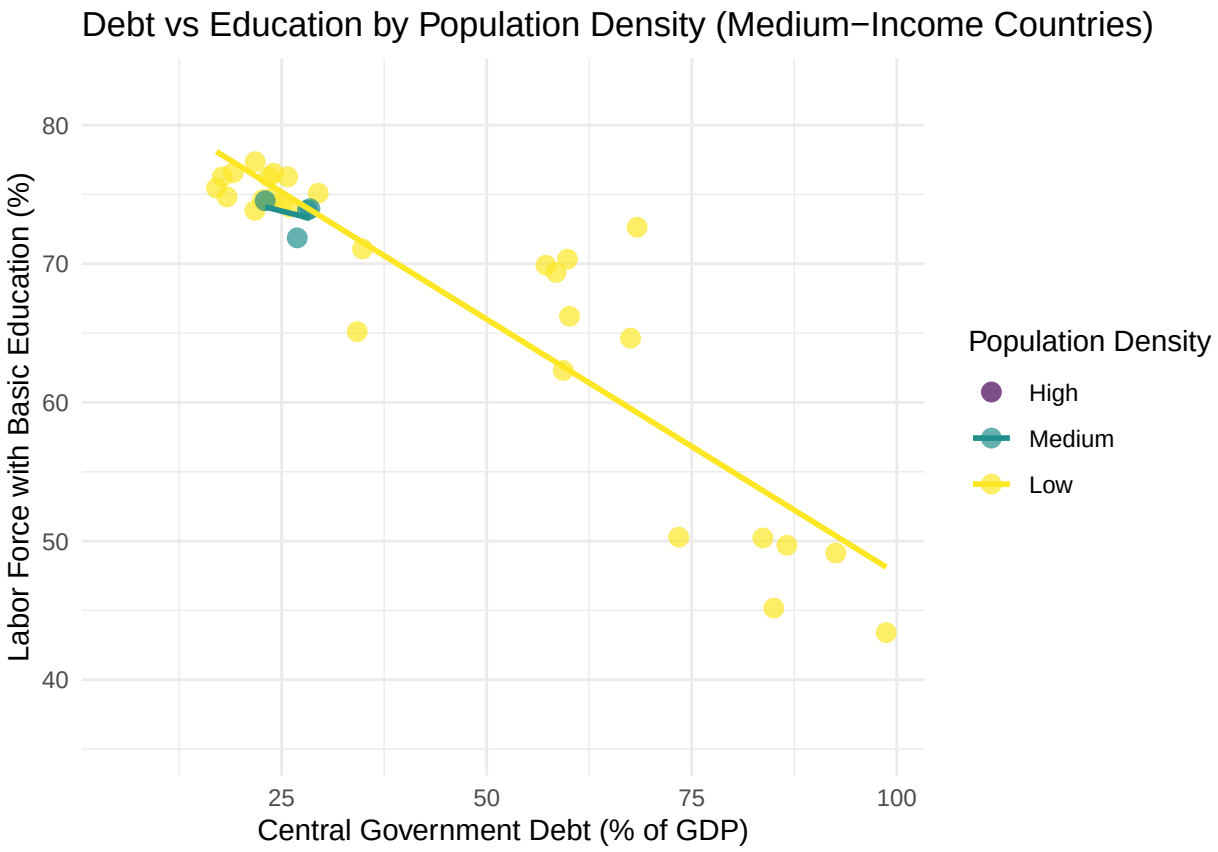
- Exhibit a strong negative correlation (-0.929) between debt and labor force education.
- Interpretation: Larger countries may face challenges in allocating resources effectively to education despite increasing debt levels.

Medium Population Countries:

- Show a moderate negative correlation (-0.704).
- Interpretation: These countries may have mixed capacities to use debt effectively, possibly due to regional or governance differences.

