Inequality of Opportunity in Educational Achievements

Cross-Country and Intertemporal Comparisons

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Inequality – Measurement, trend, impacts and policies

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Outline

1. Aim & Motivation
2. Model
3. Data
4. Results
5. Conclusions
6. Appendix

Research questions

1. Does the country ranking change when we switch the focus of the analysis from average test scores to fairness?
2. Is there any country that outperform in both the level and the degree of fairness?
3. There has been any change in the strength of the association between socio-economic characteristics and students' performances?

Motivations

- Education influences labour market participation, civic engagement, health status, earnings, social mobility, etc. (Blau & Kahn, 2005; Hanushek & Woessmann, 2010; among others).
- Intergenerational persistence in educational achievements (Marks, 2005; Macdonald et al. 2010; Ermisch et al. 2012)
- Inequality in educational attainments (Thomas et al. 2001; Morrison & Murtin, 2007)
- Inequality in educational achievements (Brown et al., 2007; Micklewright et al. 2007)

IEOp

Existing evidences

- de la Vega & Lekuona (2013): PISA 2009
- Gamboa & Waltenberg (2011) PISA 2006 & 2009, LAC
- Ferreira & Gignoux (2011) PISA 2006

What's new?

1. PISA 2012
2. Changes over time (PISA 2003, 2006, 2009, 2012)
3. How do the less advantaged students perform?

Model

Adapt to our framework the idea of measuring fairness through an ordered pair (Roemer, 2013):

$$EduOpp = (W^{EEOp}, IEOp)$$

- W^{EEOp}: focuses on worst-off students
- $IEOp$: looks at the whole sample

Outcome function

Test scores (s) depend only on circumstances (c) and effort (e)

$$s_i = f(c, e)$$

- c used to partition students into K ($j = 1, ..., K$) types
- e correspond to the rank π occupied by each student in its own type distribution of test scores
- $v^j(\pi)$: level of s for individuals in type j occupying the rank π

W^{EEOp}

$$W^{EEOp} = \int_0^1 \min_j(\pi) d\pi \tag{1}$$

- Class-ranked situations: W^{EEOp} corresponds to the average score of the worst-off students (Roemer, 2013)
- Not class-ranked situations: W^{EEOp} corresponds to the left-hand envelope of the distribution of CDFs (Roemer, 2013)
- Empirically this involves the estimation, for each country, of each type-specific CDF and their envelopes

IEOp

- Ex-Ante Approach: *IEOp* measured as between type inequality in mean outcome
- Parametric procedure

$$s_i = \beta k_i + \varepsilon_i$$

- Index of Inequality

$$IEOp = \frac{var(k,\hat{\beta})}{var(y)}$$

Dataset

OECD

- PISA 2003: 41 countries
- PISA 2006: 57 countries
- PISA 2009: 74 countries
- PISA 2012: 65 countries

Domains

- Mathematics
- Science
- Reading

Sample

2 stages sampling procedure
Students aged between 15 years and 3 months and 16 years and 3 months enrolled in grade 7 or higher
Raw test scores (s) scaled by using IRT and then standardized

$$s_i = \hat{\mu} + \frac{\hat{\sigma}}{\sigma}(x_i - \mu)$$

where x_i is the test score of student i, $\hat{\mu} = 500$ and $\hat{\sigma} = 100$ are the arbitrary (final) grand mean and SD

Available Data

PISA contains information on:

- Schools' policies and practices
- Students' background
- Students' motivation
- Students' learning style

Some empirical issues

$$EduOpp = (W^{EEOp}, IEOp)$$

- W^{EEOp} focuses on the worst-off type: the omission of relevant circumstances determines a measure of "social welfare" UPWARD biased
  - Intuition: when a new circumstance is added there is at least one additional type-distribution, conditional to a given value of the new circumstance, which is going to be at its left
- *IEOp* looks at the whole population: the omission of relevant circumstances determines a measure of inequality which is DOWNWARD biased; some variation is left unexplained and attributed to effort.
- As # of K $\uparrow \Rightarrow W^{EEOp} \downarrow$ and $IEOp \uparrow$

