

Education quality

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2023-10-08

R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
summary(cars)
```

```
##      speed      dist
##  Min.   : 4.0    Min.   :  2.00
##  1st Qu.:12.0    1st Qu.: 26.00
##  Median :15.0    Median : 36.00
##  Mean   :15.4    Mean   : 42.98
##  3rd Qu.:19.0    3rd Qu.: 56.00
##  Max.   :25.0    Max.   :120.00
```

Including Plots

You can also embed plots, for example:



Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.

Existence of universities, total numbers of universities, constitutional protection for academic freedom, freedom to research and teach, freedom of academic exchange and dissemination, institutional autonomy, campus integrity, academic as critics, international legal commitment to academic freedom under ICESCR

Education

According to the V-Dem datasets, there are two available indicators regarding the quality of education. One is the average years of education in the total population aged older than 15, whose data was collected from 1820-2022. The other is the educational inequality level estimated from the average education data collected from 1850-2010. In the following analysis, the data from 1984 to the most recent year of the available data is used.

Here is one of the source links for the data:

<https://clio-infra.eu/Indicators/AverageYearsofEducation.html>

```
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
## v dplyr      1.1.3      v readr      2.1.4
## v forcats    1.0.0      v stringr    1.5.0
## v ggplot2    3.4.3      v tibble     3.2.1
## v lubridate  1.9.3      v tidyr      1.3.0
```

```
## v purrr      1.0.2
## -- Conflicts ----- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()   masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
d <- read_csv("_DataPublic_/vdem/1984_2022/vdem_1984_2022_external.csv")
```

```
## Rows: 6789 Columns: 211
## -- Column specification -----
## Delimiter: ","
## chr   (3): country_name, country_text_id, histname
## dbl  (207): country_id, year, project, historical, codingstart, codingend, c...
## date  (1): historical_date
##
## i Use 'spec()' to retrieve the full column specification for this data.
## i Specify the column types or set 'show_col_types = FALSE' to quiet this message.
```

Select data and rename data

```
d_edu <- d |>
  select(country_name, year, e_peaveduc, e_peedgini) |>
  distinct()
```

```
d_edu <- d_edu |>
  rename("Average_education_years_15plus"="e_peaveduc", "Inequality_level"="e_peedgini", "Country"="country_name")
```

5 top average level and 5 top inequality level

```
# Here lists 5 countries-years that have the highest education level among its population
d_edu |>
  slice_max(order_by=Average_education_years_15plus, n=5)
```

```
## # A tibble: 13 x 4
##   Country      Year Average_education_years_15plus Inequality_level
##   <chr>      <dbl>                <dbl>                <dbl>
## 1 United Kingdom 2010                13.3                 6.07
## 2 United Kingdom 2011                13.3                 NA
## 3 United Kingdom 2012                13.3                 NA
## 4 United Kingdom 2013                13.3                 NA
## 5 United Kingdom 2014                13.3                 NA
## 6 United Kingdom 2015                13.3                 NA
## 7 United Kingdom 2016                13.3                 NA
## 8 United Kingdom 2017                13.3                 NA
## 9 United Kingdom 2018                13.3                 NA
## 10 United Kingdom 2019                13.3                 NA
## 11 United Kingdom 2020                13.3                 NA
## 12 United Kingdom 2021                13.3                 NA
## 13 United Kingdom 2022                13.3                 NA
```

```
# Here lists 5 countries-years that suffer from the most severe inequality in education.
d_edu |>
  slice_max(order_by=Inequality_level, n=5)
```

```
## # A tibble: 5 x 4
##   Country      Year Average_education_years_15plus Inequality_level
##   <chr>      <dbl>                <dbl>          <dbl>
## 1 Burkina Faso 1984                0.301          97.0
## 2 Burkina Faso 1985                0.322          96.9
## 3 Burkina Faso 1986                0.343          96.7
## 4 Burkina Faso 1987                0.364          96.4
## 5 Burkina Faso 1988                0.385          96.1
```

Data availability

