

The Policy Response: Education

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Separate investigation of the relationships

⇒ between educational policies and educational achievements,

⇒ between educational achievements and the distribution of earnings and incomes.

A conceptual distinction between quantity of education (i.e. the level of educational attainment) and the quality of education (i.e. student achievement on tested skills).

Lack of consistent datasets prevents us from simultaneous analysis of the two distributions → we resort to what is available, and make inference on what is unavailable.

Policies to reduce inequalities in competences (quality)

Three broad dimensions on which educational systems may differ:

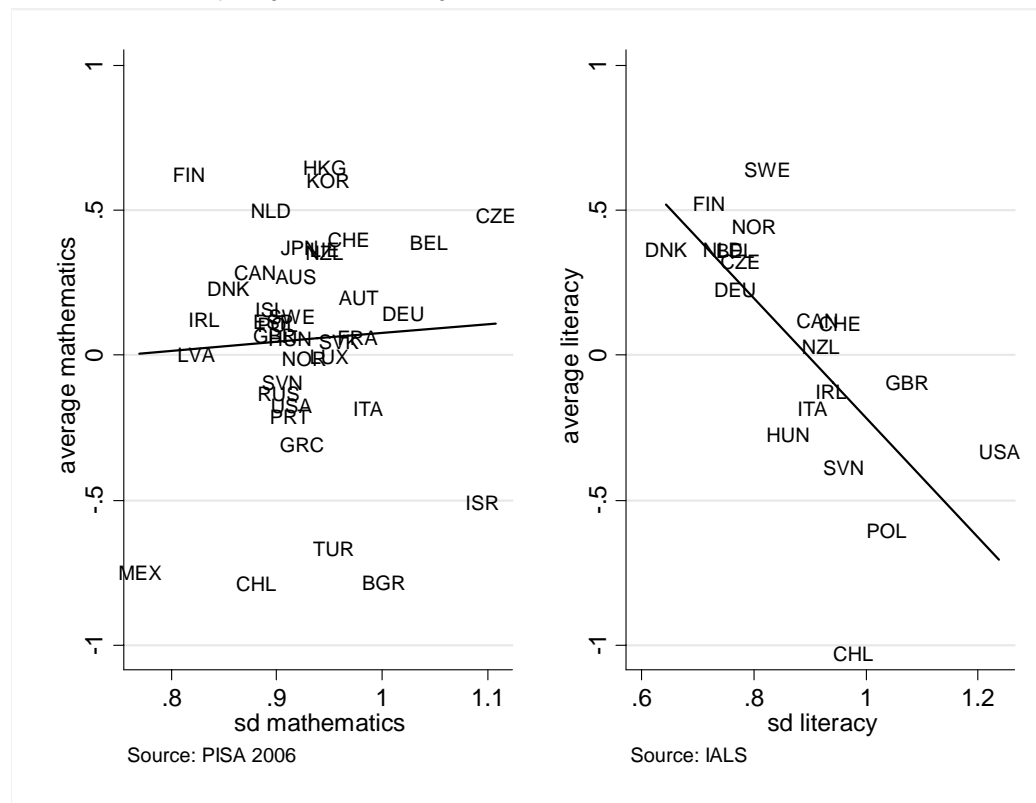
① the **extent to which students are separated in clearly distinct educational curricula** during secondary education (*tracking*)

② the **standardization** of the educational system (the extent to which education meets the same standards nationwide - standardization of input has also been referred to as *centralization* - standardization of *output* is marked by the existence of central exit examinations, sometimes called *accountability*)

③ the **vocational orientation** of the system.

Earlier research on students' competences has interpreted the association between average student performance and the dispersion in performance as a trade-off between equality and efficiency → our evidence is that there is little evidence for the existence of such trade-off

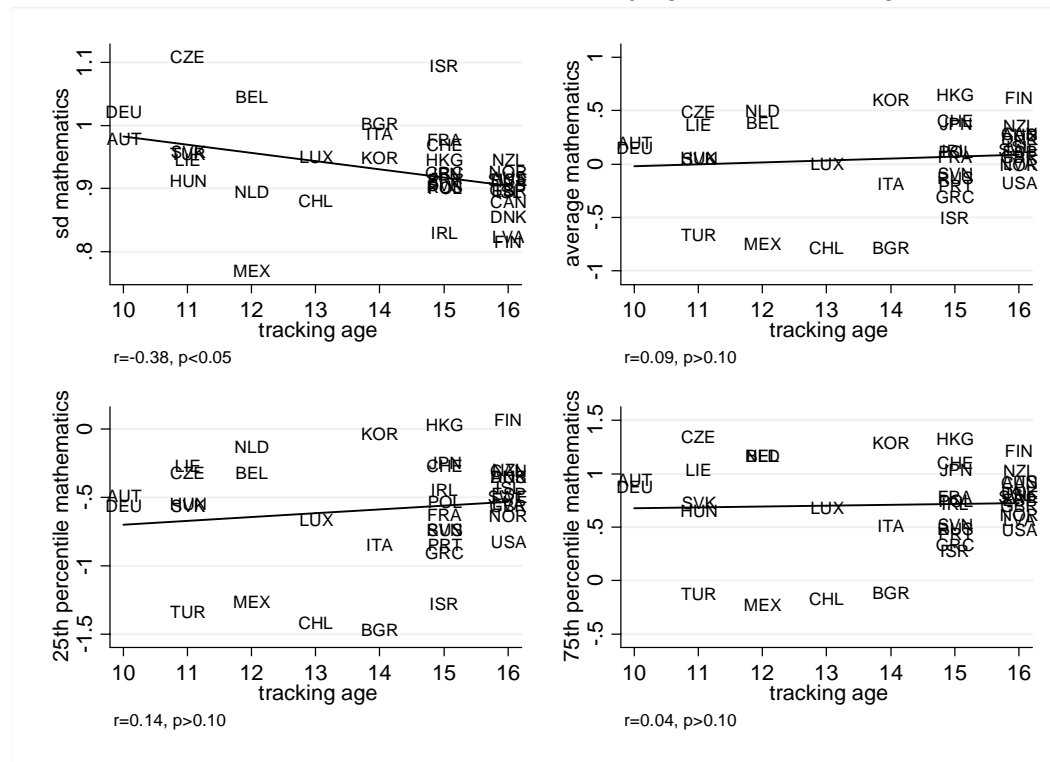
Figure 1 – The association between equality and efficiency in mid-teen mathematics (PISA 2006) and adult literacy (IALS 1994-98)



With respect to policy, we find mixed evidence on the relationship of competences distribution and tracking age.