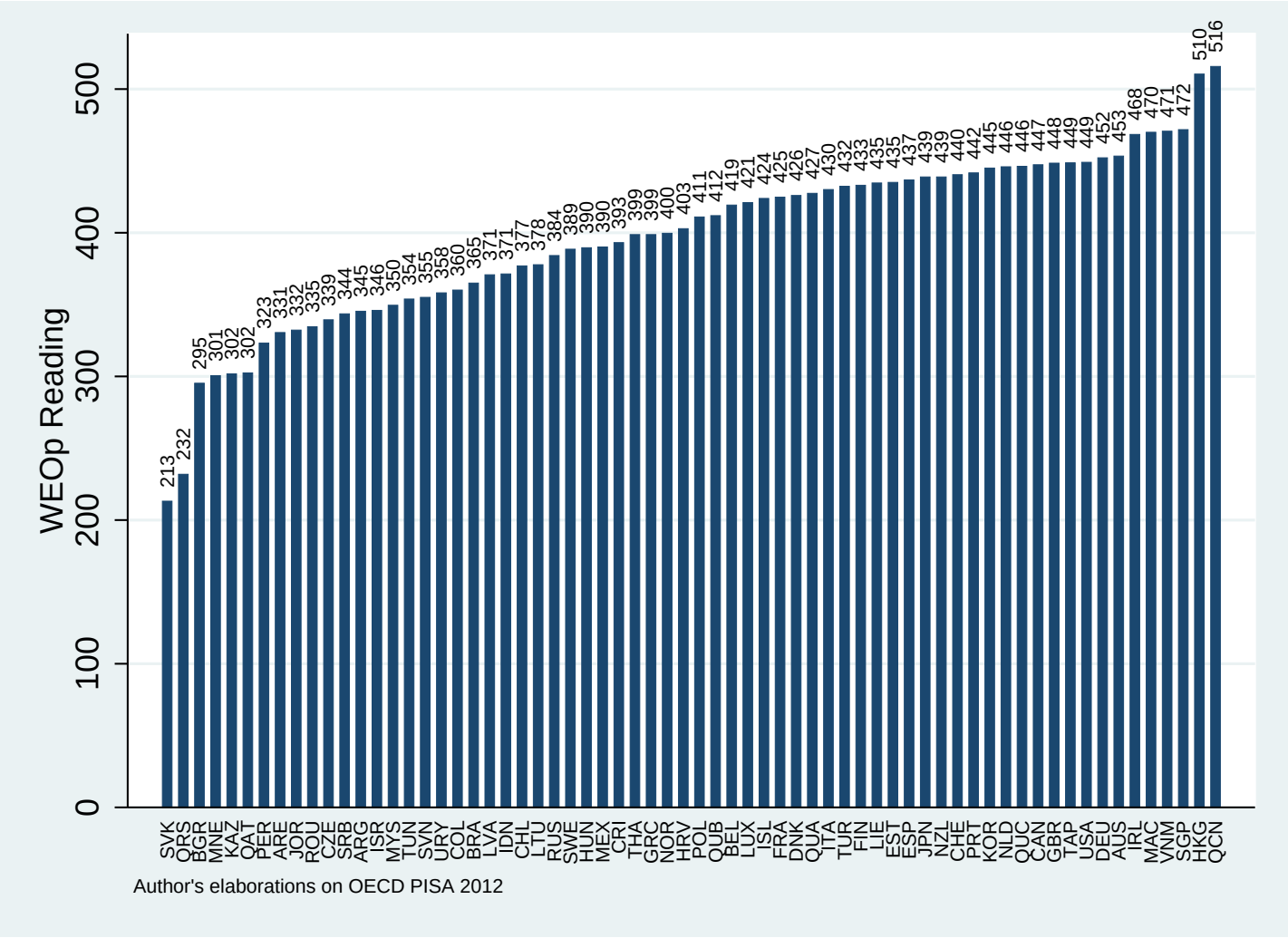
Variables

Students' circumstances

- Gender
- Parental level of education
  1. ISCED ≤ 2
  2. $3 \leq$ ISCED ≤ 4
  3. ISCED ≥ 5
- Parental job classification
  1. White collar
  2. Blue collar

