

inclass_exercise_2

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Coodbook lookup

1. Indicators include *Education 15+* (e_peaveduc) and *Educational inequality, Gini* (e_peedgini).
2. For *Education 15+* (e_peaveduc), the coverage is from 1820-2022.
For *Educational inequality, Gini* (e_peedgini), the coverage is from 1850-2010.
3. For *Education 15+* (e_peaveduc), one of the links to the sources is Clio-Infra (2018), 'Clio-Infra Project (Database)'. URL: <http://www.clio-infra.eu/>
For *Educational inequality, Gini* (e_peedgini), one of the links to the sources is van Leeuwen, B. V., Van Leeuwen-Li, J. & Földvári, P. (2012a), 'Education as a driver of income inequality in twentieth-century Africa', MPRA Paper 43574, University Library of Munich, Germany . URL: <https://mpra.ub.uni-muenchen.de/43574/>

Subset by column

```
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.
```

```

names(d)
##      [1] "country_name"           "country_text_id"
##      [3] "country_id"             "year"
##      [5] "historical_date"        "project"
##      [7] "historical"             "histname"
##      [9] "codingstart"            "codingend"
##     [11] "codingstart_contemp"    "codingend_contemp"
##     [13] "codingstart_hist"       "codingend_hist"
##     [15] "gapstart1"              "gapstart2"
##     [17] "gapstart3"              "gapend1"
##     [19] "gapend2"                "gapend3"
##     [21] "gap_index"              "COWcode"
##     [23] "e_v2x_api_3C"           "e_v2x_api_4C"
##     [25] "e_v2x_api_5C"           "e_v2x_civlib_3C"
##     [27] "e_v2x_civlib_4C"        "e_v2x_civlib_5C"
##     [29] "e_v2x_clphy_3C"         "e_v2x_clphy_4C"
##     [31] "e_v2x_clphy_5C"         "e_v2x_clpol_3C"
##     [33] "e_v2x_clpol_4C"         "e_v2x_clpol_5C"
##     [35] "e_v2x_clpriv_3C"        "e_v2x_clpriv_4C"
##     [37] "e_v2x_clpriv_5C"        "e_v2x_corr_3C"
##     [39] "e_v2x_corr_4C"          "e_v2x_corr_5C"
##     [41] "e_v2x_cspart_3C"        "e_v2x_cspart_4C"
##     [43] "e_v2x_cspart_5C"        "e_v2x_delibdem_3C"
##     [45] "e_v2x_delibdem_4C"      "e_v2x_delibdem_5C"
##     [47] "e_v2x_EDcomp_thick_3C"  "e_v2x_EDcomp_thick_4C"
##     [49] "e_v2x_EDcomp_thick_5C"  "e_v2x_egal_3C"
##     [51] "e_v2x_egal_4C"          "e_v2x_egal_5C"
##     [53] "e_v2x_egalDEM_3C"       "e_v2x_egalDEM_4C"
##     [55] "e_v2x_egalDEM_5C"       "e_v2x_elecoff_3C"
##     [57] "e_v2x_elecoff_4C"       "e_v2x_elecoff_5C"
##     [59] "e_v2x_execorr_3C"       "e_v2x_execorr_4C"
##     [61] "e_v2x_execorr_5C"       "e_v2x_feduni_3C"
##     [63] "e_v2x_feduni_4C"        "e_v2x_feduni_5C"
##     [65] "e_v2x_frassoc_thick_3C"  "e_v2x_frassoc_thick_4C"
##     [67] "e_v2x_frassoc_thick_5C"  "e_v2x_freexp_3C"
##     [69] "e_v2x_freexp_4C"        "e_v2x_freexp_5C"
##     [71] "e_v2x_freexp_altnf_3C"   "e_v2x_freexp_altnf_4C"
##     [73] "e_v2x_freexp_altnf_5C"   "e_v2x_genc1_3C"
##     [75] "e_v2x_genc1_4C"         "e_v2x_genc1_5C"
##     [77] "e_v2x_gencs_3C"         "e_v2x_gencs_4C"
##     [79] "e_v2x_gencs_5C"         "e_v2x_gender_3C"
##     [81] "e_v2x_gender_4C"        "e_v2x_gender_5C"
##     [83] "e_v2x_genpp_3C"         "e_v2x_genpp_4C"
##     [85] "e_v2x_genpp_5C"         "e_v2x_jucon_3C"
##     [87] "e_v2x_jucon_4C"         "e_v2x_jucon_5C"
##     [89] "e_v2x_libdem_3C"        "e_v2x_libdem_4C"
##     [91] "e_v2x_libdem_5C"        "e_v2x_liberal_3C"
##     [93] "e_v2x_liberal_4C"       "e_v2x_liberal_5C"
##     [95] "e_v2x_mpi_3C"           "e_v2x_mpi_4C"
##     [97] "e_v2x_mpi_5C"           "e_v2x_partip_3C"
##     [99] "e_v2x_partip_4C"        "e_v2x_partip_5C"
##    [101] "e_v2x_partipdem_3C"     "e_v2x_partipdem_4C"
##    [103] "e_v2x_partipdem_5C"     "e_v2x_polyarchy_3C"