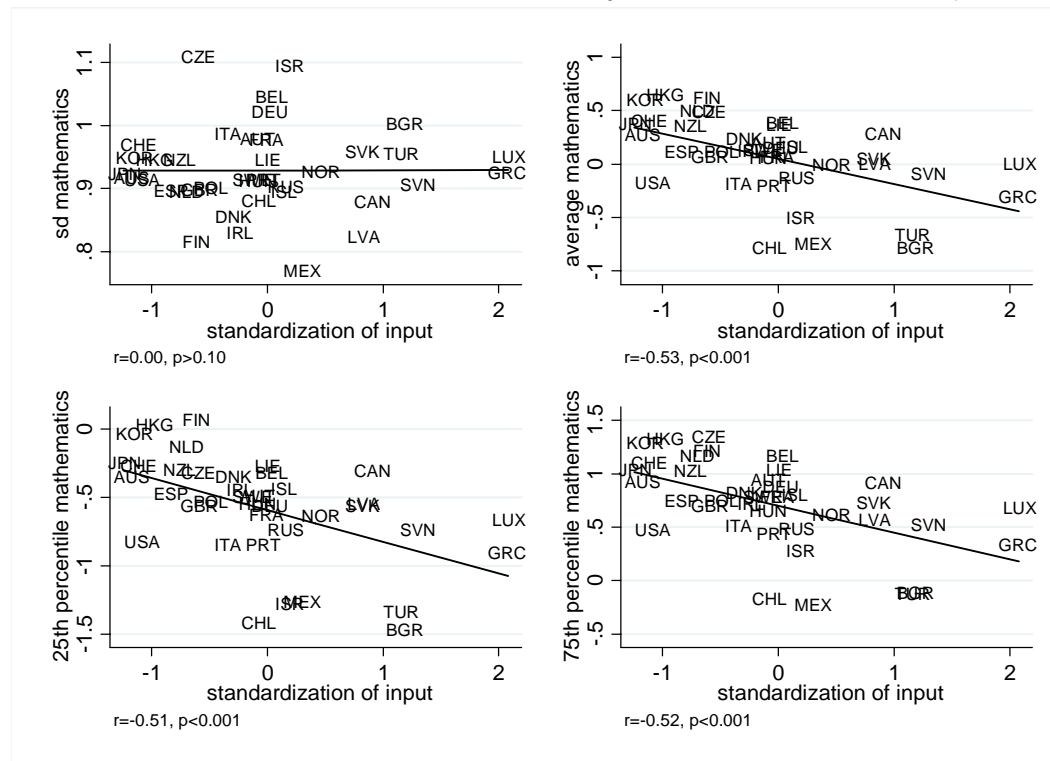
There is another form of inequality (inequality of educational opportunity by social origin) which is enhanced by tracking.

Figure 2 – The distribution of mathematics achievement by age at which tracking starts (PISA 2006)



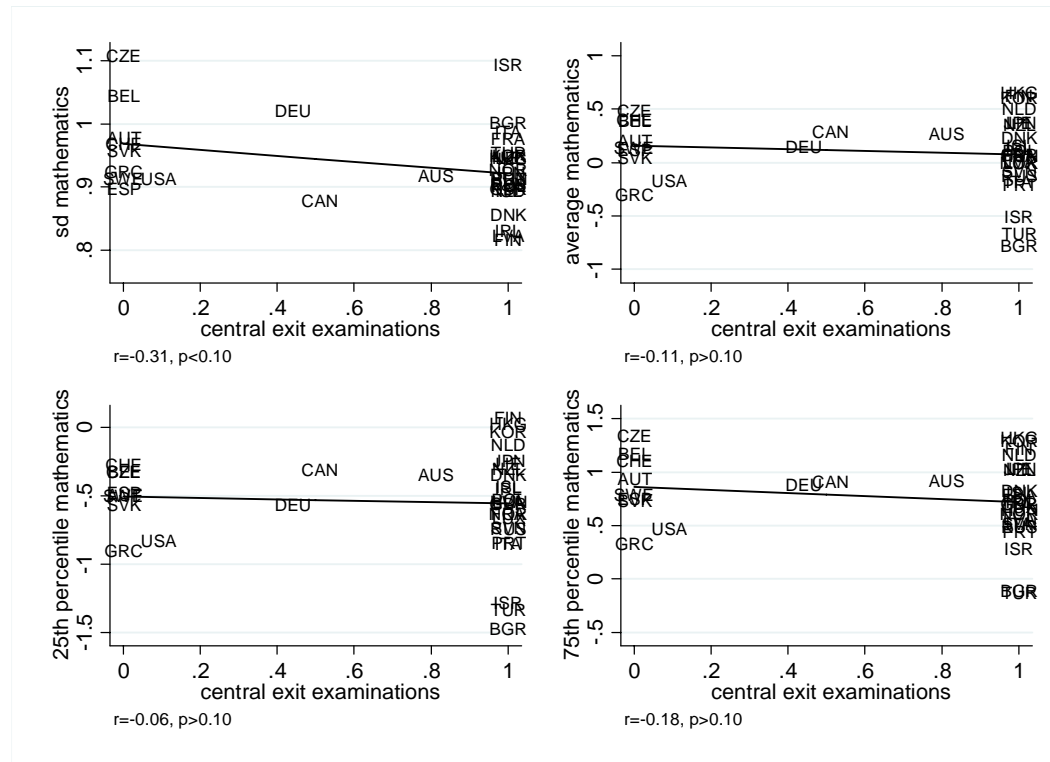
Standardization of input (measured by aggregating school principals' responses to the PISA questionnaires) is negatively correlated to the average skill quality and the skill level at the bottom and the top of the distribution. *Par contre*, School autonomy (i.e. a lack of standardization of input) is found to enhance average performance because it leads to efficiency gains due to stronger competition between schools