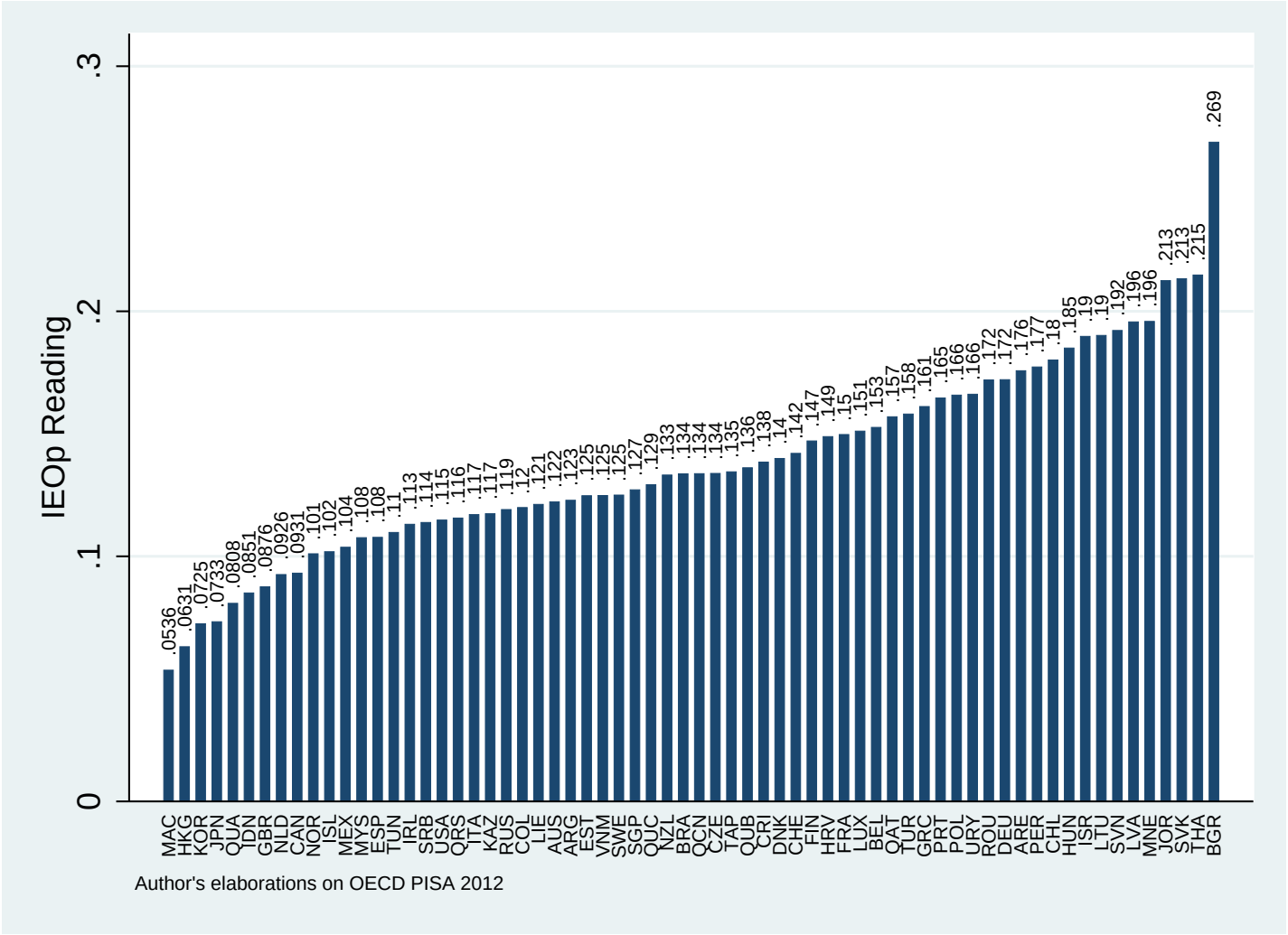
12types

W^{EEOp} in Reading, 2012



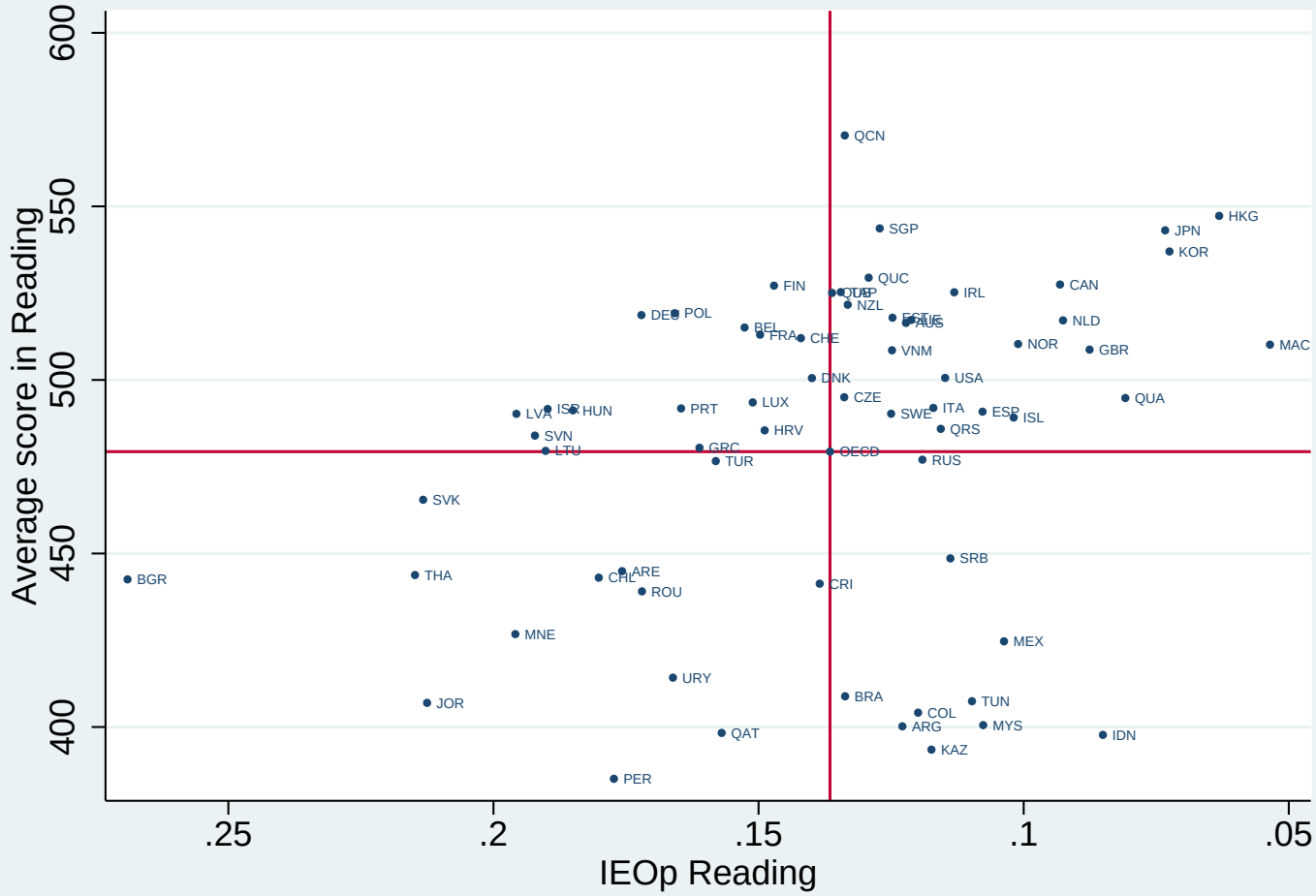
Author's elaborations on OECD PISA 2012

IEOp in Reading, 2012



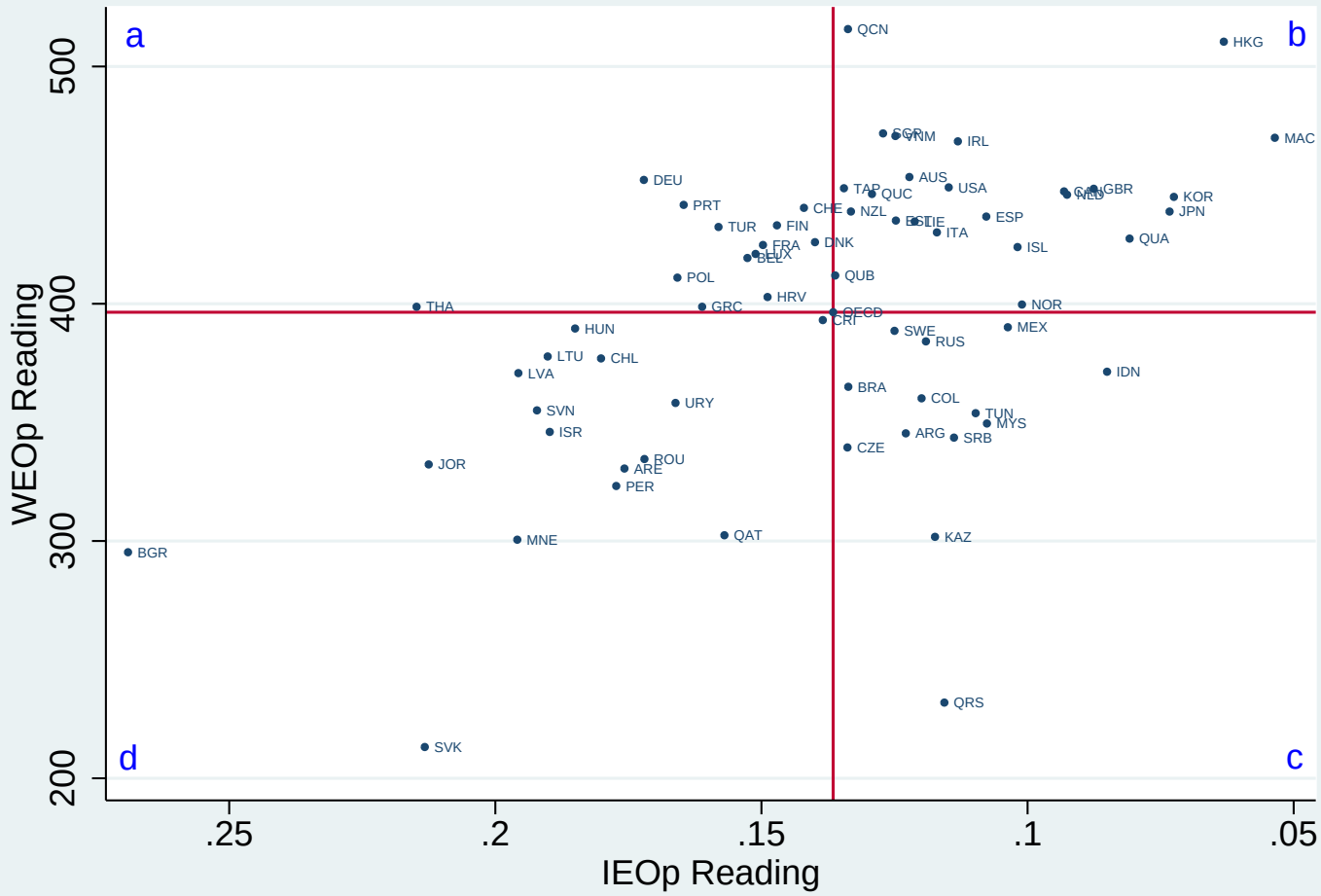
Author's elaborations on OECD PISA 2012