```

## [105]	"e_v2x_polyarchy_4C"	"e_v2x_polyarchy_5C"
## [107]	"e_v2x_pubcorr_3C"	"e_v2x_pubcorr_4C"
## [109]	"e_v2x_pubcorr_5C"	"e_v2x_suffr_3C"
## [111]	"e_v2x_suffr_4C"	"e_v2x_suffr_5C"
## [113]	"e_v2xcl_rol_3C"	"e_v2xcl_rol_4C"
## [115]	"e_v2xcl_rol_5C"	"e_v2xcs_ccsi_3C"
## [117]	"e_v2xcs_ccsi_4C"	"e_v2xcs_ccsi_5C"
## [119]	"e_v2xdd_dd_3C"	"e_v2xdd_dd_4C"
## [121]	"e_v2xdd_dd_5C"	"e_v2xdl_delib_3C"
## [123]	"e_v2xdl_delib_4C"	"e_v2xdl_delib_5C"
## [125]	"e_v2xeg_eqdr_3C"	"e_v2xeg_eqdr_4C"
## [127]	"e_v2xeg_eqdr_5C"	"e_v2xeg_eqprotec_3C"
## [129]	"e_v2xeg_eqprotec_4C"	"e_v2xeg_eqprotec_5C"
## [131]	"e_v2xel_frefair_3C"	"e_v2xel_frefair_4C"
## [133]	"e_v2xel_frefair_5C"	"e_v2xel_locelec_3C"
## [135]	"e_v2xel_locelec_4C"	"e_v2xel_locelec_5C"
## [137]	"e_v2xel_regelec_3C"	"e_v2xel_regelec_4C"
## [139]	"e_v2xel_regelec_5C"	"e_v2xlg_legcon_3C"
## [141]	"e_v2xlg_legcon_4C"	"e_v2xlg_legcon_5C"
## [143]	"e_v2xme_altinf_3C"	"e_v2xme_altinf_4C"
## [145]	"e_v2xme_altinf_5C"	"e_v2xps_party_3C"
## [147]	"e_v2xps_party_4C"	"e_v2xps_party_5C"
## [149]	"e_boix_regime"	"e_democracy_breakdowns"
## [151]	"e_democracy_omitteddata"	"e_democracy_trans"
## [153]	"e_fh_cl"	"e_fh_pr"
## [155]	"e_fh_rol"	"e_fh_status"
## [157]	"e_wbgi_cce"	"e_wbgi_gee"
## [159]	"e_wbgi_pve"	"e_wbgi_rle"
## [161]	"e_wbgi_rqe"	"e_wbgi_vae"
## [163]	"e_lexical_index"	"e_uds_median"
## [165]	"e_uds_mean"	"e_uds_pct025"
## [167]	"e_uds_pct975"	"e_coups"
## [169]	"e_legparty"	"e_autoc"
## [171]	"e_democ"	"e_p_polity"
## [173]	"e_polcomp"	"e_polity2"
## [175]	"e_bnr_dem"	"e_chga_demo"
## [177]	"e_ti_cpi"	"e_vanhanen"
## [179]	"e_peaveduc"	"e_peedgini"
## [181]	"e_area"	"e_regiongeo"
## [183]	"e_regionpol"	"e_regionpol_6C"
## [185]	"e_cow_exports"	"e_cow_imports"
## [187]	"e_gdp"	"e_gdp_sd"
## [189]	"e_gdppc"	"e_gdppc_sd"
## [191]	"e_miinflat"	"e_pop"
## [193]	"e_pop_sd"	"e_total_fuel_income_pc"
## [195]	"e_total_oil_income_pc"	"e_total_resources_income_pc"
## [197]	"e_radio_n"	"e_miferrat"
## [199]	"e_mipopula"	"e_miurbani"
## [201]	"e_miurbpop"	"e_pefeliex"
## [203]	"e_peinfmtor"	"e_pelifeex"
## [205]	"e_pematmor"	"e_wb_pop"
## [207]	"e_civil_war"	"e_miinteco"
## [209]	"e_miinterc"	"e_pt_coup"

```
## [211] "e_pt_coup_attempts"
```

```
d_edu <- d |>
  select(country_name, country_id, year, e_peaveduc, e_peedgini)
d_edu
## # A tibble: 6,789 x 5
##   country_name country_id year e_peaveduc e_peedgini
##   <chr>          <dbl> <dbl>     <dbl>     <dbl>
## 1 Mexico          3  1984      6.08      32.7
## 2 Mexico          3  1985      6.22      32.4
## 3 Mexico          3  1986      6.36      31.9
## 4 Mexico          3  1987      6.5       31.4
## 5 Mexico          3  1988      6.64      31.1
## 6 Mexico          3  1989      6.78      30.1
## 7 Mexico          3  1990      6.92      30.0
## 8 Mexico          3  1991      7.03      29.7
## 9 Mexico          3  1992      7.14      29.5
## 10 Mexico         3  1993      7.25      29.3
## # i 6,779 more rows
```

```
d_edu <- d_edu |>
  rename("edu_level"="e_peaveduc", "edu_inequality"="e_peedgini", "country"="country_name", "ID"="country_id")
d_edu
## # A tibble: 6,789 x 5
##   country ID year edu_level edu_inequality
##   <chr>   <dbl> <dbl>     <dbl>     <dbl>
## 1 Mexico  3  1984      6.08      32.7
## 2 Mexico  3  1985      6.22      32.4
## 3 Mexico  3  1986      6.36      31.9
## 4 Mexico  3  1987      6.5       31.4
## 5 Mexico  3  1988      6.64      31.1
## 6 Mexico  3  1989      6.78      30.1
## 7 Mexico  3  1990      6.92      30.0
## 8 Mexico  3  1991      7.03      29.7
## 9 Mexico  3  1992      7.14      29.5
## 10 Mexico  3  1993      7.25      29.3
## # i 6,779 more rows
```