Figure 3 – The distribution of mathematics achievement by level of standardization of input (PISA 2006)



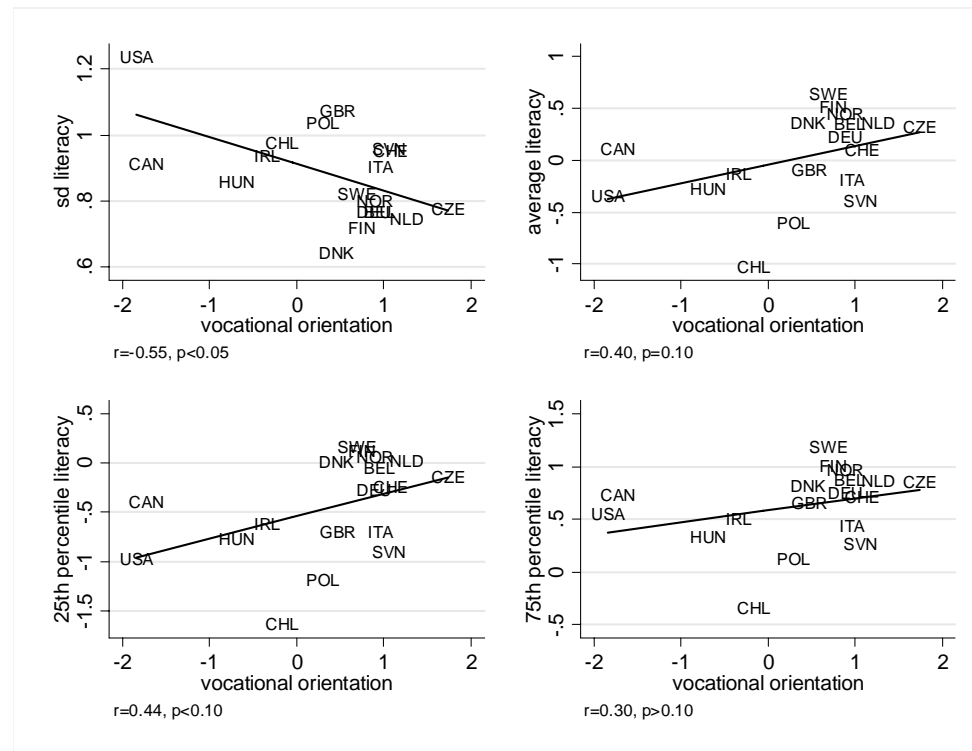
On the contrary, the existence of central exit examinations exhibits negative correlation with the standard deviation in mathematics achievement, without correlation with the average nor with the quartiles.

Figure 4 – The distribution of mathematics achievement by central exit examinations



In societies with a strong vocational sector, the dispersion is lower, particularly because the bottom of the skills distribution performs rather well: vocational education can function rather inclusively, by promoting achievement of the lower part of the distribution.

Figure 5 – The distribution of young adult literacy by the vocational orientation of the educational system