Average performance and *IEOp* in Reading, 2012



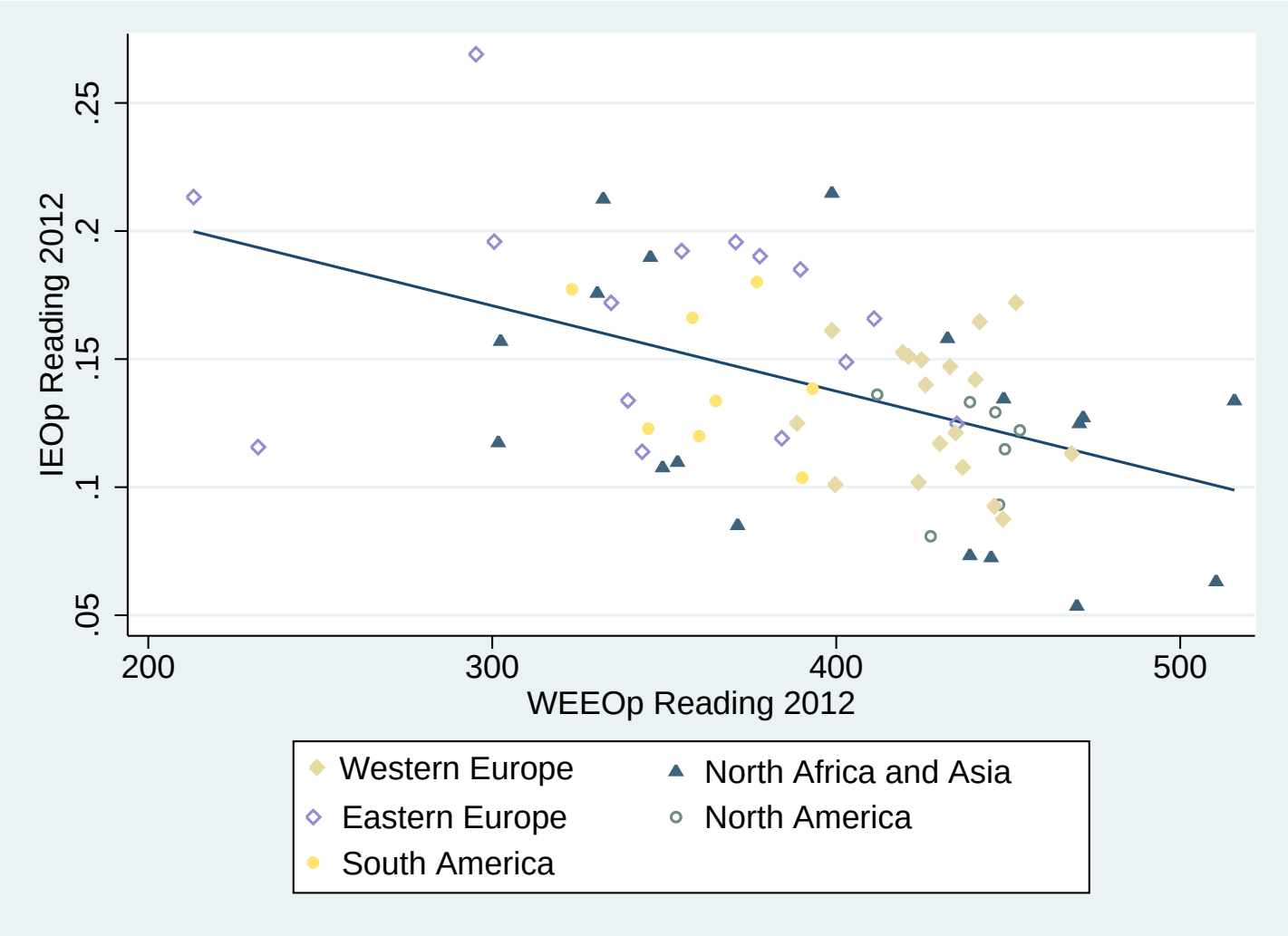
Author's elaboration on OECD PISA 2012

Is there any "outperforming" country?

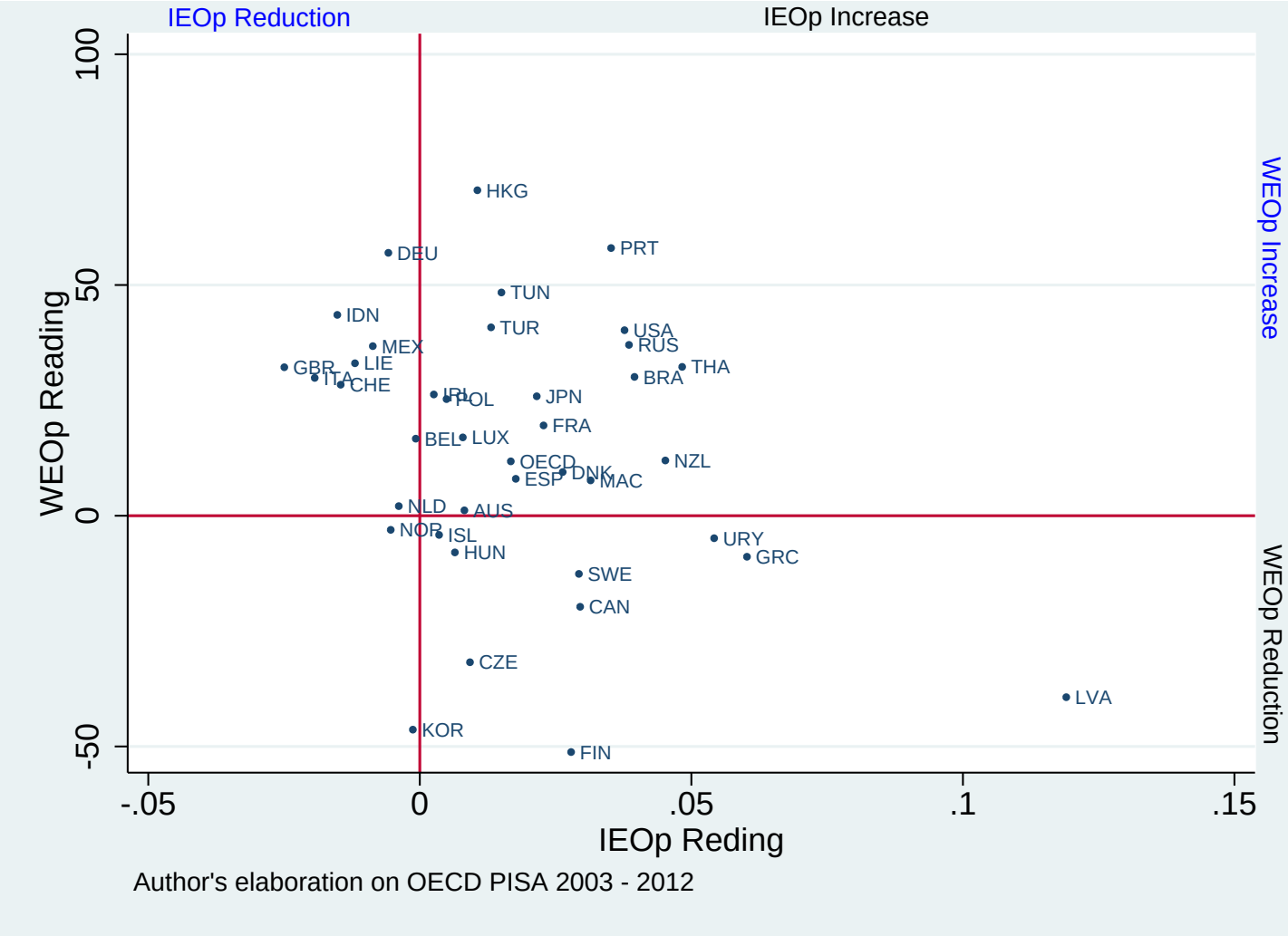


Author's elaboration on OECD PISA 2012

Geographical Pattern



Changes over time, 2003 – 2012



Limits of the analysis

- Due to the omission of relevant circumstances the two components risk to be biased, so caution is necessary in interpreting the results.
- PISA involves only students who do not drop out and have not repeated too many grades.

