# Math, Minds, and Meteorology:

## Analyzing the International Math Olympiad

DATA
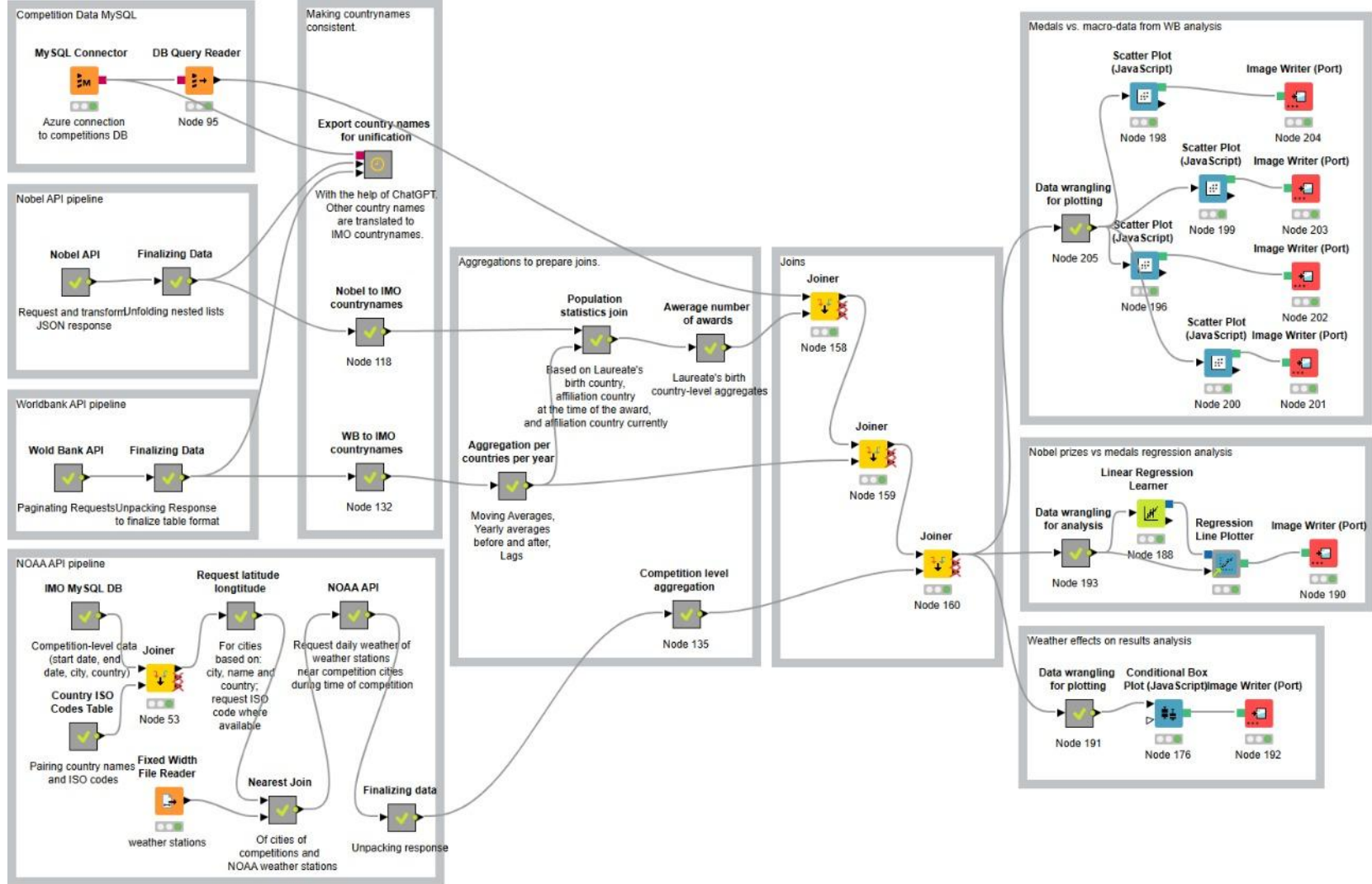
JOINS

ANALYSIS
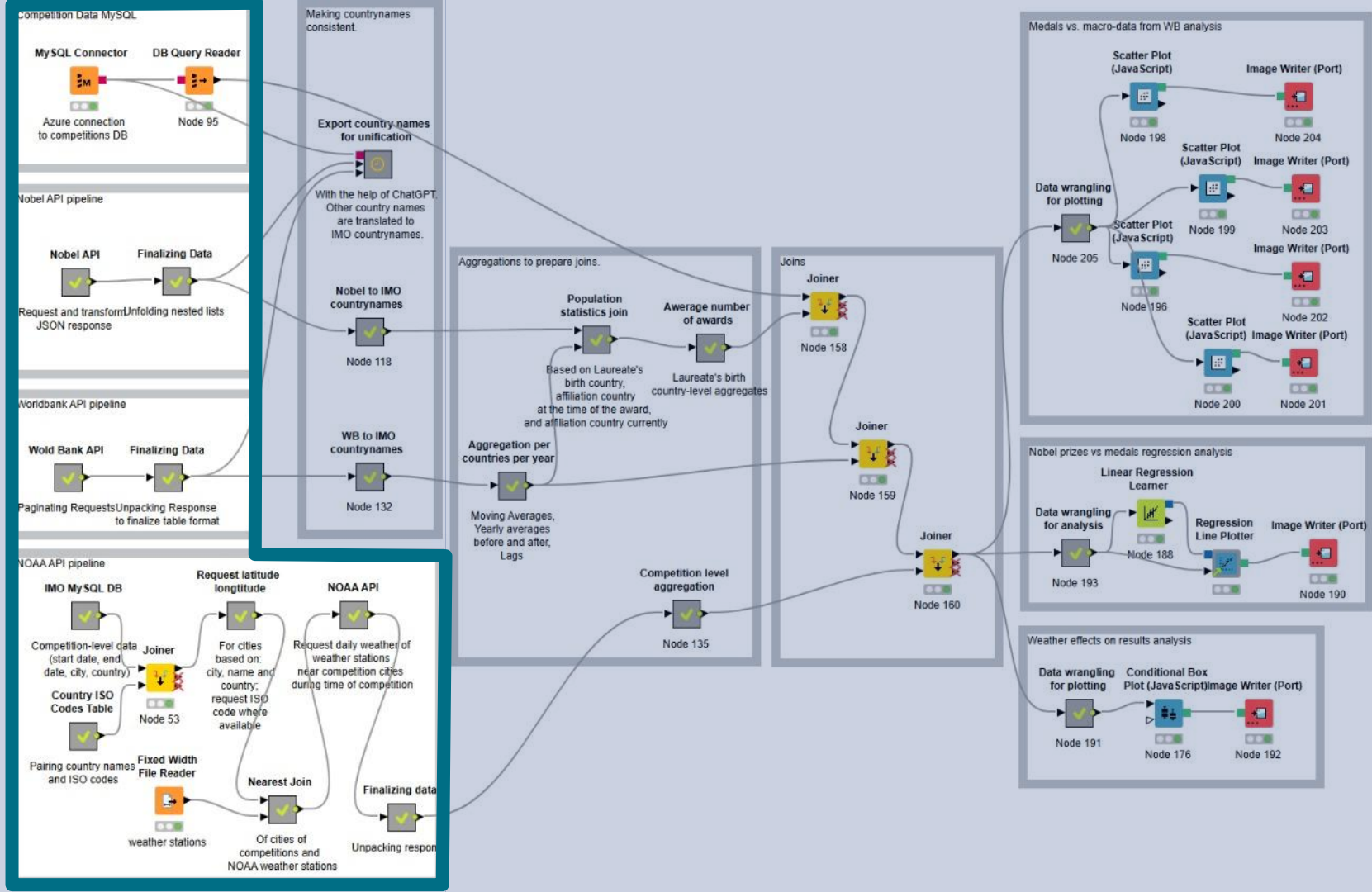
**Competition Data MySQL**

**MySQL Connector** — **DB Query Reader**

Azure connection
to competitions DB

Node 95

**Making countrynames consistent.**

**Export country names for unification**

With the help of ChatGPT.
Other country names
are translated to
IMO countrynames.