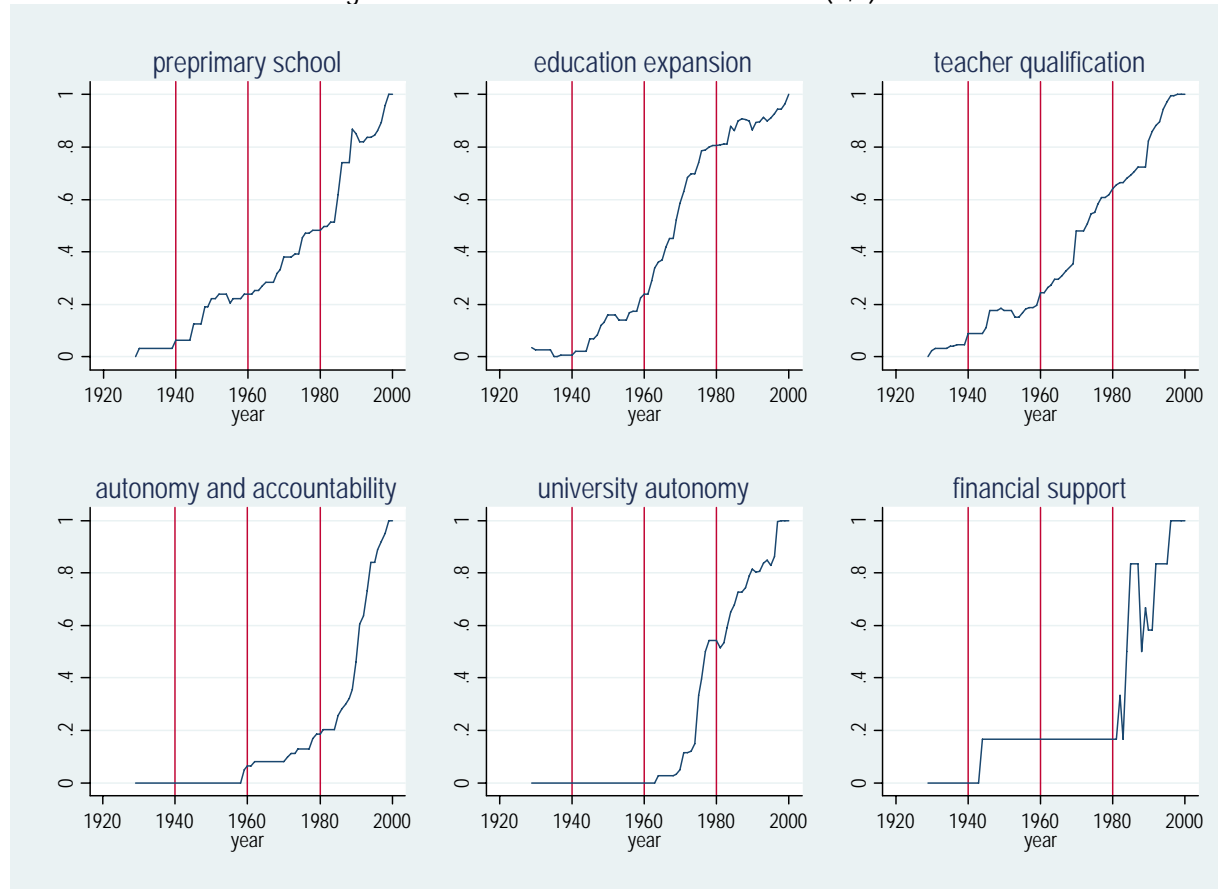


Policies to reduce inequalities in educational attainment (quantity)

Table 1: Educational reforms and expected impact on educational attainment

| area of reform | expected impact on schooling inequality |
|-------------------------------------|--|
| pre-primary education | reduction (through increased educational attainment of students from disadvantaged background) |
| expansion of compulsory education | reduction (through increased educational attainment of students from disadvantaged background) |
| school tracking | ambiguous (vocational tracks have shorter duration, prevent academic enrolment but have lower drop-out rates) |
| school autonomy | ambiguous (adaptability to social environment, increased competition in presence of centralised control) |
| school accountability | increase (school differentiation, screening and sorting of students) |
| teacher qualification | ambiguous (better quality benefits students from poorer backgrounds but allows for greater differentiation) |
| student financial support | reduction (increased enrolment of students from poorer backgrounds) |
| university autonomy and selectivity | increase (increased signalling value of tertiary education requires a more intensive selectivity in university admissions) |

Figure 6 – Temporal evolution of reform summary indexes averaged across countries and rescaled in the (0,1) interval



Source: Braga et al. (2013), figure 7.

These proposed measures of reforming activity are used as regressors to account for schooling inequalities across age cohorts in European countries.

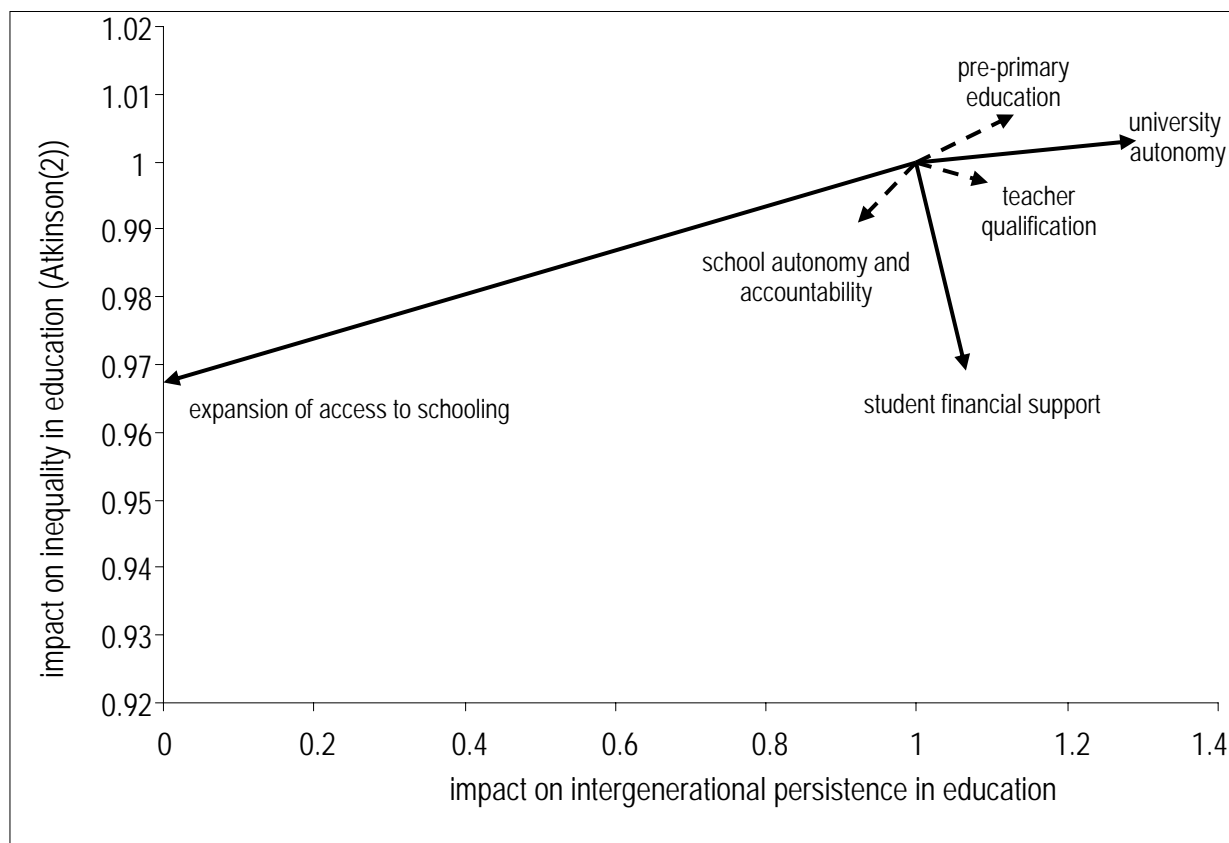
Educational inequalities are measured along two dimensions:

① **within-cohort dispersion in years of schooling** (captured by the Atkinson index ($\varepsilon = 2$) because it incorporates an inequality aversion focussing on the bottom tail of the distribution)

② **across-cohort persistence** (measured by the correlation between parental education and children attainment – it can be considered as an index of inequality of opportunities in schooling).