With these caveats in mind. . .

Conclusion

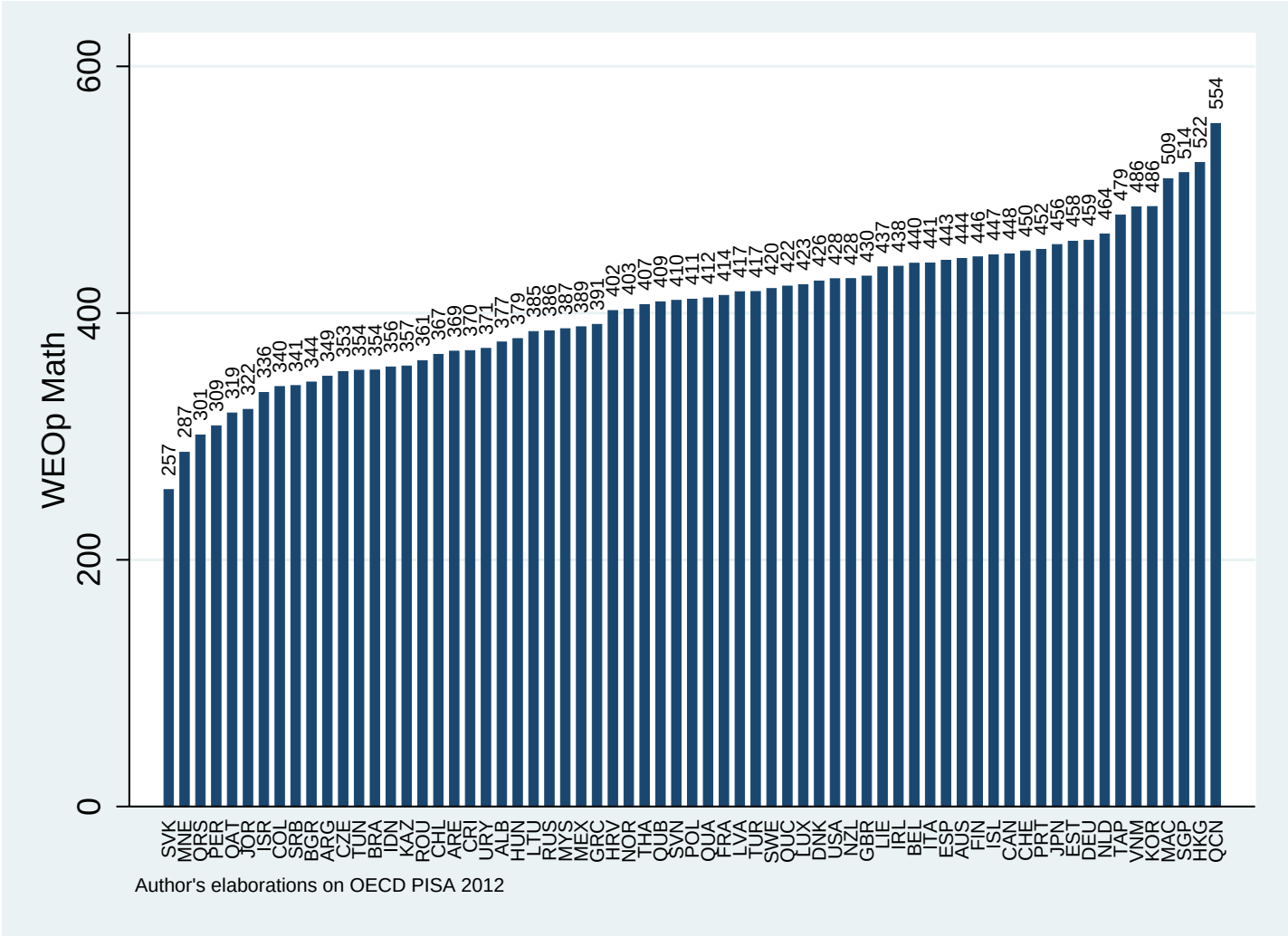
- High heterogeneity across countries in terms of both levels and degree of fairness in education
- The strength of the association between parental background and students' test scores tends to be higher in Reading than in Math and Science
- This association is, on average, lower in countries that perform better in average test scores
- There aren't countries that outperform in both dimensions of fairness
- W^{EEOp} tends to be higher and *IEOp* lower in some Asiatic countries, in North America and in Western European countries where also variability is lower

Conclusions (ctd.)

