

Different systems, same inequalities? Post-compulsory education and young adults' literacy in 18 OECD countries

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Appendix

<Appendix (sub) head>**Part 1** Additional information on the first step of analysis

| <i>Country</i> | <i>PIAAC</i> | | <i>N</i> | <i>PISA</i> | | <i>N</i> |
|-----------------|------------------------|-----------|----------|-----------------------|-----------|----------|
| | <i>Literacy scores</i> | | | <i>Reading scores</i> | | |
| | <i>mean</i> | <i>sd</i> | | <i>mean</i> | <i>sd</i> | |
| Austria | 283.27 | 41.28 | 480 | 507.13 | 93.01 | 4,745 |
| Flemish Belgium | 292.86 | 43.51 | 460 | 532.27 | 96.50 | 3,890 |
| Canada | 286.24 | 47.44 | 2,147 | 534.31 | 94.63 | 29,687 |
| Czech Republic | 284.71 | 39.46 | 714 | 491.58 | 96.33 | 5,365 |
| Germany | 284.77 | 44.79 | 503 | 483.99 | 111.22 | 5,073 |
| Denmark | 283.88 | 51.34 | 460 | 496.87 | 98.07 | 4,235 |
| Spain | 263.57 | 45.04 | 539 | 492.55 | 84.74 | 6,214 |
| Finland | 307.33 | 44.68 | 491 | 546.47 | 89.42 | 4,864 |
| France | 280.43 | 47.33 | 593 | 504.74 | 91.75 | 4,673 |
| Great Britain | 278.20 | 52.08 | 845 | 523.41 | 100.34 | 4,120 |
| Ireland | 274.74 | 46.97 | 580 | 526.67 | 93.58 | 3,854 |
| Italy | 264.13 | 43.78 | 345 | 487.47 | 91.42 | 4,984 |
| Japan | 309.26 | 34.56 | 420 | 522.24 | 85.79 | 5,256 |
| Korea | 292.26 | 34.82 | 607 | 524.75 | 69.53 | 4,982 |
| Norway | 288.09 | 50.94 | 455 | 505.28 | 103.66 | 4,147 |
| Poland | 280.87 | 45.67 | 1,649 | 479.12 | 99.80 | 3,654 |
| Sweden | 293.10 | 52.60 | 392 | 516.33 | 92.18 | 4,416 |
| USA | 278.43 | 50.99 | 523 | 504.42 | 104.79 | 3,846 |

<table head – above table>**Table A1** Descriptive statistics and sample sizes of PIAAC 2011/2012 (24–29-years-old) and PISA 2000

Note: Means and standard deviations estimated with PVs and replicate weights. Sample sizes: unweighted.

| <i>Country</i> | <i>coef.</i> | <i>SE</i> | <i>std.coef.</i> | <i>R²</i> |
|--------------------|--------------|-----------|------------------|----------------------|
| Austria | 23.46 | 4.20 | 0.59 | 0.07 |
| Flemish Belgium | 29.42 | 4.54 | 0.72 | 0.11 |
| Canada | 17.90 | 3.79 | 0.39 | 0.04 |
| Czech Republic | 28.81 | 5.55 | 0.77 | 0.09 |
| Germany | 24.82 | 4.82 | 0.58 | 0.08 |
| Denmark | 26.51 | 5.44 | 0.53 | 0.07 |
| Spain | 24.77 | 4.79 | 0.56 | 0.05 |
| Finland | 21.33 | 5.53 | 0.49 | 0.05 |
| France | 27.84 | 3.78 | 0.62 | 0.07 |
| Great Britain | 32.94 | 5.47 | 0.68 | 0.10 |
| Ireland | 20.41 | 5.02 | 0.45 | 0.04 |
| Italy | 24.15 | 7.51 | 0.56 | 0.03 |
| Japan | 15.10 | 3.79 | 0.45 | 0.05 |
| Korea | 13.91 | 3.73 | 0.41 | 0.03 |
| Norway | 26.63 | 5.81 | 0.54 | 0.07 |
| Poland | 32.51 | 4.97 | 0.74 | 0.08 |
| Sweden | 16.30 | 6.42 | 0.31 | 0.02 |
| USA | 29.57 | 5.28 | 0.61 | 0.09 |

<table head – above table>**Table A2** Linear regression of literacy scores on parental education (HIGH-PARED)

Note: coef. = coefficients for HIGH-PARED; SE = standard errors; R² = R-squared; std. coef. = standardized coefficients for HIGH-PARED.