A sort of “menu of policies” available to governments: they clearly show that **“expansion of access”** policies (which include expansion of compulsory education and detracking) accomplish the simultaneous goals of reducing the dispersion in the distribution of years of schooling and increasing intergenerational mobility in educational attainment. On the contrary, policies addressed to tertiary education tend to reinforce intergenerational persistence (at least according to what have been experienced in European countries over the last century): however **“financial support”** policies reduce educational inequality, whereas **“university autonomy and selectivity”** policies tend to increase it. Remaining policy measures (**pre-primary schooling, teacher qualification and school autonomy and accountability**) exhibit smaller impacts, which do not achieve statistical significance.

Figure 7 – Estimated effects on mean and dispersion of summary indexes of reforms



Source: Braga et al. (2013)

A full pre-primary reform (from 0 to 1) would raise GDP by about 6.5 points, while expansion reform would yield 2.8 GDP points. In both cases gains exceed costs. Reforming teacher recruitment produces 0.85 GDP points, almost in line with costs. Finally school autonomy reforms yield 3.6 points. This is the most cost effective reform, with pre-primary reform reaching similar cost effectiveness.

What drives educational policies

What accounts for country differences in their educational policies ?

- a) different (ideological) opinions about the target for a college educated workforce
- b) different (ideological) opinions about the desired extent of public subsidisation
- c) different degree of state indebtedness

We show that the type of educational reforms is correlated to the political orientation of governments:

- * parties with a left-wing orientation be more supportive of educational expansion policies, because they benefit the lower tail of the educational attainment distribution, where their supporters are largely over-represented;
- * conservative parties are more reluctant towards any generalised expansion of schooling, for they require an expansion in public expenditure, while unduly raising people expectations with respect to future life-time incomes.

Table 2 - Educational reform and political variables – OLS – 1950-2000

| | 1 | 2 | 3 | 4 | 5 | 6 |
|--------------------------------------|---------------------|------------------------|---------------------|----------------------|------------------------|----------------------|
| | pre- primary | expansion of access | teachers | school autonomy | university autonomy | financial support |
| right-wing orientation of parliament | -0.006* [0.004] | -0.026*** [0.004] | 0.033** [0.015] | 0.016 [0.015] | 0.029** [0.012] | 0.030** [0.013] |
| log GDP per capita | 0.190*** [0.036] | 0.189*** [0.044] | 0.202* [0.122] | -0.363*** [0.113] | -0.552*** [0.109] | 0.467*** [0.101] |
| government share | 1.131*** [0.181] | 0.778*** [0.239] | 2.340*** [0.868] | 0.117 [0.776] | 4.528*** [0.831] | 4.942*** [0.770] |
| Observations | 843 | 843 | 843 | 843 | 770 | 770 |
| R ² | 0.901 | 0.899 | 0.871 | 0.864 | 0.893 | 0.828 |
| Countries | 24 | 24 | 24 | 24 | 17 | 17 |

Robust standard errors in brackets - * significant at 10%; ** significant at 5%; *** significant at 1%
constant, country and year fixed effects, country-specific time trend included

How are educational policy, quality and quantity of education, and income inequality related?

We have combined data on measured inequality from students' tests with data on measured inequality on earnings of the same age cohorts, gender and country.

Data on students' competences are obtained from three surveys on mathematical competences of 14-year-old students conducted in past decades (FIMS 1964 on students born in 1950, SIMS 1980-82 on students born in 1966 and TIMSS 1995 on students born in 1981).

Data on schooling and labour market outcomes come are obtained from the 2009 wave of EUSILC. Gross labour earnings are obtained summing earnings from dependent employment (variable PY010G) and earnings from self-employment (variable PY050G) and excluding cases of negative values.

Data on years of education have been computed from maximum educational attainment according to ISCED classification (variable PE040) converted into years by using legal duration.