Low Population Countries:

- barely represented in medium income countries




```
## [1] "Calculating correlation coefficients and data pair counts for each population density"
```

```
## # A tibble: 3 x 3
##   population_density correlation data_pairs
##   <ord>                   <dbl>      <int>
## 1 High                   NA              0
## 2 Medium                 -0.321          4
## 3 Low                    -0.904         29
```

High Population Density:

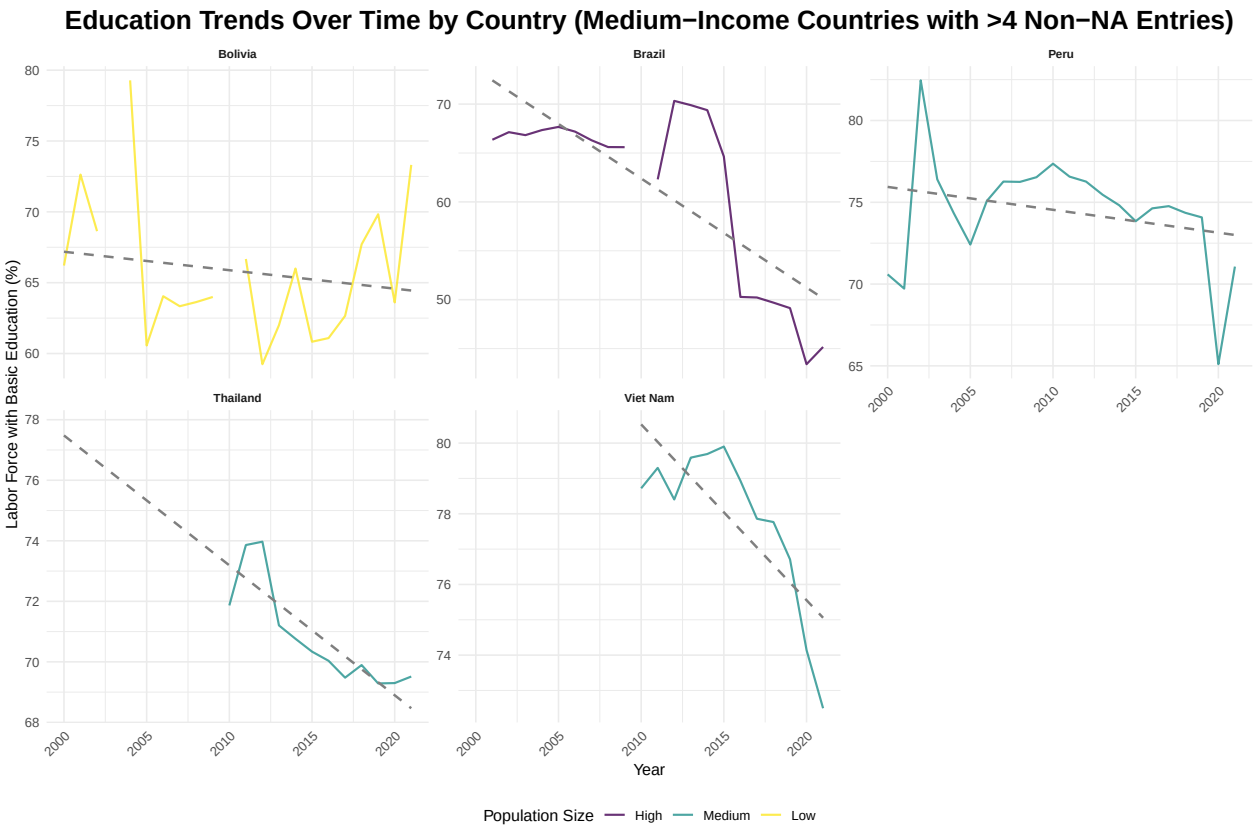
- no medium income countries with high population density

Medium Population Density:

- Trends are unclear, with little visible clustering of data points.
- This group might represent countries with varying economic and governance conditions.