Source: own elaboration on PIAAC 2011/2012 (24-to29-years-old). Analyses performed with PVs and replicate weights in STATA 13 using the package 'piaactools'.

<appendix (sub) head>**Part 2** Additional information on the second step of analysis

| <i>Source variable</i> | <i>Description and data source</i> | <i>Calibration thresholds</i> | <i>Fuzzy-set</i> |
|---|---|--|--|
| PIAAC variance explained by parental education | Variance in literacy skills explained by highest educational level among parents. <i>Source</i> : own elaboration on PIAAC 2011/12 (24–29-years-old). | Fully out: 0.039 Cross-over: 0.058 Fully in: 0.090 | Stratified skills (<i>OUTCOME</i>) |
| PISA variance explained by parental education | Variance in reading skills explained by highest educational level among parents. <i>Source</i> : own elaboration on PISA 2000. | Fully out: 0.012 Crossover: 0.028 Fully in: 0.064 | Previously stratified skills (<i>STRAT-PISA</i>) |
| Vocational orientation index | Standardized index for vocational orientation of upper-secondary education (Bol and Van De Werfhorst, 2011) | Fully out: -1.23 Cross-over: 0.15 Fully-in: 1.32 | Vocational-oriented secondary education (<i>VOC-SEC</i>) |
| Relative enrolment between offspring of graduates/not graduates | Relative probability to enrol in tertiary education for individuals with at least one parent who completed tertiary education vs. none parent who completed it. <i>Source</i> : own elaboration on PIAAC 2011/12 (24–29-years-old). | Fully out: 1.5 Crossover: 1.75 Fully in: 2 | Socially-selective higher education (<i>SE-HE</i>) |
| % Students in ISCED 5B | Proportion of students enrolled in ISCED 5B over those enrolled in ISCED 5A and 5B in 2004. <i>Source</i> : (OECD iLibrary, 2016) | Fully out: 10 Crossover: 20 Fully in: 30 | Vocationally-oriented higher education (<i>VOC-HE</i>) |

| | | | |
|-------------------------|---|--|---|
| See text, section 3.5 | See text, section 3.5 | / | Relevant autonomy in tertiary education governance (<i>AUTON</i>) |
| / | / | Intersection (fuzzy-set minimum) of the sets <i>DIFF-HE</i> and <i>AUTON</i> | Differentiated tertiary (<i>DIFF-HE</i>) |
| Association skills/ISEI | Estimated coefficient of reading literacy skills in a linear regression predicting socio-economic status on the ISEI scale, controlling for age, gender and educational level. <i>Source</i> : own elaboration on PIAAC 2011/12. | Fully out: 0.072 Crossover: 0.077 Fully in: 0.09 | Social salience of skills (<i>SKILL-SAL</i>) |

<table head – above table>**Table A3** Data sources and calibration thresholds for source variables (outcome and conditions)

Note: Data on % Students in ISCED 5B for France refer to 2003, for Flemish Belgium refer to Belgium overall, and for the US come from Adams (2002, 20).

| <i>Country</i> | <i>PISA variance explained by parental education</i> | <i>Vocational orientation index</i> | <i>Relative enrolment between offspring of graduates/not</i> | <i>% Students in ISCED 5B</i> | <i>Association skills/ISEI</i> |
|----------------|--|-------------------------------------|--|-------------------------------|--------------------------------|
| Austria | 0.03 | 1.701 | 2.12 | 10.64 | 0.12 |
| Flanders | 0.00 | 0.945 | 1.80 | 51.82 | 0.08 |
| Canada | 0.04 | -1.723 | 1.45 | 24.52 | 0.10 |
| Czech rep. | 0.07 | 1.744 | 2.33 | 10.36 | 0.09 |
| Germany | 0.06 | 0.887 | 2.04 | 14.98 | 0.10 |
| Denmark | 0.09 | 0.455 | 1.56 | 12.81 | 0.09 |
| Spain | 0.05 | -0.001 | 1.70 | 13.89 | 0.08 |
| Finland | 0.02 | 0.737 | 1.54 | 0.05 | 0.08 |
| France | 0.02 | 0.393 | 1.77 | 23.85 | 0.08 |
| G.Britain | 0.04 | 0.467 | 1.71 | 22.82 | 0.10 |
| Ireland | 0.02 | -0.354 | 1.67 | 33.56 | 0.06 |
| Italy | 0.02 | 0.948 | 2.33 | 1.10 | 0.05 |
| Japan | 0.00 | -0.729 | 1.93 | 24.39 | 0.07 |
| Korea | 0.02 | -0.55 | 1.28 | 39.16 | 0.08 |
| Norway | 0.02 | 0.885 | 1.76 | 2.03 | 0.09 |
| Poland | 0.08 | 0.296 | 1.72 | 1.09 | 0.07 |
| Sweden | 0.01 | 0.686 | 1.68 | 3.91 | 0.09 |
| USA | 0.06 | -1.844 | 1.36 | 21.15 | 0.09 |