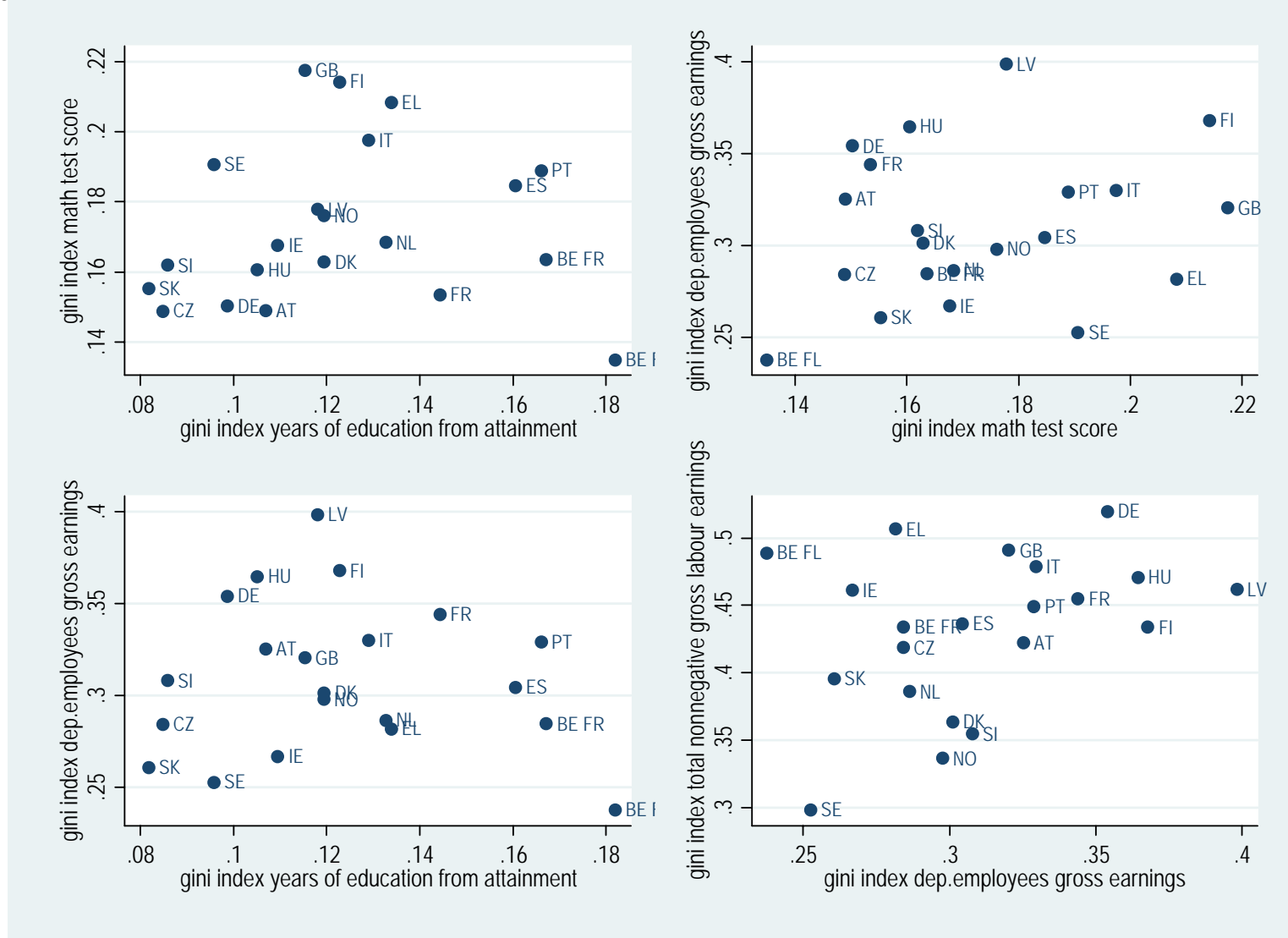
In order to partially account for gender composition and increase the degrees of freedom, we have computed these measures separately for men and women. Overall we possess an unbalanced panel covering 20 countries with 64 observations (32 county/cohort \times 2 genders).

Table 3 – Inequality in earnings and educational attainment – EUSILC 2009

1st number: Gini index on gross total labour earnings of employed – 2nd number: Gini index on years of education (from maximal educational attainment) – 3rd number: observations available with non negative labour earnings – 4th number: Gini index on math test scores

| | 1950 | 1966 | 1981 | Total | | 1950 | 1966 | 1981 | Total | | 1950 | 1966 | 1981 | Total |
|----------------|-------------|-------------|-------------|-------|-----------------|-------------|-------------|-------------|-------|----------------|-------------|-------------|-------------|-------------|
| Austria | 0.44 | 0.33 | 0.32 | 0.36 | Hungary | 0.44 | 0.35 | 0.37 | 0.39 | Slovenia | 0.57 | 0.32 | 0.3 | 0.39 |
| | 0.12 | 0.1 | 0.1 | 0.11 | | 0.1 | 0.1 | 0.09 | 0.1 | | 0.13 | 0.11 | 0.09 | 0.11 |
| | 169 | 241 | 160 | 570 | | 386 | 310 | 288 | 984 | | 435 | 478 | 458 | 1371 |
| | | | 0.15 | 0.15 | | | 0.16 | 0.16 | 0.16 | | | | 0.16 | 0.16 |
| Belgium | 0.32 | 0.27 | 0.21 | 0.27 | Ireland | 0.47 | 0.35 | 0.26 | 0.37 | Spain | 0.35 | 0.37 | 0.31 | 0.34 |
| | 0.16 | 0.15 | 0.11 | 0.14 | | 0.18 | 0.13 | 0.1 | 0.14 | | 0.21 | 0.18 | 0.16 | 0.18 |
| | 198 | 243 | 166 | 607 | | 165 | 131 | 124 | 420 | | 454 | 584 | 458 | 1496 |
| | 0.17 | 0.15 | 0.12 | 0.15 | | | | 0.17 | 0.17 | | | | 0.18 | 0.18 |
| Czech Republic | 0.35 | 0.27 | 0.3 | 0.31 | Italy | 0.46 | 0.35 | 0.33 | 0.38 | Sweden | 0.28 | 0.23 | 0.28 | 0.26 |
| | 0.07 | 0.05 | 0.09 | 0.07 | | 0.19 | 0.14 | 0.12 | 0.15 | | 0.11 | 0.09 | 0.1 | 0.1 |
| | 378 | 287 | 235 | 900 | | 622 | 845 | 545 | 2012 | | 205 | 274 | 168 | 647 |
| | | | 0.15 | 0.15 | | | | 0.2 | 0.2 | | | | 0.22 | 0.16 |
| Denmark | 0.27 | 0.23 | 0.3 | 0.26 | Latvia | 0.39 | 0.43 | 0.39 | 0.4 | United Kingdom | 0.35 | 0.39 | 0.29 | 0.35 |
| | 0.13 | 0.11 | 0.12 | 0.12 | | 0.12 | 0.09 | 0.11 | 0.11 | | 0.13 | 0.1 | 0.09 | 0.11 |
| | 215 | 273 | 112 | 600 | | 183 | 167 | 155 | 505 | | 252 | 278 | 193 | 723 |
| | | | 0.16 | 0.16 | | | | 0.18 | 0.18 | | | | 0.23 | 0.24 |
| Finland | 0.37 | 0.35 | 0.31 | 0.35 | Netherlands | 0.36 | 0.33 | 0.23 | 0.32 | Total | 0.4 | 0.34 | 0.31 | 0.35 |
| | 0.14 | 0.1 | 0.09 | 0.12 | | 0.15 | 0.12 | 0.11 | 0.13 | | 0.14 | 0.12 | 0.11 | 0.12 |
| | 440 | 391 | 254 | 1085 | | 343 | 381 | 216 | 940 | | 6005 | 6620 | 4758 | 17383 |
| | 0.21 | 0.22 | | 0.21 | | 0.18 | 0.18 | 0.14 | 0.17 | | 0.18 | 0.19 | 0.17 | 0.17 |
| France | 0.46 | 0.34 | 0.26 | 0.36 | Norway | 0.28 | 0.31 | 0.3 | 0.3 | | | | | |
| | 0.2 | 0.12 | 0.1 | 0.14 | | 0.12 | 0.11 | 0.12 | 0.12 | | | | | |
| | 351 | 377 | 265 | 993 | | 164 | 218 | 126 | 508 | | | | | |
| | 0.18 | 0.15 | 0.14 | 0.15 | | | | 0.18 | 0.18 | | | | | |
| Germany | 0.35 | 0.37 | 0.36 | 0.36 | Portugal | 0.46 | 0.43 | 0.32 | 0.41 | | | | | |
| | 0.11 | 0.09 | 0.09 | 0.1 | | 0.11 | 0.19 | 0.17 | 0.16 | | | | | |
| | 430 | 474 | 236 | 1140 | | 169 | 185 | 129 | 483 | | | | | |
| | 0.14 | | 0.16 | 0.15 | | | | 0.19 | 0.19 | | | | | |
| Greece | 0.59 | 0.42 | 0.32 | 0.44 | Slovak Republic | 0.31 | 0.3 | 0.26 | 0.29 | | | | | |
| | 0.21 | 0.18 | 0.12 | 0.17 | | 0.06 | 0.07 | 0.08 | 0.07 | | | | | |
| | 224 | 272 | 229 | 725 | | 222 | 211 | 241 | 674 | | | | | |
| | | | 0.21 | 0.21 | | | | 0.16 | 0.16 | | | | | |

