Exploring differences in financial literacy across countries: the role of individual characteristics, experience, and institutions

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Disclaimer: The views and results presented in this paper are those of the authors and do not necessarily represent the official opinions of the NBS, OeNB, or the Eurosystem.
Rising importance of financial literacy for consumers from several reasons:
- Rising capital-to-income ratios – more to invest...
- Challenged PAYG public pensions – rising importance of the private pension schemes...
- Digitalization of the banking/financial industry...

Households (will) face more direct and more risky products

Do they possess enough financial literacy to deal with such developments and how prepared are they across countries?
Numerous studies analyzing impact of financial literacy on behaviors (see Fernandes et al., 2014 *Manag. Scie.*; Lusardi and Mitchell, 2014 *J. Econ. Lit.* for overview)

Some comparative (descriptive) studies on differences in financial literacy across countries

- Standard & Poor’s survey (2014)
- OECD’s survey on adults’ financial literacy (e.g. Atkinson and Messy, 2012)
- Comparisons based on unharmonized data (e.g. Lusardi and Mitchell, 2011)
- An exception is a study by Jappelli (2010 *Econ. J.*) analyzing macroeconomic determinants of econ. literacy

Remaining gap in the literature...
Contribution

Our contribution...

- We reveal (potential) drivers of the financial literacy gaps across countries by utilizing novel dataset from the OECD/INFE.
- We are the first study to employ counterfactual decomposition techniques to study differences in financial literacy across countries.

Main results...

- Financial literacy gaps can be substantial, e.g. Finland vs. Croatia or Russia.
- Differences in individual characteristics and experience with finance cannot fully explain the observed gaps.
- Larger part of the gaps (in some cases) is due to different economic environments.
Outline

1. Data
   - Variables

2. Empirical strategy
   - Determinants of financial literacy
   - Decomposition analysis
   - Unexplained differences vs. institutions

3. Results
   - Determinants of financial literacy
   - Decomposition analysis
   - Unexplained differences vs. institutions

4. Summary
Data

- Representative microdata from the OECD/INFE (International Network for Financial Education) survey

- Our sample – 12 countries over the world covering 15K individuals

- Information on financial knowledge, behaviors and attitudes of individuals + standard demographic characteristics

- The data contains more detailed financial literacy questions than previously used in surveys (Lusardi and Mitchell, 2014)

- Comparability across countries – large degree of harmonization ensured
Dependent variable

- Financial literacy score created similarly to the extant literature (Lusardi and Mitchell, 2014)
- Sum of binary variables taking value 1 if the $j$-th FL question ($Q$) answered correctly:

$$FL = \sum_{j=0}^{7} Q_j$$

- Questions cover the following topics: time value of money, interest paid on loan, interest and principal, compound interest, risk and return, inflation, and risk diversification
- Both multiple-choice and open-ended questions
Distribution of financial literacy score across countries

Austria

Brasil

Canada

Croatia

Finland

Germany

Hong Kong

Hungary

Jordan

The Netherlands

Russia

UK
### Variables (cont’d)

#### Explanatory variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Individual (basic) characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Income buffer</td>
<td>Dummy variable: 1 if an individual has a financial buffer for at least three months in the case he/she loses his/her job (a proxy for wellbeing)</td>
</tr>
<tr>
<td>Gender</td>
<td>Dummy variable: 1 if female and 0 otherwise</td>
</tr>
<tr>
<td>Single</td>
<td>Dummy variable: 1 if an individual lives in a single-member household and 0 otherwise</td>
</tr>
<tr>
<td>University education</td>
<td>Dummy variable: 1 if university education is the highest attained one and 0 otherwise</td>
</tr>
<tr>
<td>Age category (18-29)</td>
<td>Dummy variable: 1 if an individual aged from 18 to 29 and 0 otherwise</td>
</tr>
<tr>
<td>Age category (30-49)</td>
<td>Dummy variable: 1 if an individual aged from 30 to 49 and 0 otherwise</td>
</tr>
<tr>
<td>Age category (50-69)</td>
<td>Dummy variable: 1 if an individual aged from 50 to 69 and 0 otherwise</td>
</tr>
<tr>
<td>Age category (70+)</td>
<td>Dummy variable: 1 if an individual aged 70+ and 0 otherwise</td>
</tr>
<tr>
<td>Employed</td>
<td>Dummy variable: 1 if paid employment (working for someone else) and 0 otherwise</td>
</tr>
<tr>
<td>Self-employed</td>
<td>Dummy variable: 1 if self-employed (working for him/herself) and 0 otherwise</td>
</tr>
<tr>
<td>Retired</td>
<td>Dummy variable: 1 if retired and 0 otherwise</td>
</tr>
<tr>
<td>Other, not-working</td>
<td>Dummy variable: 1 if unemployed or not-working (e.g. apprentice, looking for work, looking after home, unable to work due to sickness, student) and 0 otherwise</td>
</tr>
<tr>
<td><strong>Experience with finance</strong></td>
<td></td>
</tr>
<tr>
<td>Having budget</td>
<td>Dummy variable: 1 if an individual is responsible for budget and has a budget and 0 otherwise</td>
</tr>
<tr>
<td>Active saver</td>
<td>Dummy variable: 1 if an individual actively saves in one of the following schemes (cash at home, savings account, informal savings club, investment products) and 0 otherwise</td>
</tr>
<tr>
<td>Holding risky financial assets</td>
<td>Dummy variable: 1 if an individual holds shares or bonds in his/her financial portfolio and 0 otherwise</td>
</tr>
<tr>
<td>Financial planning</td>
<td>Dummy variable: 1 if an individual sets long-term financial goals and 0 otherwise</td>
</tr>
</tbody>
</table>
Empirical strategy