Low Population Density:

- Exhibit a strong negative trend, with labor force education decreasing as debt increases.
- Interpretation: In sparsely populated areas, education infrastructure may be costly to maintain or expand, leading to less effective debt utilization.




```
## # A tibble: 5 x 4
##   `Country Name` min_education max_education range_education
##   <chr>                  <dbl>         <dbl>           <dbl>
## 1 Bolivia                 59.2          79.3            20.0
## 2 Brazil                  43.4          70.3            26.9
## 3 Peru                    65.1          82.5            17.4
## 4 Thailand                69.3          77.8             8.56
## 5 Viet Nam                72.5          79.9             7.41
```

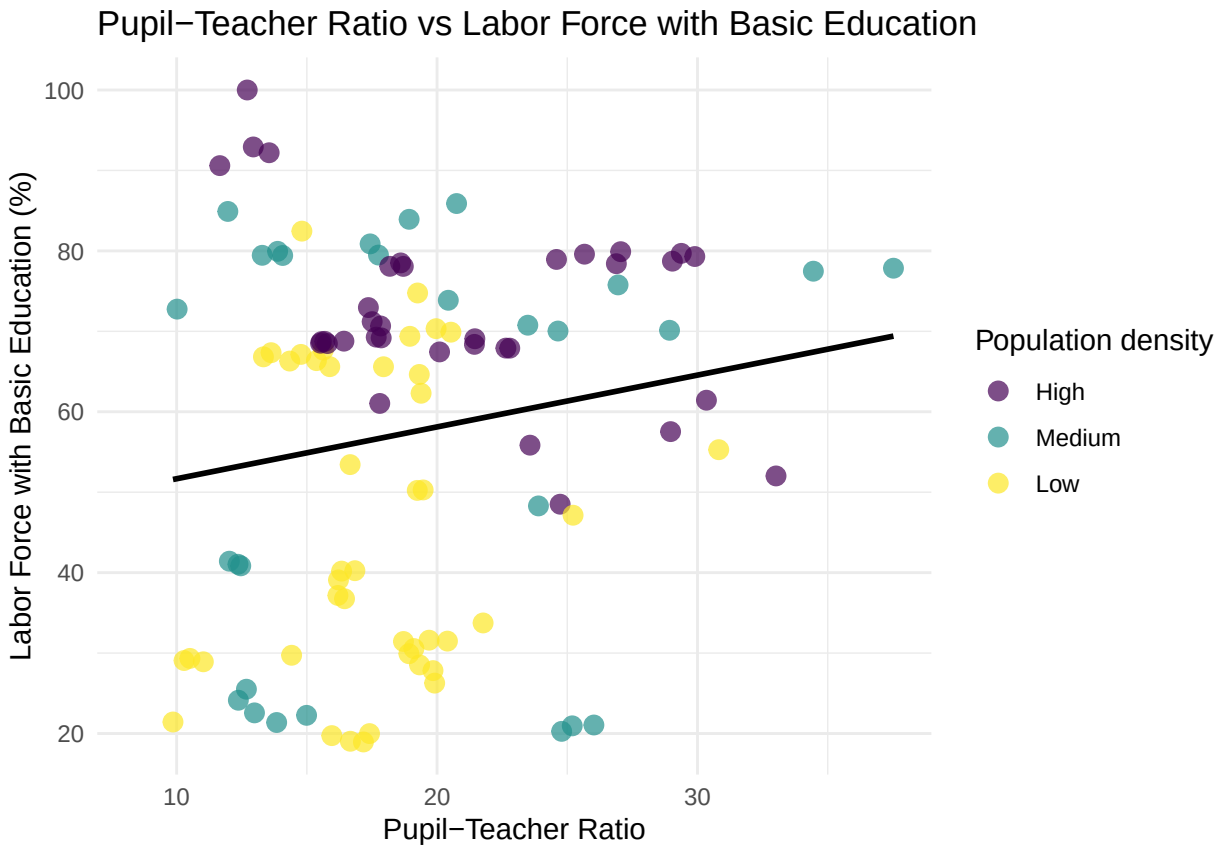
Interpretations

- insufficient data for most countries
- overall % with basic education drastically decreasing among filtered countries
- high fluctuation and variability in measurements questioning data quality
- sparsely populated countries have difficulty of achieving and maintaining of high education standards

