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education policy preferences in a hierarchical system

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# Differences in education systems across OECD countries: the role of education policy preferences in a hierarchical system

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**Abstract.** The design of the educational system affects the degree of students' equality of opportunities and the intergenerational social mobility. The topic is therefore of paramount importance. In this paper, we document differences in educational systems among OECD countries and argue that the system observed in a country is the result of a complex interaction between preferences for education and political competition. To analyse individual preferences over education funding, we build a model that allows us to study the effects of public funding on the welfare of agents, which are heterogeneous in terms of income and human capital. The model takes into account the hierarchical nature of the educational system and emphasises the role played by family background. Our theoretical results might help to explain why some OECD countries seem to remain stuck in "low education" traps.

**Keywords:** basic and tertiary education, equality of opportunity, individual preferences, parental education, political economy.

## Introduction

Educational systems vary considerably over the world, even among developed countries. Not only the share of GDP devoted to education is different but also the composition of education expenditures by level of education (primary/secondary vs. tertiary) and by program orientation (vocational vs. general).<sup>1</sup> Other important aspects of differentiation include, among others, financing (e.g. public vs private), years of compulsory schooling and school tracking.<sup>2</sup>

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<sup>1</sup> Another relevant aspect is the distribution of graduates by field of education. Di Gioacchino and Profeta (2014) argue that differences in the composition of human capital are related to the production structure of the economy through the key role of firms' political pressure activity: firms specialized in different sectors lobby to induce the government to subsidize the type of education complementary to their production.

<sup>2</sup> Recently, Ozkok (2016) has investigated the impact of globalization on public education financing in Europe at different levels of education.

In recent decades, educational systems have increasingly been the object of scientific as well as political debate. An important aspect of the discussion is the relationship between educational systems and the degree of equality in educational opportunities provided to students. The question is important since the lower the degree of equality in educational opportunities, the stronger pupils' educational attainments are determined by the family background. This dependency is in turn held responsible for lower intergenerational mobility of human capital (and hence of income) and persistent social inequality.<sup>3</sup>

Public provision of education is usually justified as a (politically acceptable) means of redistributing income in order to provide students from low social background the same educational opportunities of students from a high social background. However, even when education fully relies on public funding, access to the former is not homogeneously distributed across social groups. Indeed, the social and cultural environment at home might directly influence children's educational attainments at school and, in turn, employment and earning prospects. Thus, parents from higher social background are more prone to encourage their offspring investment in education than parents from lower social background do.

Another potential factor affecting the relationship between schooling outcomes and family background is school tracking.<sup>4</sup> A school system is characterized by tracking when students are allocated, at some stage of their career, to different tracks, which usually differ in the curriculum offered, typically vocational vs. general. Children with highly educated parents are more likely to be educated in academically selective schools than those with less educated parents (Dustmann, 2004). Thus, educational systems that are similar in terms of the level of public funding might nonetheless differ in the extent to which family background affects educational

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<sup>3</sup>"Intergenerational social mobility refers to the relationship between the socio-economic status of parents and the status their children will attain as adults." (OECD, 2010). Status is often measured by earnings or income, but also measures of education, occupation or social class have been used. The empirical literature has sought to evaluate the intergenerational earnings elasticity in the relationship that relates the earnings of children to that of their parents. For OECD countries, the estimated value of this elasticity varies between 0.15 in Denmark and 0.5 in the Great Britain (OECD, 2010 and Corak, 2013).

<sup>4</sup>There is substantial cross-country variation in secondary school design, with some countries tracking students into different ability schools very early, and other countries with little or no tracking at all (Ariga and Brunello, 2007).

outcomes, according to the specific school design observed (comprehensive schooling as opposed to early school tracking).

Finally, an additional argument explaining why children from poor households have lower enrolment rates at increasingly higher levels of education than children from richer families relates to the chances of finding a good job position or, put another way, to the effect of family lines, social relations and neighbourhood networks on the premium to education.

Overall, these arguments suggest that there is more to be considered than the level of public education expenditure to evaluate the degree of equality in educational opportunities offered by different educational systems. Namely, the redistributive effects of public education expenditure must be evaluated taking into account the composition of public expenditures across different educational stages, the school design, the distribution of income and human capital across the adult population and the influence of parental background in allocating offspring in good jobs positions.

These same factors are also relevant in shaping individual preferences for public education policies and, in turn, to understand the variability in education systems across different societies. In fact, the policies implemented might be seen as the result of the aggregation of individuals' (policy) preferences through the specific political process in act.

In this paper, we graft a model to analyse the determinants of individual's preferences by incorporating all the insights developed above. Namely, the model takes into account the hierarchical nature of the educational system by separating basic (K-12) from tertiary education.<sup>5</sup> In the model, the hierarchical nature of the educational system implies that higher education is never a good of universal access, even if it is free. The probability of acceding to university depends on parents' human capital and on K-12 school design features, such as school tracking. Moreover, we take into account the possibility of talent mismatching, allowing

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<sup>5</sup>K-12, from kindergarten to 12<sup>th</sup> grade, refers to primary and secondary education.

returns from human capital accumulation to depend on family background, with pupils coming from rich families earning, *ceteris paribus*, higher returns than pupils from poor families do.

Contrarily to intuition, the analysis highlights the fact that less affluent households might be willing to form a coalition with the richer segment of the population to reduce the overall level of education expenditures. The likelihood of this event is greater in countries where the education premium is strongly related to family ties and/or where the share of population with tertiary education is low and the specific design of the education system is not of an inclusive type.