**Nobel to IMO countrynames**

Node 118

**WB to IMO countrynames**

Node 132

**Nobel API pipeline**

**Nobel API** — **Finalizing Data**

Request and transform — Unfolding nested lists
JSON response

**Worldbank API pipeline**

**Wold Bank API** — **Finalizing Data**

Paginating Requests — Unpacking Response
to finalize table format

**NOAA API pipeline**

**IMO MySQL DB** — **Request latitude longtitude** — **NOAA API**

Competition-level data
(start date, end
date, city, country)

**Joiner**

Node 53

For cities
based on:
city, name and
country;
request ISO
code where
available

Request daily weather of
weather stations
near competition cities
during time of competition

**Country ISO Codes Table**

Pairing country names
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**Fixed Width File Reader**

weather stations

**Nearest Join**

Of cities of
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Based on Laureate's
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Moving Averages,
Yearly averages
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**Joiner**

Node 158

**Joiner**

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**Joiner**

Node 160

**Medals vs. macro-data from WB analysis**

**Scatter Plot (JavaScript)** — **Image Writer (Port)**

Node 198 — Node 204

**Scatter Plot (JavaScript)** — **Image Writer (Port)**

Node 199 — Node 203

**Data wrangling for plotting**

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**Nobel prizes vs medals regression analysis**

**Linear Regression Learner**

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**Regression Line Plotter**

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**Weather effects on results analysis**

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**Conditional Box Plot (JavaScript)** — **Image Writer (Port)**

Node 176 — Node 192

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# 1

# DATA

Data sources & workflow

# DATA SOURCES

| Data | Level of observation | Workflow |
|---|---|---|
| International Math Olympiad (IMO) | Competition, participant | Downloaded from GitHub, pushed to Azure |
| Nobel Prize winners | Year, individual | Nobel Prize API, Knime workflow |
| World Bank Education Statistics | Year, country | World Bank API, Knime workflow to paginate and impute missing values |
| National Oceanic and Atmospheric Administration Weather data | Competition city | NOAA API, Knime extension to match the city to the closest weather station |

# 2

# JOINS

Aggregations & joins workflow

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# AGGREGATIONS & JOINS

Standardized country names to ISO3 codes (ChatGPT)