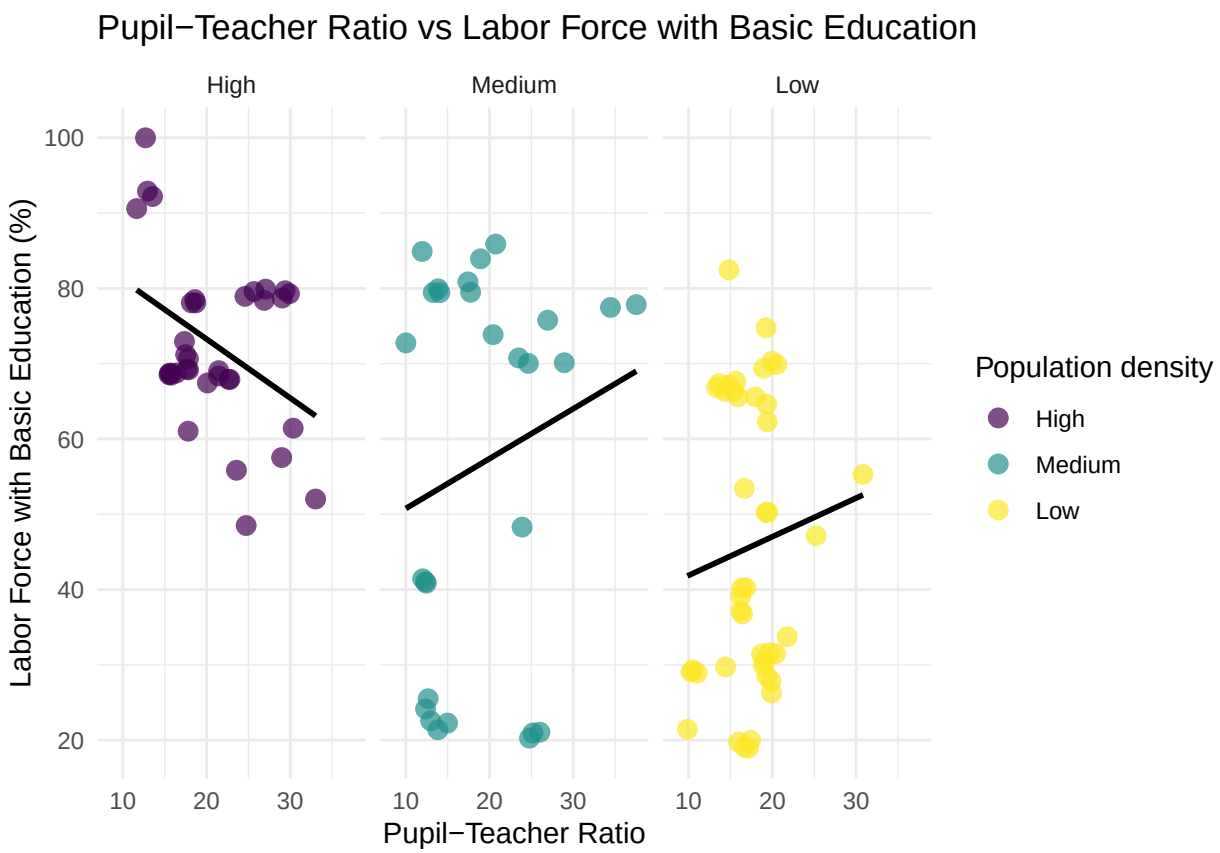
2 Labor Force Education and Pupil-Teacher ratios

In our previous analysis we highlighted sparsely populated countries that struggle with overall education quality. One driving factor in this might be pupil-teacher ratios.