<table head – above table> **Table A4** Distribution of the source variables for the country-level explanatory conditions
Sources: see Table A3.

| <i>Country</i> | <i>STR AT- PISA</i> | <i>VOC- SEC</i> | <i>SE- HE</i> | <i>VOC- HE</i> | <i>AUTON</i> | <i>DIFF- HE</i> | <i>SKILL- SAL</i> | <i>OUTCOM E</i> |
|----------------|-----------------------------|---------------------|-------------------|--------------------|--------------|---------------------|-----------------------|---------------------|
| Austria | 0.62 | 1.00 | 1.00 | 0.01 | 0.20 | 0.01 | 1.00 | 0.73 |
| Flanders | 0.00 | 0.96 | 0.70 | 1.00 | 0.20 | 0.20 | 0.85 | 1.00 |
| Canada | 0.71 | 0.00 | 0.00 | 0.93 | 0.40 | 0.40 | 1.00 | 0.01 |
| Czech rep. | 1.00 | 1.00 | 1.00 | 0.01 | 0.80 | 0.01 | 0.94 | 0.98 |
| Germany | 0.97 | 0.95 | 1.00 | 0.18 | 0.20 | 0.18 | 1.00 | 0.95 |
| Denmark | 1.00 | 0.77 | 0.03 | 0.05 | 0.01 | 0.01 | 0.94 | 0.76 |
| Spain | 0.94 | 0.38 | 0.30 | 0.10 | 0.40 | 0.10 | 0.29 | 0.16 |
| Finland | 0.24 | 0.91 | 0.02 | 0.00 | 0.40 | 0.00 | 0.92 | 0.13 |
| France | 0.15 | 0.72 | 0.59 | 0.91 | 0.60 | 0.60 | 0.59 | 0.88 |
| G.Britain | 0.78 | 0.78 | 0.33 | 0.88 | 0.99 | 0.88 | 1.00 | 1.00 |
| Ireland | 0.07 | 0.16 | 0.18 | 1.00 | 0.60 | 0.60 | 0.00 | 0.02 |
| Italy | 0.15 | 0.96 | 1.00 | 0.00 | 0.20 | 0.00 | 0.00 | 0.00 |
| Japan | 0.00 | 0.05 | 0.96 | 0.93 | 0.80 | 0.80 | 0.00 | 0.11 |
| Korea | 0.19 | 0.09 | 0.00 | 1.00 | 0.99 | 0.99 | 0.14 | 0.00 |
| Norway | 0.02 | 0.95 | 0.54 | 0.00 | 0.01 | 0.00 | 1.00 | 0.83 |
| Poland | 1.00 | 0.64 | 0.35 | 0.00 | 0.20 | 0.00 | 0.06 | 0.97 |
| Sweden | 0.00 | 0.89 | 0.22 | 0.00 | 0.01 | 0.00 | 0.96 | 0.00 |
| USA | 0.98 | 0.00 | 0.00 | 0.79 | 0.99 | 0.79 | 0.96 | 0.98 |

<table head – above table> **Table A5** Distribution of the fuzzy sets for the country-level explanatory conditions and the outcome

Note: Sources and calibration thresholds: see Table A3.