```
# Here checks data availability: For which countries are the indicators of education quality available
d_edu |>
  mutate(
    edu_average_missing=as.numeric(is.na(Average_education_years_15plus)),
    edu_inequality_missing=as.numeric(is.na(Inequality_level)),
    .after=Average_education_years_15plus) |>
  group_by(Country) |>
  summarise(N_edu_average_missing=sum(edu_average_missing), N_edu_inequality_missing=sum(edu_inequality_
```

```
## # A tibble: 181 x 3
##   Country      N_edu_average_missing N_edu_inequality_missing
##   <chr>          <dbl>          <dbl>
## 1 Afghanistan      0            12
## 2 Albania          39            39
## 3 Algeria          0            12
## 4 Angola           0            12
## 5 Argentina        0            12
## 6 Armenia          0            12
## 7 Australia        0            12
## 8 Austria          0            12
## 9 Azerbaijan       0            12
## 10 Bahrain         39            39
## # i 171 more rows
```

```
# Here checks data availability: For which years are the indicators of education quality available
d_edu |>
  mutate(
    edu_average_missing=as.numeric(is.na(Average_education_years_15plus)),
    edu_inequality_missing=as.numeric(is.na(Inequality_level)),
    .after=Average_education_years_15plus) |>
  group_by(Year) |>
  summarise(N_edu_average_missing=sum(edu_average_missing), N_edu_inequality_missing=sum(edu_inequality_
```

```
## # A tibble: 39 x 3
##   Year N_edu_average_missing N_edu_inequality_missing
```

```
##      <dbl>                <dbl>                <dbl>
## 1  1984                40                42
## 2  1985                40                42
## 3  1986                40                42
## 4  1987                40                42
## 5  1988                40                42
## 6  1989                41                43
## 7  1990                42                44
## 8  1991                43                45
## 9  1992                44                46
## 10 1993                45                47
## # i 29 more rows
```

Change year by year

```
# Here summarizes the average level of education years above 15 and inequality level
d_edu |>
  group_by(Country)|>
  summarize(mean_years=mean(Average_education_years_15plus, na.rm=TRUE),
            mean_inequality=mean(Inequality_level, na.rm=TRUE))
```

```
## # A tibble: 181 x 3
##   Country      mean_years mean_inequality
##   <chr>         <dbl>         <dbl>
## 1 Afghanistan     2.80           77.8
## 2 Albania         NaN           NaN
## 3 Algeria          6.31           45.8
## 4 Angola           2.46           53.9
## 5 Argentina        8.37           16.6
## 6 Armenia          10.7           16.5
## 7 Australia        12.9            9.60
## 8 Austria          11.2            6.35
## 9 Azerbaijan       10.7           14.5
## 10 Bahrain         NaN           NaN
## # i 171 more rows
```

```
# Here adds two columns of the change in education quality year by year
d_edu |>
  group_by(Country)|>
  arrange(Year) |>
  mutate(year_change = Average_education_years_15plus - lag(Average_education_years_15plus, n=1),
         inequality_change=Inequality_level - lag(Inequality_level, n=1))|>
  ungroup()|>
  arrange(Country, Year)
```

```
## # A tibble: 6,789 x 6
##   Country      Year Average_education_years_15plus Inequality_level year_change
##   <chr>         <dbl>                <dbl>         <dbl>         <dbl>
## 1 Afghanistan 1984             1.30           85.4          NA
## 2 Afghanistan 1985             1.35           84.8          0.0510
## 3 Afghanistan 1986             1.40           84.8          0.0510
```