- As a preliminary step, we estimate OLS determinants of financial literacy

- Then, we devise a two-step empirical strategy to explain differences in financial literacy across countries by:
  - Decomposing gaps in financial literacy in a counterfactual way
  - Correlating the unexplained part of the gaps with institutional environments
We estimate determinants of financial literacy by OLS:

$$FL = X \beta' + \gamma I + \varepsilon,$$

where $FL$ is the financial literacy score, $X$ contains constant and predictors (both exogenous and endogenous), $I$ includes country fixed effects, and $\varepsilon$ is an (i.i.d.) error term.

We estimate OLS with and without country fixed effects.
Decomposition analysis

- In the first-stage, we decompose mean differences in financial literacy score across countries (Blinder, 1973 *IER*; Oaxaca, 1973 *JHR*)
- We decompose gaps to a part that is due to different endowments between considered groups and a part that cannot be explained by such differences
- Based on the linear model, we can write the two-fold decomposition as

\[
\hat{\triangle} \mu_{FLc} = (\bar{X}_c - \bar{X}_{c=j})' \hat{\beta}_c + \bar{X}_{c=j}'(\hat{\beta}_c - \hat{\beta}_{c=j}),
\]

where \( c = AT, BR, CA, HR, ..., UK \) and the benchmark is Finland, \( j \)
Decomposition beyond mean

- As a sensitivity check, we decompose the distributions in financial literacy between countries using recentred influence function (RIF) regressions along with the B-O technique (Firpo et al., 2007, 2009 *Econometrica*).
- A RIF regression is similar to a standard regression, except that the dependent variable is replaced by the recentered influence function of the statistic of interest.
- We run RIF regressions for the 10th, 50th and 90th percentiles.
Inspired by Christelis et al. (2013 Rev. Econ. Stat.), we correlate the unexplained parts of the gap $\bar{X}'_{c=j}(\hat{\beta}_c - \hat{\beta}_{c=j})$ with selected macroeconomic indicators (one-by-one).

The list of aggregate indicators affecting financial literacy at country-level comes from Jappelli (2010).

<table>
<thead>
<tr>
<th>Country</th>
<th>GDP per capita (current $USD)</th>
<th>Internet users (% of the population)</th>
<th>Life expectancy (years)</th>
<th>Enrolment ratio, upper secondary, both sexes (%)</th>
<th>Stock market total value to GDP (%)</th>
<th>Social contributions (% of revenue)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>43,665</td>
<td>83.93</td>
<td>81.84</td>
<td>95.75</td>
<td>7.33</td>
<td>32.33</td>
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<td>Brazil</td>
<td>8,757</td>
<td>59.08</td>
<td>74.68</td>
<td>90.97</td>
<td>31.19</td>
<td>31.68</td>
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<td>Canada</td>
<td>43,316</td>
<td>88.47</td>
<td>82.14</td>
<td>119.30</td>
<td>77.59</td>
<td>23.70</td>
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<td>Croatia</td>
<td>11,580</td>
<td>69.80</td>
<td>77.28</td>
<td>97.66</td>
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<tr>
<td>Finland</td>
<td>42,405</td>
<td>92.65</td>
<td>81.39</td>
<td>115.23</td>
<td>56.61</td>
<td>33.67</td>
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<td>Germany</td>
<td>41,177</td>
<td>87.59</td>
<td>81.09</td>
<td>106.68</td>
<td>38.25</td>
<td>54.61</td>
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<tr>
<td>Hong Kong</td>
<td>42,351</td>
<td>84.95</td>
<td>84.28</td>
<td>113.22</td>
<td>478.70</td>
<td>N.A.</td>
</tr>
<tr>
<td>Hungary</td>
<td>12,366</td>
<td>72.83</td>
<td>75.96</td>
<td>102.67</td>
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<td>4,096</td>
<td>53.40</td>
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<tr>
<td>Netherlands</td>
<td>44,293</td>
<td>93.10</td>
<td>81.70</td>
<td>124.47</td>
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<td>36.69</td>
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<td>Russia</td>
<td>9,329</td>
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<td>70.91</td>
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<td>92.00</td>
<td>81.60</td>
<td>83.20</td>
<td>103.06</td>
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### OLS estimates of determinants of financial literacy