Figure 8 – Inequality in competences, years of schooling, gross labour earnings (from dependent employment and from total employment)



- ✓ positive correlation between inequality in quantity and inequality in quality of education for the country/gender/cohort cell available
- ✓ both dimensions are also positively correlated with earnings inequality.
- ✓ the relationship between earnings inequality for dependent employees and for total employment is altered by the extent of self-employment, labour market participation (which is significantly varying across countries in accordance with gender), unemployment and early retirement (which are both computed at zero incomes).

Table 4 - Gross earnings and educational inequality - alternative inequality measures - OLS

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|----------------------------|------------------------|----------------------------|------------------------|----------------------------|------------------------|
| | Gini index | | coefficient of variation | | standard deviation of logs | |
| | dep.empl. earnings (gross) | total earnings (gross) | dep.empl. earnings (gross) | total earnings (gross) | dep.empl. earnings (gross) | total earnings (gross) |
| inequality in math test scores | 0.904 [0.329]*** | 0.666 [0.278]** | 1.308 [0.519]** | 1.066 [0.460]** | 0.564 [0.730] | 0.257 [0.578] |
| inequality in years of education (from isced attainments) | 0.701 [0.268]** | 0.761 [0.236]*** | 0.995 [0.383]** | 0.982 [0.349]*** | -0.586 [0.816] | -0.106 [0.767] |
| male component | -0.071 [0.020]*** | -0.096 [0.018]*** | -0.153 [0.053]*** | -0.197 [0.048]*** | -0.105 [0.060]* | -0.089 [0.053]* |
| Observations | 64 | 64 | 64 | 64 | 64 | 64 |
| Countries | 20 | 20 | 20 | 20 | 20 | 20 |
| R-squared | 0.54 | 0.6 | 0.48 | 0.52 | 0.16 | 0.16 |

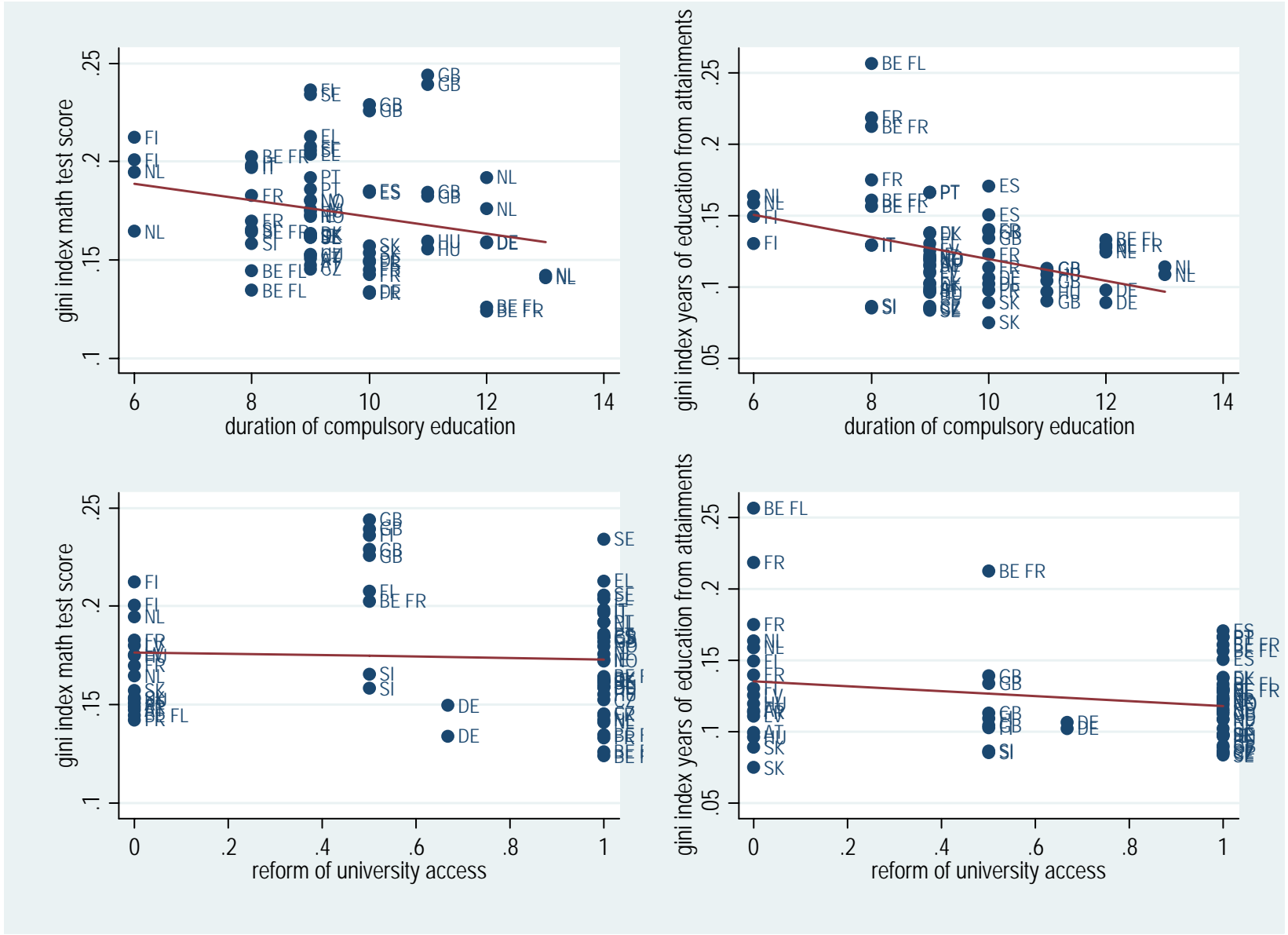
Robust standard errors in brackets - constant and year controls included