```
## 4 Afghanistan 1987          1.45          84.6          0.0510
## 5 Afghanistan 1988          1.50          84.5          0.0510
## 6 Afghanistan 1989          1.55          84.1          0.0510
## 7 Afghanistan 1990          1.60          83.8          0.0510
## 8 Afghanistan 1991          1.69          82.8          0.091
## 9 Afghanistan 1992          1.78          81.9          0.0900
## 10 Afghanistan 1993         1.88          81.0          0.091
## # i 6,779 more rows
## # i 1 more variable: ineuality_change <dbl>
```

Overall change

#here examines the overall change of average education years from 1984-2022

```
d_edu |>
  group_by(Country)|>
  arrange(Year) |>
  summarise(year_change_total = last(Average_education_years_15plus)-first(Average_education_years_15plus))|>
  ungroup()|>
  arrange(year_change_total)
```

```
## # A tibble: 181 x 2
##   Country      year_change_total
##   <chr>          <dbl>
## 1 Tajikistan    -0.252
## 2 North Korea      0
## 3 Russia         0.230
## 4 Azerbaijan     0.252
## 5 Uzbekistan     0.272
## 6 Kyrgyzstan     0.301
## 7 Switzerland    0.328
## 8 Armenia        0.336
## 9 Germany        0.350
## 10 Georgia       0.387
## # i 171 more rows
```

#here examines the overall change of inequality levels from 1984-2010

```
d_edu |>
  filter(Year>=1984 & Year<=2010)|>
  group_by(Country)|>
  arrange(Year) |>
  summarise(ineuality_change_total=last(Inequality_level)- first(Inequality_level))|>
  ungroup()|>
  arrange(ineuality_change_total)
```

```
## # A tibble: 180 x 2
##   Country      ineuality_change_total
##   <chr>          <dbl>
## 1 Nepal        -39.8
## 2 Botswana     -34.0
## 3 Haiti        -31.5
## 4 Egypt        -30.8
```

```
## 5 Iran -30.3
## 6 Angola -29.5
## 7 India -29.0
## 8 Nigeria -27.5
## 9 Malawi -27.2
## 10 Uganda -26.8
## # i 170 more rows
```

From the available data from 1984-2022, one can see that Tajikistan's average education years in the total population aged older than 15 is the only country that decreased and Botswana's increased the most. Also, available data from 1984-2010 shows that Nepal's inequality level decreased the most by 39.820 and Costa Rica's increased by 4.123. Therefore, from the perspective of overall change, Tajikistan performed the worst and Botswana improved the best in terms of education years, and Costa Rica performed the worst and Nepal improved the best in terms of education equality.

Mean data

```
d_edu |>
  group_by(Country)|>
  summarise(Average_education_mean=mean(Average_education_years_15plus))|>
  arrange(Average_education_mean)
```

```
## # A tibble: 181 x 2
##   Country      Average_education_mean
##   <chr>          <dbl>
## 1 Burkina Faso    0.982
## 2 Niger          1.06
## 3 Mali           1.25
## 4 Somalia        1.29
## 5 Burundi        1.86
## 6 Mozambique     2.36
## 7 Benin          2.39
## 8 Angola         2.46
## 9 Senegal        2.54
## 10 Guinea        2.62
## # i 171 more rows
```

```
d_edu |>
  filter(Year>=1984 & Year<=2010)|>
  group_by(Country)|>
  summarise(Inequality_mean=mean(Inequality_level))|>
  arrange(Inequality_mean)
```

```
## # A tibble: 180 x 2
##   Country      Inequality_mean
##   <chr>          <dbl>
## 1 Austria        6.35
## 2 Barbados       6.98
## 3 Denmark        8.17
## 4 Switzerland    8.28
## 5 United Kingdom  8.38
```

```
## 6 Japan 9.33
## 7 Norway 9.58
## 8 Australia 9.60
## 9 Tajikistan 10.8
## 10 Hungary 11.2
## # i 170 more rows
```

From the perspective of average educational quality, one can see that from 1985-2022, Burkina Faso's average education years in the total population aged older than 15 is the lowest and Denmark's is the most. Also, available data from 1984-2010 shows that Austria has the most equal education and Burkina Faso has the most unequal education.