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</tr>
</thead>
<tbody>
<tr>
<td>Income buffer</td>
<td>0.621***</td>
<td>0.439***</td>
<td>0.473***</td>
<td>0.306***</td>
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<tr>
<td></td>
<td>(0.030)</td>
<td>(0.031)</td>
<td>(0.033)</td>
<td>(0.034)</td>
</tr>
<tr>
<td>Gender (female)</td>
<td>-0.429***</td>
<td>-0.452***</td>
<td>-0.387***</td>
<td>-0.419***</td>
</tr>
<tr>
<td></td>
<td>(0.029)</td>
<td>(0.028)</td>
<td>(0.030)</td>
<td>(0.029)</td>
</tr>
<tr>
<td>Single</td>
<td>-0.078**</td>
<td>-0.131***</td>
<td>-0.023</td>
<td>-0.094**</td>
</tr>
<tr>
<td></td>
<td>(0.039)</td>
<td>(0.039)</td>
<td>(0.040)</td>
<td>(0.040)</td>
</tr>
<tr>
<td>University education</td>
<td>0.543***</td>
<td>0.655***</td>
<td>0.452***</td>
<td>0.568***</td>
</tr>
<tr>
<td></td>
<td>(0.031)</td>
<td>(0.033)</td>
<td>(0.032)</td>
<td>(0.033)</td>
</tr>
<tr>
<td>Age category (18-29)</td>
<td>-0.148**</td>
<td>-0.015</td>
<td>-0.236***</td>
<td>-0.056</td>
</tr>
<tr>
<td></td>
<td>(0.074)</td>
<td>(0.074)</td>
<td>(0.077)</td>
<td>(0.076)</td>
</tr>
<tr>
<td>Age category (30-49)</td>
<td>0.067</td>
<td>0.135*</td>
<td>-0.059</td>
<td>0.044</td>
</tr>
<tr>
<td></td>
<td>(0.070)</td>
<td>(0.069)</td>
<td>(0.073)</td>
<td>(0.072)</td>
</tr>
<tr>
<td>Age category (50-69)</td>
<td>0.247***</td>
<td>0.288***</td>
<td>0.092</td>
<td>0.156**</td>
</tr>
<tr>
<td></td>
<td>(0.061)</td>
<td>(0.059)</td>
<td>(0.063)</td>
<td>(0.062)</td>
</tr>
<tr>
<td>Employed</td>
<td>0.217***</td>
<td>0.239***</td>
<td>0.133***</td>
<td>0.142***</td>
</tr>
<tr>
<td></td>
<td>(0.042)</td>
<td>(0.041)</td>
<td>(0.043)</td>
<td>(0.042)</td>
</tr>
<tr>
<td>Self-employed</td>
<td>0.088</td>
<td>0.188***</td>
<td>-0.043</td>
<td>0.087</td>
</tr>
<tr>
<td></td>
<td>(0.055)</td>
<td>(0.056)</td>
<td>(0.056)</td>
<td>(0.056)</td>
</tr>
<tr>
<td>Retired</td>
<td>-0.048</td>
<td>0.023</td>
<td>-0.116*</td>
<td>-0.045</td>
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<td></td>
<td>(0.059)</td>
<td>(0.058)</td>
<td>(0.060)</td>
<td>(0.060)</td>
</tr>
<tr>
<td>Having budget</td>
<td>-0.066**</td>
<td>-0.005</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.030)</td>
<td>(0.031)</td>
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<tr>
<td>Active saver</td>
<td>0.080**</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>(0.033)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holding risky financial assets</td>
<td>0.392***</td>
<td>0.293***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.037)</td>
<td>(0.038)</td>
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<tr>
<td>Financial planning</td>
<td>0.213***</td>
<td>0.174***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.031)</td>
<td>(0.031)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>4.507***</td>
<td>4.878***</td>
<td>4.662***</td>
<td>4.853***</td>
</tr>
<tr>
<td></td>
<td>(0.079)</td>
<td>(0.089)</td>
<td>(0.084)</td>
<td>(0.094)</td>
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<tr>
<td>Country fixed effects</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.099</td>
<td>0.144</td>
<td>0.107</td>
<td>0.148</td>
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<tr>
<td>Observations</td>
<td>12,298</td>
<td>12,298</td>
<td>10,810</td>
<td>10,810</td>
</tr>
</tbody>
</table>