| <i>STRAT- PISA</i> | <i>VOC- SEC</i> | <i>SE- HE</i> | <i>DIFF- HE</i> | <i>SKILL- SAL</i> | <i>OUTCOME</i> | <i>Cons.</i> | <i>Cases</i> |
|------------------------|---------------------|-------------------|---------------------|-----------------------|----------------|--------------|--------------|
| 0 | 1 | 1 | 1 | 1 | 1 | 1.000 | FRA |
| 1 | 1 | 1 | 0 | 1 | 1 | 0.959 | AUT,CZE,DEU |
| 1 | 1 | 0 | 1 | 1 | 1 | 0.916 | GBR |
| 0 | 1 | 1 | 0 | 1 | 1 | 0.91 | BELF,NOR |
| 1 | 1 | 0 | 0 | 1 | 1 | 0.849 | DNK |
| 1 | 1 | 0 | 0 | 0 | 1 | 0.799 | POL |
| 1 | 0 | 0 | 1 | 1 | 1 | 0.709 | USA |
| 1 | 0 | 0 | 0 | 0 | 0 | 0.624 | ESP |
| 1 | 0 | 0 | 0 | 1 | 0 | 0.593 | CAN |
| 0 | 1 | 0 | 0 | 1 | 0 | 0.512 | FIN,SWE |
| 0 | 1 | 1 | 0 | 0 | 0 | 0.408 | ITA |
| 0 | 0 | 1 | 1 | 0 | 0 | 0.372 | JPN |
| 0 | 0 | 0 | 1 | 0 | 0 | 0.248 | IRL,KOR |

<table head – above table>**Table A6** Truth table

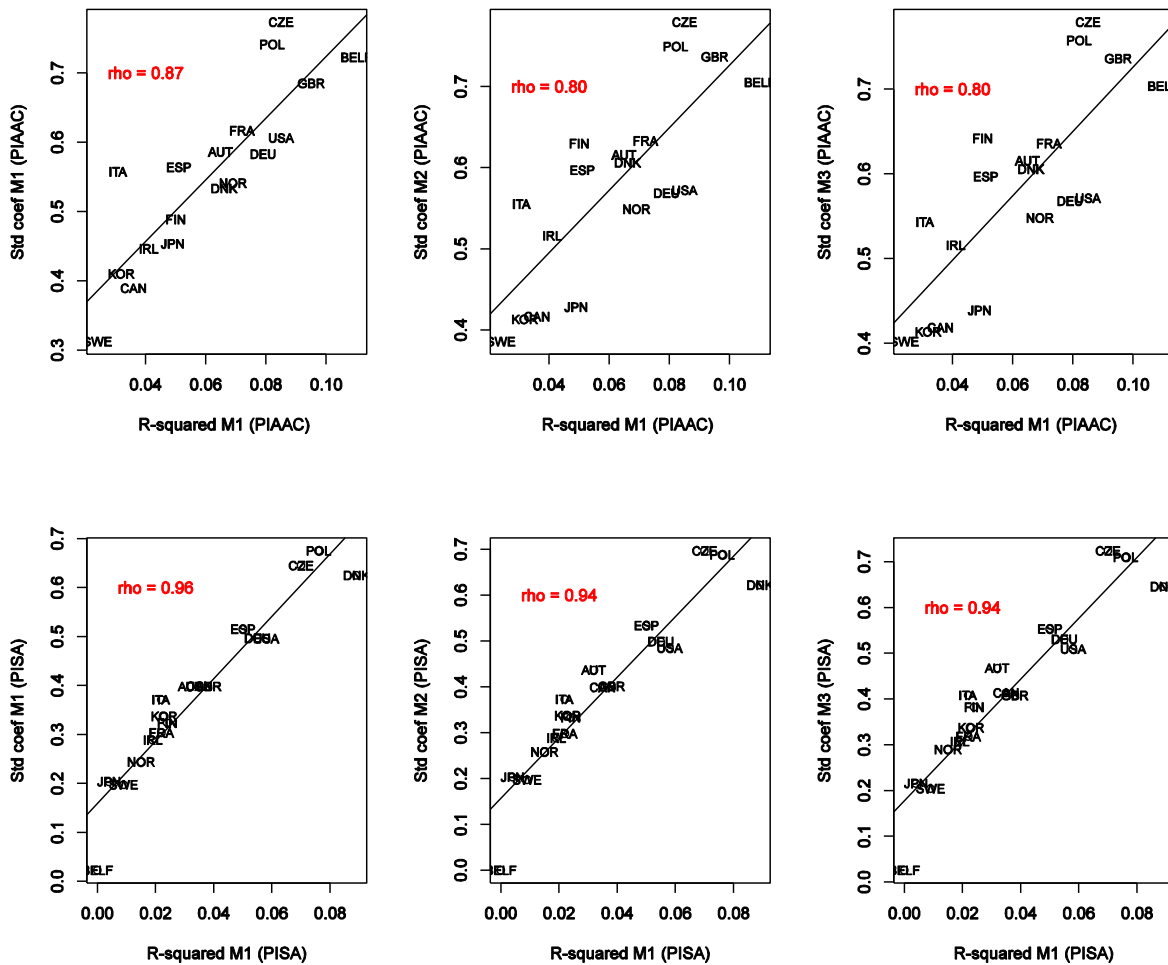
Note: Frequency threshold: 1. Consistency threshold: 0.7.