Subset by rows

```
#countries-years have the highest education level
d_edu |> slice_max(order_by=edu_level, n=5)
## # A tibble: 13 x 5
##   country ID year edu_level edu_inequality
##   <chr>   <dbl> <dbl>     <dbl>     <dbl>
## 1 United Kingdom 101 2010      13.3      6.07
## 2 United Kingdom 101 2011      13.3      NA
## 3 United Kingdom 101 2012      13.3      NA
## 4 United Kingdom 101 2013      13.3      NA
## 5 United Kingdom 101 2014      13.3      NA
## 6 United Kingdom 101 2015      13.3      NA
```

```
## 7 United Kingdom 101 2016 13.3 NA
## 8 United Kingdom 101 2017 13.3 NA
## 9 United Kingdom 101 2018 13.3 NA
## 10 United Kingdom 101 2019 13.3 NA
## 11 United Kingdom 101 2020 13.3 NA
## 12 United Kingdom 101 2021 13.3 NA
## 13 United Kingdom 101 2022 13.3 NA
```

```
#countries-years that suffer from the most severe inequality
d_edu |>slice_max(order_by=edu_inequality,n=5)
## # A tibble: 5 x 5
##   country      ID year edu_level edu_inequality
##   <chr>      <dbl> <dbl>   <dbl>         <dbl>
## 1 Burkina Faso  54 1984   0.301          97.0
## 2 Burkina Faso  54 1985   0.322          96.9
## 3 Burkina Faso  54 1986   0.343          96.7
## 4 Burkina Faso  54 1987   0.364          96.4
## 5 Burkina Faso  54 1988   0.385          96.1
```