Note: Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
### Results: decomposition analysis

#### Blinder-Oaxaca decomposition at mean

<table>
<thead>
<tr>
<th></th>
<th>AT</th>
<th>BR</th>
<th>CA</th>
<th>HR</th>
<th>DE</th>
<th>HK</th>
<th>HU</th>
<th>JO</th>
<th>NL</th>
<th>RU</th>
<th>UK</th>
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</thead>
<tbody>
<tr>
<td><strong>Baseline</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>I. Differential</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difference (raw)</td>
<td>0.302***</td>
<td>0.759***</td>
<td>0.292***</td>
<td>0.899***</td>
<td>0.023</td>
<td>-0.509***</td>
<td>0.506***</td>
<td>0.787***</td>
<td>-0.040</td>
<td>0.839***</td>
<td>0.667***</td>
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<tr>
<td></td>
<td>(0.058)</td>
<td>(0.061)</td>
<td>(0.061)</td>
<td>(0.067)</td>
<td>(0.067)</td>
<td>(0.058)</td>
<td>(0.065)</td>
<td>(0.064)</td>
<td>(0.069)</td>
<td>(0.068)</td>
<td>(0.068)</td>
</tr>
<tr>
<td>Difference (%)</td>
<td>5.9%</td>
<td>15.5%</td>
<td>5.7%</td>
<td>18.6%</td>
<td>0.5%</td>
<td>-9.2%</td>
<td>10.1%</td>
<td>16.1%</td>
<td>-0.7%</td>
<td>17.3%</td>
<td>13.5%</td>
</tr>
<tr>
<td>II. Decomposition</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Explained</td>
<td>0.179***</td>
<td>0.115**</td>
<td>-0.207***</td>
<td>0.161***</td>
<td>-0.036</td>
<td>-0.066</td>
<td>0.175***</td>
<td>-0.289***</td>
<td>-0.167***</td>
<td>0.094**</td>
<td>-0.091***</td>
</tr>
<tr>
<td></td>
<td>(0.032)</td>
<td>(0.048)</td>
<td>(0.037)</td>
<td>(0.035)</td>
<td>(0.035)</td>
<td>(0.046)</td>
<td>(0.042)</td>
<td>(0.066)</td>
<td>(0.050)</td>
<td>(0.048)</td>
<td>(0.033)</td>
</tr>
<tr>
<td>Unexplained</td>
<td>0.123*</td>
<td>0.644***</td>
<td>0.499***</td>
<td>0.738***</td>
<td>0.059</td>
<td>-0.443***</td>
<td>0.331***</td>
<td>1.076***</td>
<td>0.127</td>
<td>0.745***</td>
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<td>(0.068)</td>
<td>(0.080)</td>
<td>(0.069)</td>
<td>(0.078)</td>
<td>(0.075)</td>
<td>(0.074)</td>
<td>(0.080)</td>
<td>(0.091)</td>
<td>(0.084)</td>
<td>(0.085)</td>
<td>(0.075)</td>
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<td><strong>Baseline + Experience</strong></td>
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<tr>
<td>I. Differential</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Difference (raw)</td>
<td>0.036</td>
<td>0.772***</td>
<td>0.010</td>
<td>0.737***</td>
<td>-0.191***</td>
<td>-0.496***</td>
<td>0.289***</td>
<td>0.679***</td>
<td>-0.027</td>
<td>0.846***</td>
<td>0.367***</td>
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<tr>
<td></td>
<td>(0.058)</td>
<td>(0.061)</td>
<td>(0.063)</td>
<td>(0.069)</td>
<td>(0.067)</td>
<td>(0.057)</td>
<td>(0.069)</td>
<td>(0.064)</td>
<td>(0.068)</td>
<td>(0.067)</td>
<td>(0.071)</td>
</tr>
<tr>
<td>Difference (%)</td>
<td>0.7%</td>
<td>15.8%</td>
<td>0.2%</td>
<td>15.0%</td>
<td>-3.6%</td>
<td>-9.0%</td>
<td>5.6%</td>
<td>13.7%</td>
<td>-0.5%</td>
<td>17.4%</td>
<td>7.2%</td>
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<tr>
<td>II. Decomposition</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Explained</td>
<td>0.123***</td>
<td>0.246***</td>
<td>-0.365***</td>
<td>0.134***</td>
<td>-0.131***</td>
<td>-0.141***</td>
<td>0.278***</td>
<td>-0.264***</td>
<td>-0.145**</td>
<td>0.191***</td>
<td>-0.203***</td>
</tr>
<tr>
<td></td>
<td>(0.047)</td>
<td>(0.057)</td>
<td>(0.046)</td>
<td>(0.044)</td>
<td>(0.047)</td>
<td>(0.049)</td>
<td>(0.057)</td>
<td>(0.067)</td>
<td>(0.061)</td>
<td>(0.054)</td>
<td>(0.047)</td>
</tr>
<tr>
<td>Unexplained</td>
<td>-0.087</td>
<td>0.525***</td>
<td>0.375***</td>
<td>0.604***</td>
<td>-0.060</td>
<td>-0.355***</td>
<td>0.011</td>
<td>0.943***</td>
<td>0.117</td>
<td>0.655***</td>
<td>0.569***</td>
</tr>
<tr>
<td></td>
<td>(0.076)</td>
<td>(0.086)</td>
<td>(0.073)</td>
<td>(0.083)</td>
<td>(0.080)</td>
<td>(0.073)</td>
<td>(0.092)</td>
<td>(0.092)</td>
<td>(0.090)</td>
<td>(0.089)</td>
<td>(0.082)</td>
</tr>
</tbody>
</table>