| A \ B | OUTCOME | STRAT-PISA | VOC-SEC | SE-HE | DIFF-HE | SKILL-SAL |
|------------|---------|------------|---------|-------|---------|-----------|
| OUTCOME | | 0.74 | 0.69 | 0.67 | 0.52 | 0.69 |
| STRAT-PISA | 0.69 | | 0.52 | 0.49 | 0.49 | 0.59 |
| VOC-SEC | 0.81 | 0.66 | | 0.88 | 0.39 | 0.78 |
| SE-HE | 0.58 | 0.46 | 0.64 | | 0.43 | 0.49 |
| DIFF-HE | 0.31 | 0.31 | 0.20 | 0.29 | | 0.28 |
| SKILL-SAL | 0.84 | 0.77 | 0.81 | 0.70 | 0.59 | |

<table head – above table> **Table A7** Results from analysis of necessity and sufficiency.

Note: Consistency values for A as superset of B.

<appendix (sub) head>**Part 3** Robustness checks



<Figure head – below figure>**Figure A1** Correlation plots of chosen vs. alternative measures for social stratification of literacy in PIAAC (above) and PISA (below). Note: Std. coef. = standardized coefficients for HIGH-PARED. M1 = Model with no controls; M2 = Model controlling for migratory status; M3 = Model controlling for migratory status and gender. rho = Pearson’s correlation coefficient. Source: own elaboration on PIAAC 2011/2012 (24–29-years-old) and PISA 2000. Analyses performed with PVs and replicate weights in STATA 13 using the packages ‘piaactools’ and ‘pisatools’.

| <i>Solution components</i> | <i>con</i> | <i>cov</i> | <i>un. cov.</i> | <i>Cases</i> |
|----------------------------|------------|------------|-----------------|-------------------------------|
| | S. | . | | |
| SKILL-SAL * SE-HE | 0.89 | 0.5 | 0.19 | BELF, NOR; FRA; AUT, CZE, DEU |
| STRAT-PISA * DIFF-HE | 0.76 | 0.2 | 0.08 | FRA; GBR; USA |

| | | | |
|-----------------------|------|------|---------------------------------|
| STRAT-PISA * VOC-SEC | 0.5 | 0.15 | DNK; AUT, CZE, DEU; GBR; POL |
| | 0.89 | 5 | |
| <i>Whole solution</i> | | 0.8 | |
| | 0.82 | 2 | |

<table head – above table>**Table A8** Minimized configurations sufficient for the outcome (first alternative solution)

Note: Frequency threshold: 1. Consistency threshold: 0.7. Outcome and conditions defined as in the original formulation. Parsimonious solution resulting from model ambiguities.

| <i>Solution components</i> | <i>cons.</i> | <i>cov.</i> | <i>un. cov.</i> | <i>Cases</i> |
|------------------------------------|--------------|-------------|---------------------|----------------------------------|
| SKILL-SAL * SE-HE | 0.89 | 0.53 | 0.20 | BELF, NOR; FRA; AUT, CZE, DEU |
| SKILL-SAL * DIFF-HE* STRAT-PISA | 0.79 | 0.22 | 0.13 | GBR; USA |
| STRAT-PISA * VOC-SEC * diff-he | 0.89 | 0.47 | 0.16 | DNK; AUT, CZE, DEU; POL |
| <i>Whole solution</i> | 0.84 | 0.83 | | |

<table head – above table>**Table A9** Minimized configurations sufficient for the outcome (second alternative solution)

Note: Frequency threshold: 1. Consistency threshold: 0.7. Outcome and conditions defined as in the original formulation. Intermediate solution with positive directional expectations for STRAT-PISA, and SE-HE, SKILL-SAL.