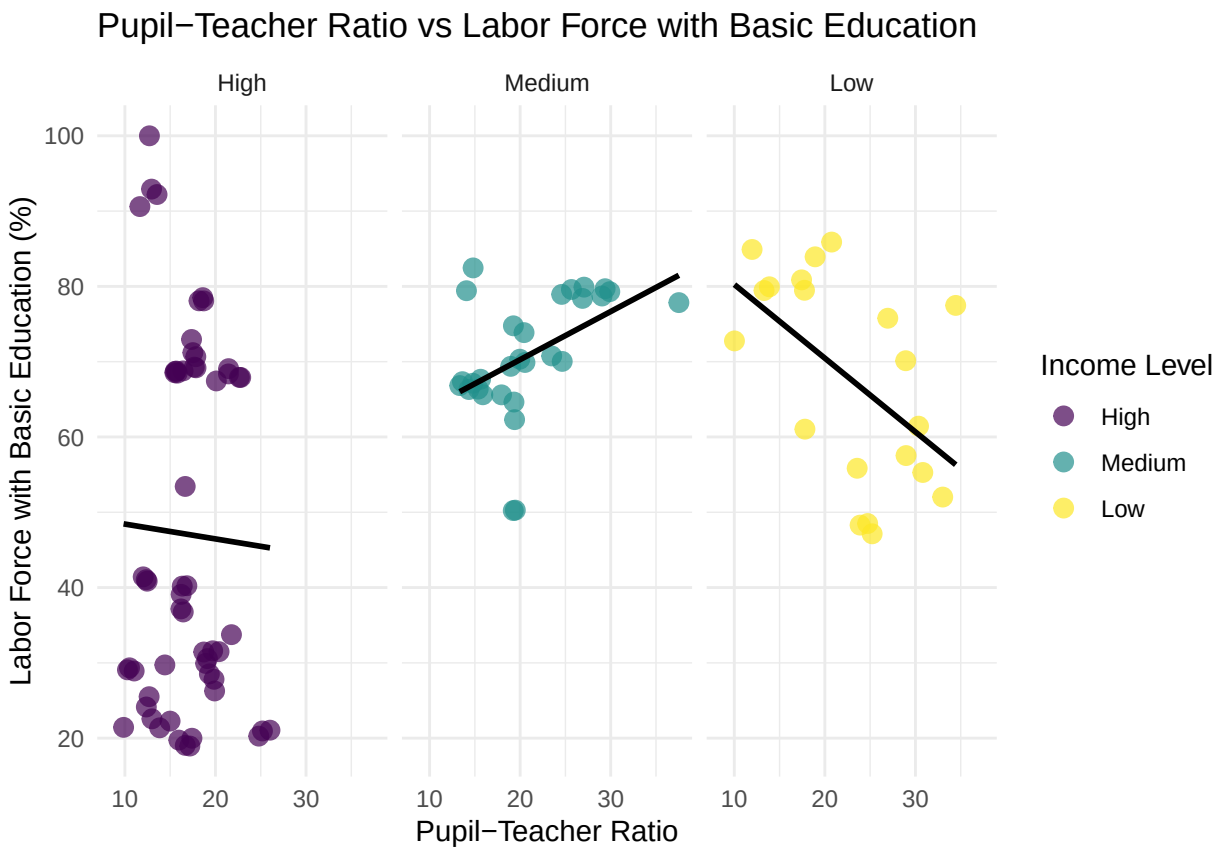
For this we first look at the general relationship between basic education and pupil-teacher ratios:

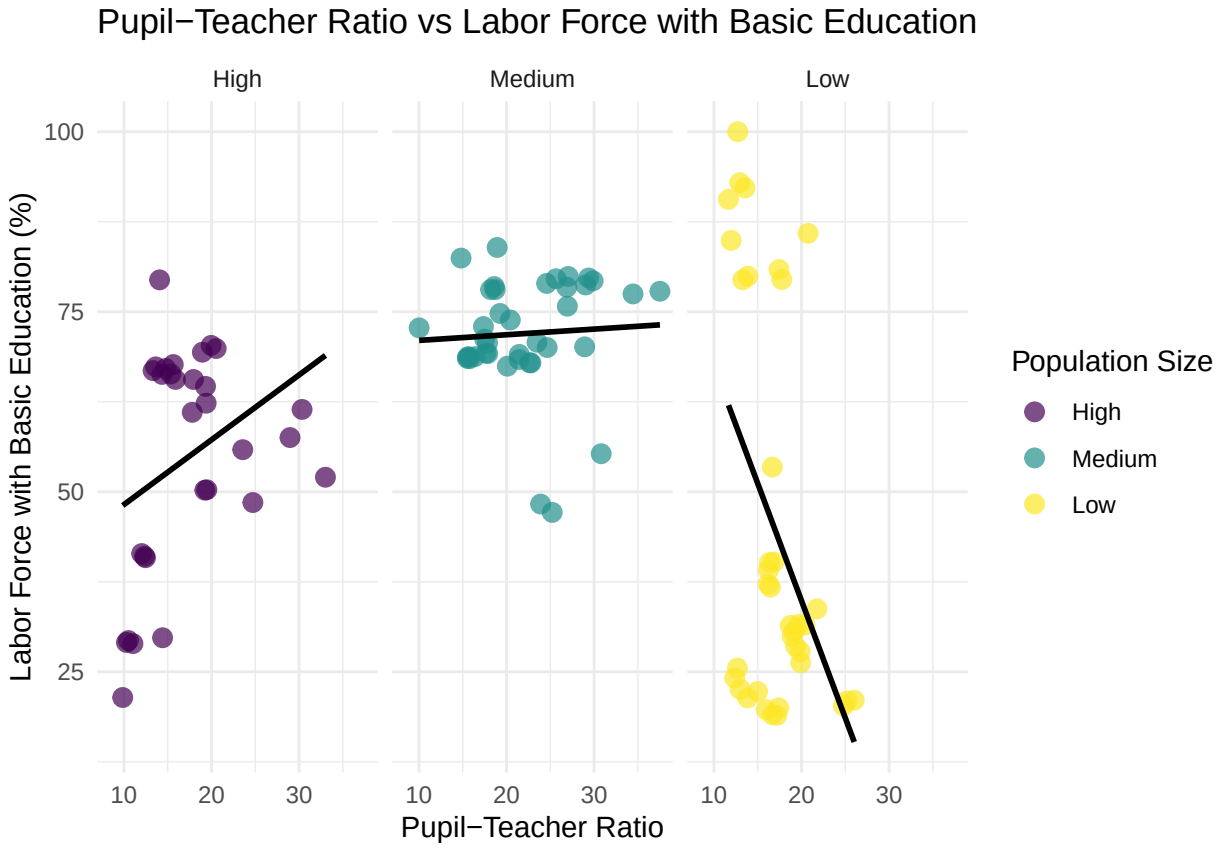


- densely populated countries tend to have better education quality
- sparsely populated countries tend to have lower pupil-teacher ratios
- variability in education quality decreases as pupil-teacher ratios increase
- small positive relationship between both variables



- densely populated countries tend to achieve better education with less pupils per teacher indicating higher monetary power


Pupil−Teacher Ratio vs Labor Force with Basic Education
High
Medium
Low
Labor Force with Basic Education (%)
100
80
60
40
20
10
20
30
Pupil−Teacher Ratio
Income Level
High
Medium
Low


Pupil−Teacher Ratio vs Labor Force with Basic Education
High
Medium
Low
Labor Force with Basic Education (%)
100
75
50
25
10
20
30
Pupil−Teacher Ratio
Population Size
High
Medium
Low