Calculated weighted averages for medals

Calculated Moving Averages for marco indicators

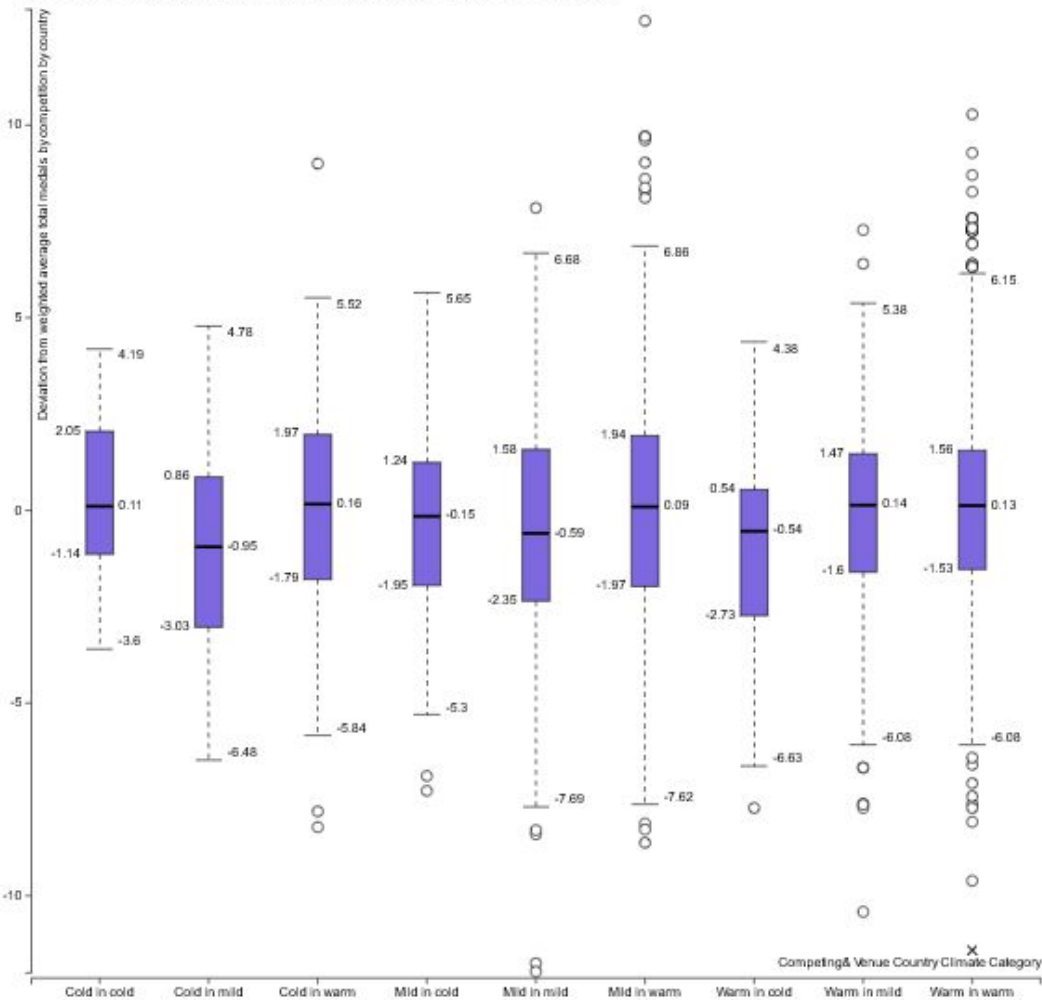Joined IMO and Nobel prize winners

Joined IMO and World Bank data

# 3
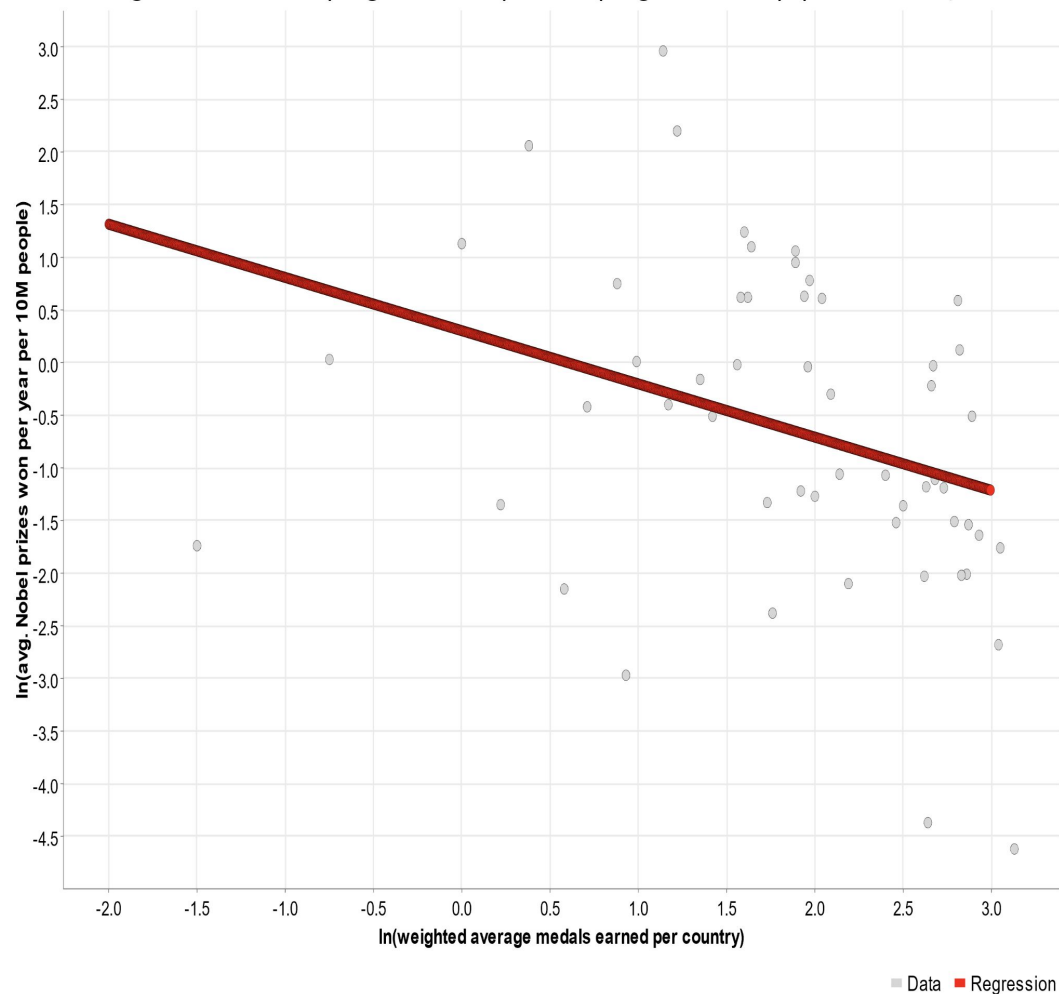
# ANALYSIS

Data analytics & visualization

# CLIMATE

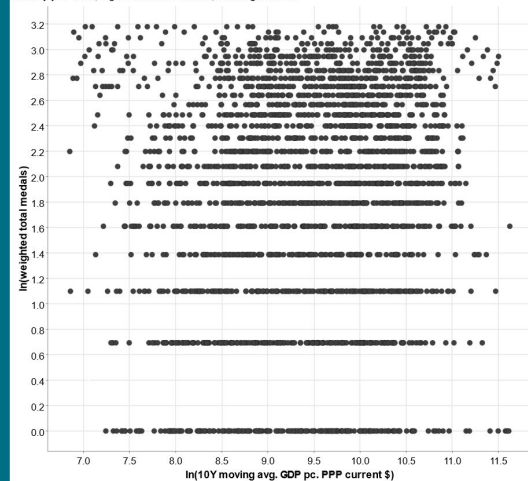No relationship between the climate of the competition location and participants' home country

# NOBEL PRIZE

No strong relationship between IMO medals and Nobel prizes



Linear regression of ln(avg. Nobels) on ln(avg. medals) (R2:0.1114)

Weighted medals vs. 10Y MA GDP pc. PPP
Country-year obs., log-transformed values, missing omitted.