| <i>Country</i> | <i>Source variables</i> | | <i>Fuzzy sets</i> | |
|----------------|-------------------------|---------------------------|-------------------|----------------|
| | <i>Std.coef M3 PISA</i> | <i>Std.coef. M3 PIAAC</i> | <i>STRAT-PISA</i> | <i>OUTCOME</i> |
| Austria | 0.47 | 0.62 | 0.87 | 0.73 |
| Flanders | 0.03 | 0.70 | 0.00 | 1.00 |
| Canada | 0.41 | 0.42 | 0.64 | 0.00 |
| Czech rep. | 0.72 | 0.78 | 1.00 | 1.00 |
| Germany | 0.53 | 0.57 | 0.97 | 0.23 |
| Denmark | 0.65 | 0.61 | 1.00 | 0.59 |
| Spain | 0.55 | 0.60 | 0.98 | 0.47 |
| Finland | 0.38 | 0.64 | 0.47 | 0.94 |
| France | 0.32 | 0.64 | 0.24 | 0.91 |
| G.Britain | 0.41 | 0.74 | 0.61 | 1.00 |
| Ireland | 0.31 | 0.52 | 0.21 | 0.04 |
| Italy | 0.41 | 0.54 | 0.61 | 0.10 |
| Japan | 0.22 | 0.44 | 0.06 | 0.00 |
| Korea | 0.34 | 0.41 | 0.30 | 0.00 |
| Norway | 0.29 | 0.55 | 0.17 | 0.12 |
| Poland | 0.71 | 0.76 | 1.00 | 1.00 |
| Sweden | 0.20 | 0.40 | 0.05 | 0.00 |
| USA | 0.51 | 0.57 | 0.95 | 0.25 |

Table A10 Distribution of alternative source variables and fuzzy sets for the outcome and the condition 'STRAT-PISA'

Note: Std.coef. = standardized coefficient for HIGH-PARED. M3 = Model controlling for migratory status and gender.

| <i>STRAT- PISA</i> | <i>VOC- SEC</i> | <i>SE- HE</i> | <i>DIFF- HE</i> | <i>SKILL- SAL</i> | <i>OUTCOME</i> | <i>Cons.</i> | <i>Cases</i> |
|------------------------|---------------------|-------------------|---------------------|-----------------------|----------------|--------------|--------------|
| 0 | 1 | 1 | 1 | 1 | 1 | 0.999 | FRA |
| 1 | 1 | 0 | 1 | 1 | 1 | 0.916 | GBR |
| 1 | 1 | 0 | 0 | 0 | 1 | 0.876 | POL |
| 1 | 1 | 0 | 0 | 1 | 1 | 0.868 | DNK |
| 1 | 1 | 1 | 0 | 1 | 1 | 0.77 | AUT,CZE,DEU |
| 1 | 0 | 0 | 0 | 0 | 0 | 0.758 | ESP |
| 0 | 1 | 1 | 0 | 1 | 0 | 0.706 | BELF,NOR |
| 1 | 0 | 0 | 0 | 1 | 0 | 0.665 | CAN |
| 1 | 1 | 1 | 0 | 0 | 0 | 0.617 | ITA |
| 0 | 1 | 0 | 0 | 1 | 0 | 0.573 | FIN,SWE |
| 1 | 0 | 0 | 1 | 1 | 0 | 0.436 | USA |
| 0 | 0 | 1 | 1 | 0 | 0 | 0.29 | JPN |
| 0 | 0 | 0 | 1 | 0 | 0 | 0.246 | IRL,KOR |

<table head – above table>**Table A11** Truth table with alternative calibration for the outcome and the condition ‘STRAT-PISA’

Note: Frequency threshold: 1. Consistency threshold: 0.76. Outcome and condition ‘STRAT-PISA’

based on standardized coefficients from model 3 (see Table A10); other conditions defined as in the original formulation.

| <i>Solution components</i> | <i>cons.</i> | <i>cov.</i> | <i>un. cov.</i> | <i>Cases</i> |
|---------------------------------|--------------|-------------|---------------------|----------------|
| SKILL-SAL * SE-HE * STRAT-PISA | 0.75 | 0.36 | 0.22 | AUT, CZE, DEU |
| SKILL-SAL * DIFF-HE* strat-pisa | 0.72 | 0.16 | 0.07 | FRA |
| STRAT-PISA * VOC-SEC * sel-he | 0.86 | 0.37 | 0.23 | DNK; POL ; GBR |
| <i>Whole solution</i> | 0.76 | 0.67 | | |

<table head – above table>**Table A12** Minimized configurations sufficient for the outcome (third alternative solution)

Note: Frequency threshold: 1. Consistency threshold: 0.76. Outcome and condition 'STRAT-PISA'

based on standardized coefficients from model 3 (see Table A10); other conditions defined as in the original formulation. Parsimonious solution.