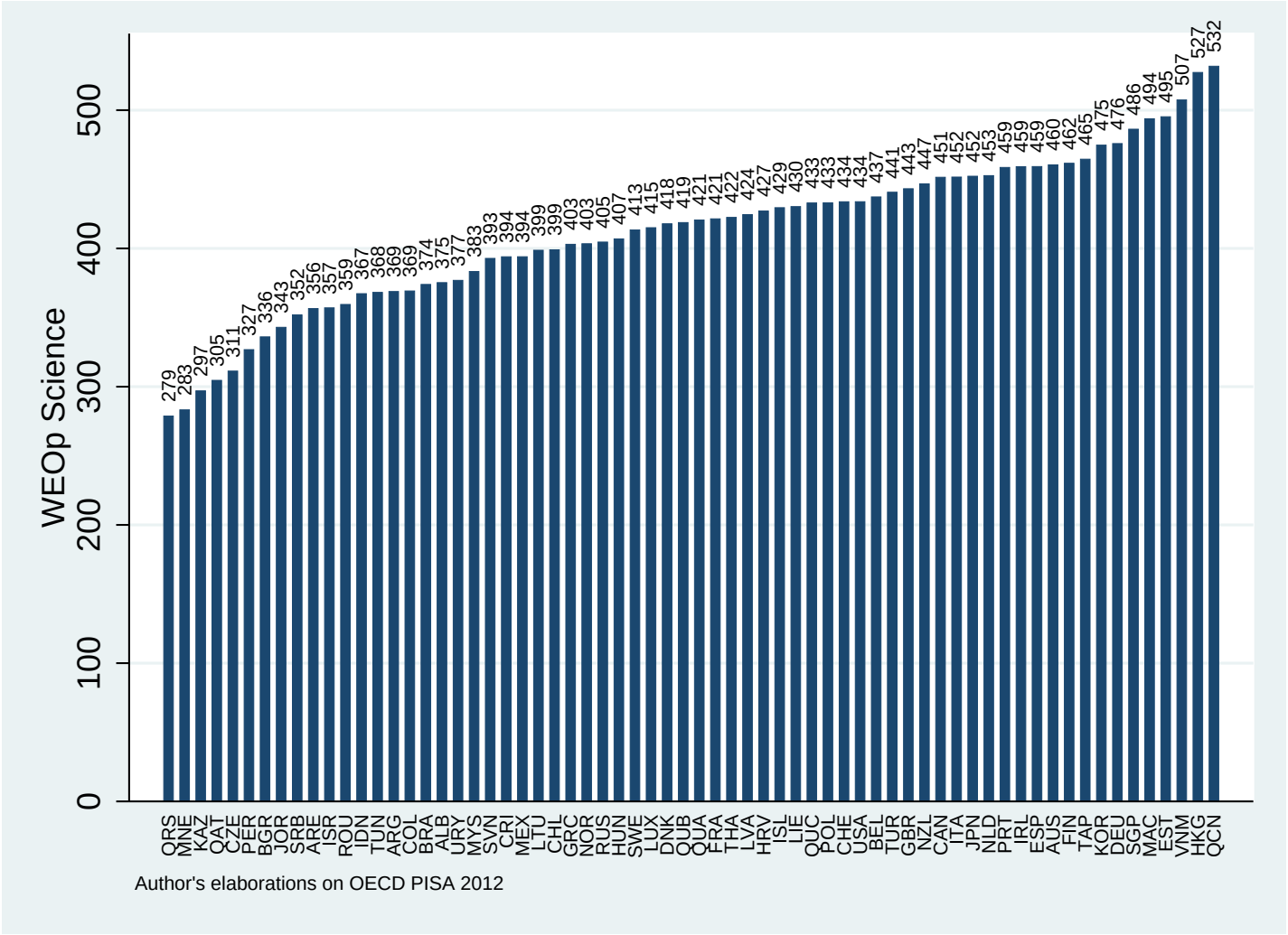
- Eastern European countries occupy an intermediate position in terms of *IEOp*
- Between 2003 and 2012 $\uparrow$ in W^{EEOp} has been accompanied by $\uparrow$ in *IEOp*
- Few countries moved toward lower degree of *IEOp* all the while improving the performances of the less advantaged students.
- Most of them, with the exceptions of Indonesia and Mexico, are Western European.

THANK YOU!