Summarize the data

```
#check data availability (edu_level)
d_edu |>
  mutate(edu_level_available=as.numeric(!is.na(edu_level)), .after=edu_level) |>
  group_by(country) |>
  summarise(N_edu_level_available=sum(edu_level_available))
## # A tibble: 181 x 2
##   country      N_edu_level_available
##   <chr>          <dbl>
## 1 Afghanistan      39
## 2 Albania           0
## 3 Algeria          39
## 4 Angola           39
## 5 Argentina        39
## 6 Armenia          33
## 7 Australia        39
## 8 Austria          39
## 9 Azerbaijan       33
## 10 Bahrain         0
## # i 171 more rows
```

```
#check data availability(edu_inequality)
d_edu |>
  mutate(edu_inequality_available=as.numeric(!is.na(edu_inequality)), .after=edu_inequality) |>
  group_by(country) |>
  summarise(N_edu_inequality_available=sum(edu_inequality_available))
## # A tibble: 181 x 2
##   country      N_edu_inequality_available
##   <chr>          <dbl>
## 1 Afghanistan      27
## 2 Albania           0
```

```
## 3 Algeria 27
## 4 Angola 27
## 5 Argentina 27
## 6 Armenia 21
## 7 Australia 27
## 8 Austria 27
## 9 Azerbaijan 21
## 10 Bahrain 0
## # i 171 more rows
```

```
#average level of education quality
d_edu |>
  group_by(country) |>
  summarize(edu_level_average=mean(edu_level,na.rm=TRUE),
            edu_inequality_average=mean(edu_inequality,na.rm=TRUE))
## # A tibble: 181 x 3
##   country      edu_level_average edu_inequality_average
##   <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
```

```
#change of education quality
#Most countries have edu_inequality records in 2010
d_edu |>
  filter(year>=1984,year<=2010) |>
  group_by(country) |>
  arrange(year) |>
  summarise(edu_level_change_2010_1984=last(edu_level)-first(edu_level),
            edu_inequality_change_2010_1984=last(edu_inequality)-first(edu_inequality)) |>
  ungroup() |>
  arrange(country)
## # A tibble: 180 x 3
##   country      edu_level_change_2010_1984 edu_inequality_change_2010_1984
##   <chr>          <dbl>          <dbl>
## 1 Afghanistan    2.52          -21
## 2 Albania        NA           NA
## 3 Algeria        3.35         -18.9
## 4 Angola         1.64         -29.5
## 5 Argentina      1.06          -3.56
## 6 Armenia        0.336         -2.87
## 7 Australia      0.878         -7.77
## 8 Austria        1.16         -5.68
## 9 Azerbaijan     0.252         -2.16
## 10 Bahrain       NA           NA
## # i 170 more rows
```

Briefly discuss

```
#examine the data
d_edu |>
  group_by(country) |>
  summarize(edu_level_average=mean(edu_level,na.rm=TRUE),
            edu_inequality_average=mean(edu_inequality,na.rm=TRUE)) |>
  slice_max(order_by=edu_inequality_average,n=181)
## # A tibble: 181 x 3
##   country      edu_level_average edu_inequality_average
##   <chr>          <dbl>          <dbl>
## 1 Burkina Faso      0.982            91.3
## 2 Mali              1.25            87.9
## 3 Niger             1.06            85.3
## 4 Somalia           1.29            84.7
## 5 Afghanistan      2.80            77.8
## 6 Benin             2.39            76.9
## 7 The Gambia        2.82            76.7
## 8 Guinea            2.62            73.4
## 9 Burundi           1.86            73.0
## 10 Nepal            3.21            69.8
## # i 171 more rows
```

```
d_edu |>
  group_by(country) |>
  summarize(edu_level_average=mean(edu_level,na.rm=TRUE),
            edu_inequality_average=mean(edu_inequality,na.rm=TRUE)) |>
  slice_min(order_by=edu_level_average,n=181)
## # A tibble: 181 x 3
##   country      edu_level_average edu_inequality_average
##   <chr>          <dbl>          <dbl>
## 1 Burkina Faso      0.982            91.3
## 2 Niger             1.06            85.3
## 3 Mali              1.25            87.9
## 4 Somalia           1.29            84.7
## 5 Burundi           1.86            73.0
## 6 Mozambique        2.36            52.6
## 7 Benin             2.39            76.9
## 8 Angola            2.46            53.9
## 9 Senegal           2.54            66.8
## 10 Guinea           2.62            73.4
## # i 171 more rows
```

```
d_edu |>
  filter(year>=1984,year<=2010) |>
  group_by(country) |>
  arrange(year) |>
  summarise(edu_level_change_2010_1984=last(edu_level)-first(edu_level),
            edu_inequality_change_2010_1984=last(edu_inequality)-first(edu_inequality)) |>
  ungroup() |>
  arrange(country) |>
  slice_min(order_by=edu_level_change_2010_1984,n=181)
## # A tibble: 180 x 3
```

```
##      country      edu_level_change_2010_1984 edu_inequality_change_2010_1984
##      <chr>              <dbl>              <dbl>
##  1 Tajikistan          -0.252              -6.42
##  2 North Korea           0                NA
##  3 Russia               0.230             -10.1
##  4 Azerbaijan           0.252             -2.16
##  5 Uzbekistan           0.272             -2.48
##  6 Kyrgyzstan           0.301             -2.73
##  7 Switzerland          0.328              1.72
##  8 Armenia              0.336             -2.87
##  9 Germany              0.350             -2.33
## 10 Georgia              0.387             -3.56
## # i 170 more rows
```

In terms of average educational level and average educational inequality index, the countries with the best performance include: Germany, Australia, the United Kingdom, Barbados, Denmark, Sweden, etc. The worst countries include Burkina Faso, Mali, Nigeria, Somalia, etc. Looking from the changes from 1984 to 2010, countries such as Botswana, Singapore, and Libya have made great progress. Tajikistan, North Korea, Russia and other countries have not changed much.