Weighted medals vs. % 10Y MA publ. educ. exp.
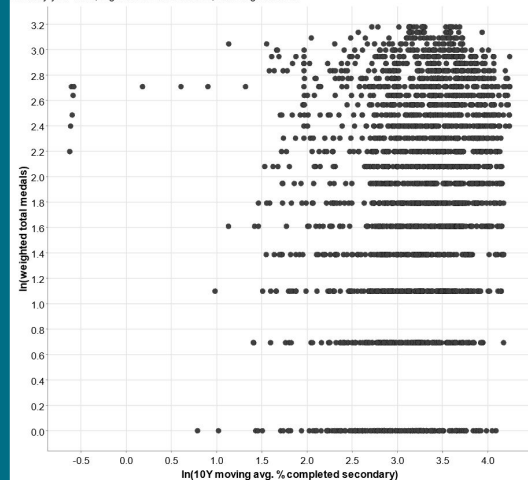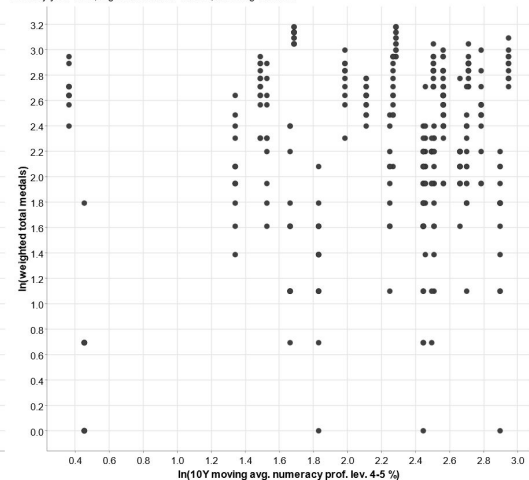Country-year obs., log-transformed values, missing omitted.
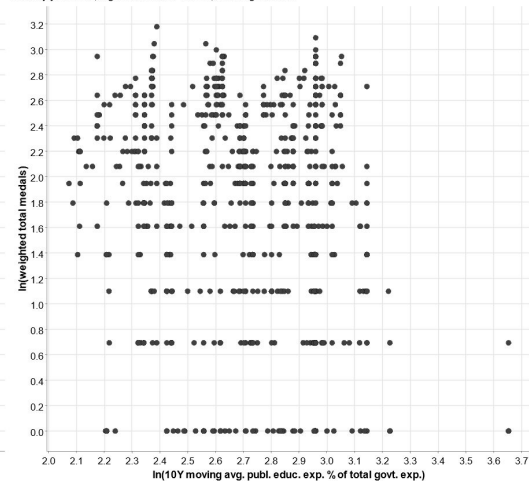
Weighted medals vs. % 10Y MA secondary school
Country-year obs., log-transformed values, missing omitted.

Weighted medals vs. % 10Y MA numeracy level 4-5
Country-year obs., log-transformed values, missing omitted.

# EDUCATION STATISTICS

Mixed results on various education indicators

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# THANK YOU!

# Q&A

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