Note: Finland is benchmark. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Results: unexplained differences vs. institutions

Similarly to Bover et al. (2016), we present results of this stage in graphical form.

GDP per capita

10th percentile

Mean

90th percentile
Results: unexplained differences vs. institutions (cont’d)

Internet usage

10th percentile

Mean

90th percentile
Results: unexplained differences vs. institutions (cont’d)

Life expectancy

10th percentile

Mean

90th percentile

Cupák, Fessler, Silgoner, Ulbrich
Results: unexplained differences vs. institutions (cont’d)

Welfare state

10th percentile

Mean

90th percentile
### Results: unexplained differences vs. institutions (cont’d)

#### Which institutions matter the most?

<table>
<thead>
<tr>
<th>Indicator</th>
<th>10th percentile</th>
<th>Mean</th>
<th>90th percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standardized effect</td>
<td>Rank</td>
<td>Standardized effect</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>-0.222</td>
<td>4</td>
<td>-0.289**</td>
</tr>
<tr>
<td>Gross enrolment ratio</td>
<td>-0.292*</td>
<td>3</td>
<td>-0.293***</td>
</tr>
<tr>
<td>Internet users</td>
<td>-0.200</td>
<td>5</td>
<td>-0.297***</td>
</tr>
<tr>
<td>Life expectancy</td>
<td>-0.489*</td>
<td>1</td>
<td>-0.514**</td>
</tr>
<tr>
<td>Social contributions rate</td>
<td>-0.121*</td>
<td>6</td>
<td>-0.301***</td>
</tr>
<tr>
<td>Stock market capitalization</td>
<td>-0.368***</td>
<td>2</td>
<td>-0.247***</td>
</tr>
</tbody>
</table>

### Baseline + Experience

| GDP per capita                   | -0.217*         | 4    | -0.253**         | 4    | -0.237**         | 4    |
| Gross enrolment ratio            | -0.243*         | 3    | -0.242***        | 5    | -0.189*          | 5    |
| Internet users                   | -0.196          | 5    | -0.264*          | 3    | -0.289***        | 2    |
| Life expectancy                  | -0.474**        | 1    | -0.452**         | 1    | -0.360**         | 1    |
| Social contributions rate        | -0.123*         | 6    | -0.288***        | 2    | -0.279***        | 3    |
| Stock market capitalization      | -0.326***       | 2    | -0.184***        | 6    | -0.036           | 6    |

Note: Country-level regressions of the unexplained parts of the gap estimated from the mean and quantile decomposition analyses on a set of aggregate indicators which have been standardised (i.e. values demeaned and divided by their standard deviations). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. 
The gaps in financial literacy can be substantial across countries

Differences in financial literacy cannot be fully explained by varying individuals characteristics and experience with finance

Larger part of the gaps (in some cases) is due to different economic environments

There is a potential space for harmonization of environments with regards to decrease inequality in financial literacy

Our results inform policy how to enhance financial literacy in an efficient way
Thank you for your attention!
OECD (2016) results – all participating countries

Financial literacy score

Avg = 4.6