* significant at 10%; ** significant at 5%; *** significant at 1%

In terms of elasticities, earnings inequality measured by Gini concentration indices would exhibit an elasticity of 0.70 with respect to inequality in test scores and 0.25 with respect to inequality in years of education.

Despite the fact that schooling presumably ended before entrance in the labour market, and test scores were collected in years when the sampled population was 14-year-old, still we cannot claim that inequalities in quantity and quality of human capital are causing inequalities in income. In order to strengthen the claim of causality, in the next table we resort to instrumental variable estimation, which has the additional advantage of allowing us the study of the impact of educational reforms on income inequality via their impact on inequality in quantity and quality of human capital.

| | dependent employment incomes | | | total labour incomes | | | |
|--|------------------------------|--|-------------------------|------------------------|--|-------------------------|---------------------|
| | 1 ols | 2 iv partitioning instruments | 3 iv all instruments | 4 ols | 5 iv partitioning instruments | 6 iv all instruments | |
| inequality in math test scores | 1.389 [0.784]* | 1.344 [0.740]* | 0.450 [0.410] | 1.403 [0.764]* | 3.163 [0.783]* | 0.635 [0.433] | |
| inequality in years of education (from isced attainments) | 1.496 [0.494]*** | 2.993 [0.668]*** | 2.735 [0.473]*** | 1.614 [0.443]*** | 1.554 [0.674]*** | 2.962 [0.423]*** | |
| Observations | 64 | 64 | 64 | 64 | 64 | 64 | |
| R-squared | 0.86 | 0.84 | 0.83 | 0.86 | 0.85 | 0.83 | |
| | | 1st stage: partitioning educational reforms | | | 1st stage: partitioning educational reforms | | |
| | | gini yrs education) | gini math test | gini yrs education) | gini math test | gini yrs education) | gini math test |
| reform on public pre-primary schooling | | -0.057 [0.013]*** | | -0.085 [0.029]*** | -0.01 [0.050] | -0.057 [0.013]*** | -0.01 [0.050] |
| duration compulsory school | | 0.039 [0.015]** | 0.008 [0.005] | 0.06 [0.010]*** | 0.021 [0.037] | 0.039 [0.015]** | 0.021 [0.037] |
| compulsory education (end age) | | -0.041 [0.016]** | | -0.056 [0.008]*** | -0.012 [0.039] | -0.041 [0.016]** | -0.012 [0.039] |
| tracking age | | | 0.008 [0.005] | 0.006 [0.003]** | 0.009 [0.003]** | | 0.009 [0.003]** |
| introduction of standardised test | | | -0.03 [0.015]* | -0.042 [0.026] | -0.038 [0.024] | | -0.038 [0.024] |
| reform on school accountability | | | -0.085 [0.013]*** | -0.001 [0.027] | -0.077 [0.043]* | | -0.077 [0.043]* |
| reform on school teacher autonomy | | 0.012 [0.005]** | | 0.02 [0.008]** | 0.008 [0.014] | | 0.008 [0.014] |
| reform of university access | | | 0.055 [0.011]*** | 0.033 [0.026] | 0.056 [0.019]*** | | 0.056 [0.019]*** |
| Observations | | 64 | 64 | 64 | 64 | 64 | 64 |
| R-squared | | 0.89 | 0.91 | 0.9 | 0.91 | 0.89 | 0.91 |
| F-test 1st stage (p-value) | | | | 0.00 | 0.00 | | 0.00 |



Concluding remarks

Countries characterised by low income inequality support high level of investment in education, both from private and public sources. Low inequality in education and income in the parent generation implies lower inequality of opportunities for the children generation, as well as reduced conflict in the selection of (redistributive) public expenditure in education. This in turn yields lower inequality in educational attainments, which reinforces the stability of this configuration.

A different configuration occurs in countries with high initial inequality in incomes. This prevents parental investment in children education for poor families, as well as exacerbating the internal conflict on public expenditure. The resulting equilibrium results in lower public investment in education and greater inequality in educational outcomes. Once in the labour market, the children generation experiences higher earnings inequality, which again reinforce the stability of this alternative equilibrium.

The transition from one equilibrium to another one is not easily identifiable, despite variations in political attitudes observed in many European countries. Social desirability of one or the other outcomes should also be evaluated against the social consequences of inequalities, which have been surveyed in other line of research of Gini.