W^{EEOp} in Mathematics, 2012

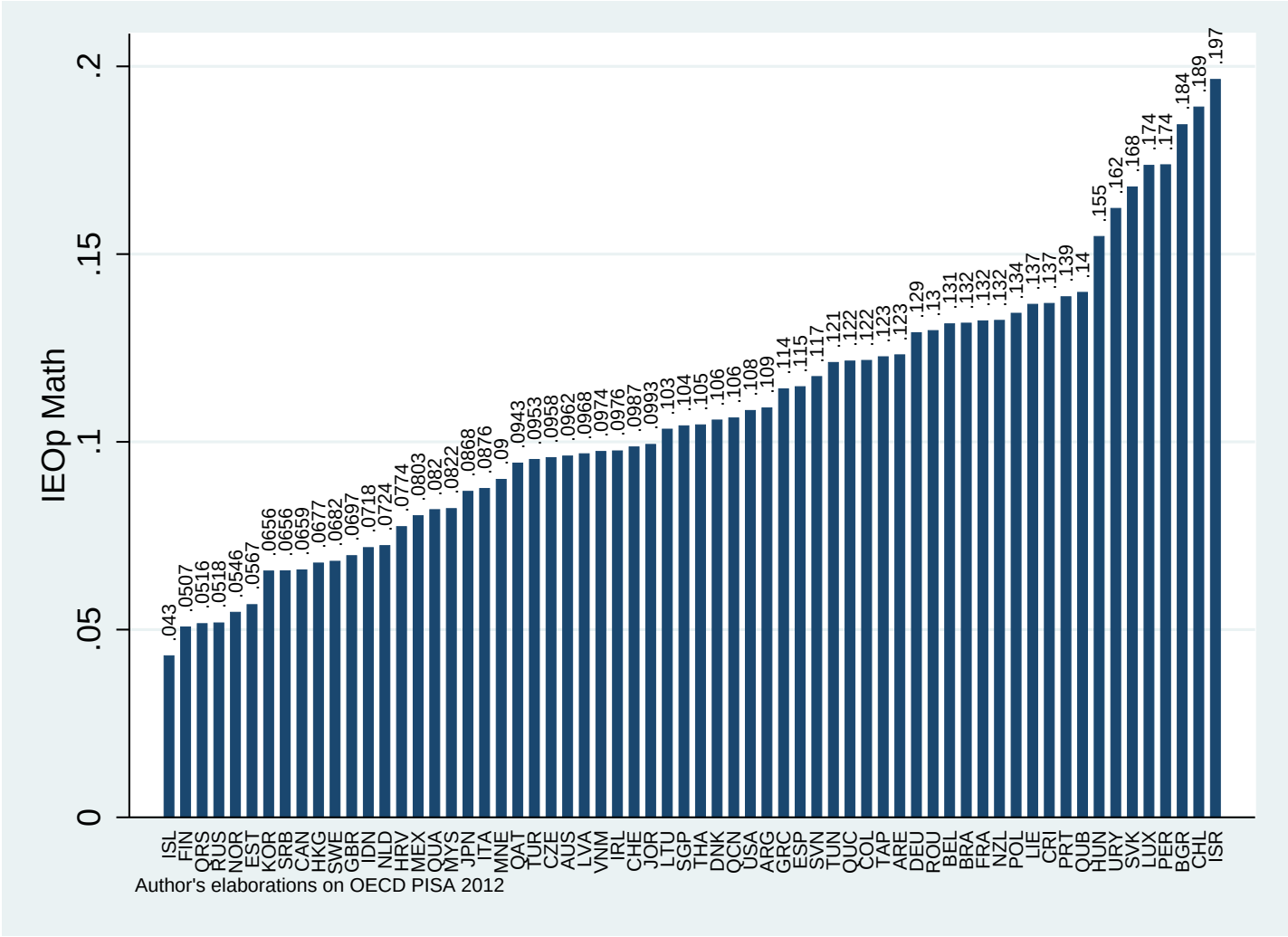


W^{EEOp} in Science, 2012

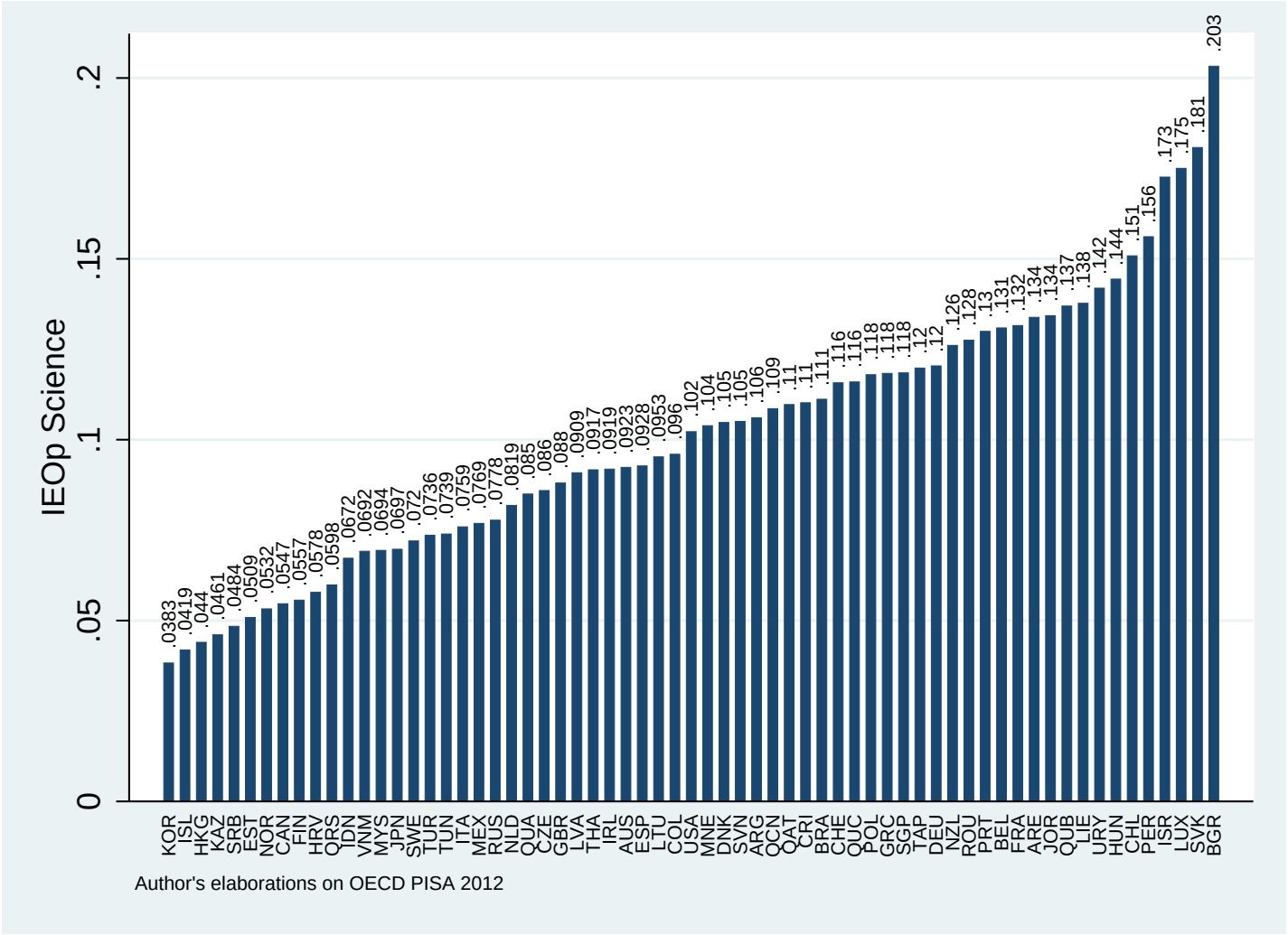


Author's elaborations on OECD PISA 2012

IEOp in Mathematics, 2012



IEOp in Science, 2012



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