The paper's contribution is twofold: on the one hand, it can contribute to understand the documented differences in educational systems over OECD countries, in particular it might help to explain why some countries seem to remain stuck in "low education" traps; on the other hand, it contributes to the theoretical literature by modelling individual's preferences for public education by taking explicitly into account the hierarchical nature of the educational system.

The paper is organized as follows. Section 2 introduces the related literature. Section 3 presents descriptive evidence on the main features characterizing educational systems across OECD countries. Section 4 offers a model of individual preferences over education policy as a contribution to understanding the observed differences in educational systems. Section 5 contains some concluding remarks and indicates directions for future research.

## **2 Related literature**

The so called *human capital view*, inspired by Becker and Tomes (1979 and 1986), sees the intergenerational transmission of inequalities as almost exclusively due to the role played by liquidity constraints in the accumulation of human capital. If capital markets are not perfect and public institutions do not compensate for this effect, lack of liquidity always limits investment in human capital of individuals coming from disadvantaged backgrounds. The government can try to make up for poor background with publicly provided education but children from poor

households have overall much lower enrolment rates at increasingly higher levels of education than children from richer families.<sup>6</sup>To this respect, Glomm and Ravikumar (1992 and 2003) argue that a sufficient high elasticity of parental human capital in the learning technology might be responsible for low intergenerational mobility of human capital, even in educational systems where funding is mainly public. Put another way, since education is a hierarchical process, students from disadvantaged family backgrounds have a much lower probability of entering higher levels of education because with a greater probability they fail to meet the basic prerequisites to advance into education. This view is supported by the observation that lack of financial means is not the only barrier in the access to university; even more relevant is the failure to attain the educational prerequisites needed to enter university. Ample evidence from the United States suggests that true credit constraints are not a binding issue in the admission to higher education in the vast majority of cases (see Carneiro and Heckman, 2002). Rather, the fact that students from disadvantaged family backgrounds have a much lower probability of entering university seems to be due to the lack of early educational investments, which deprive these students of the basic prerequisites to advance to university (see Cunha et al., 2006). This phenomenon appears to be even more relevant in Europe, where higher education is mostly publicly funded (Wößmann and Schutz, 2006). Cardak and Ryan (2009) for Australia find similar results.<sup>7</sup>

The literature considering education as a hierarchical process is small. Much of the literature on education treats basic (K-12) and tertiary education symmetrically, or simply assumes a single type of education. However, some recent works have begun to model explicitly the two types of educational expenditures and to investigate the dynamic effects of allocating public funds between basic and advanced education.<sup>8</sup>In the specific, Restuccia and Urrutia (2004) find that educational policies aimed at early education are far more effective at reducing persistence of

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<sup>6</sup>See De Fraja (2004) for a discussion of this point.

<sup>7</sup>See also Reis (2010) on this point.

<sup>8</sup>See Restuccia and Urrutia (2004); Su (2004); Blankenau (2005); Blankenau et al. (2007); Arcalean and Schiopu (2010).

discrepancies in earnings than policies aimed at college education. Their result hinges on the relative strength of poor parents' borrowing constraints, which appear to be more relevant in early stages of offspring's education. In the same line, Su (2004) obtains that for an economy in its early development stage, focusing on basic education for sufficiently long duration is the only way out of poverty.

Another potential factor affecting the relation between schooling outcomes and family background is school tracking (Brunello and Checchi, 2007). As reported by Woßmann and Schutz (2006), there is some evidence that later tracking is associated with better student performance and that moving away from early tracking has positive effects on educational attainment, especially for students with a lower socio-economic background.<sup>9</sup>Overall, these studies suggest an equity-enhancing role for late tracking.<sup>10</sup>

The relationship between family background and educational attainments might be also affected by social classes' formation. Bowles and Gintis (2002) argue that social classes are not based exclusively on people's talent and ability or educational achievements, but also on family connections.<sup>11</sup>These factors give kids from rich families higher chances of being allocated into better paying jobs, and hence of remaining rich, even when they have low talent; at the same time they reduce the chances of the poor to improve their status, even when they have more talent. Franzini et al. (2013) empirically analyse the association between parents' social background and several offspring's outcomes (education, labour market achievements, earnings) in eight EU countries. Interestingly, they find that, in Nordic and Central European countries, the influence of parental background on earnings appears entirely mediated by intervening factors such as educational attainments and the process of occupational sorting. Differently, in Southern countries, Great Britain, and Ireland, they find a significant association

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<sup>9</sup>Ferreira and Gignoux (2011); Aakvik et al. (2010); Meghir and Palme (2005).

<sup>10</sup>Hanushek and Woessmann (2006) make use of PISA and find that inequality in performance is higher in countries that adopt early tracking compared to countries that do not.

<sup>11</sup>Bowles and Gintis (2002) and Goldthorpe and Jackson (2008) emphasize the impact of familiar models on the development of children's non cognitive traits such as risk aversion, extroversion, the willingness to work in team, the sense of discipline or leadership. All these traits seem to be extremely relevant in determining labour market success.

between family background and earnings, not mediated by the other factors, confirming the “mismatch of talent” hypothesis (Bernasconi and Profeta, 2009).

Overall, the literature reviewed above helps to identify the factors that may explain the degree of equality of opportunities offered by different educational systems to students from different background. As already mentioned in the introduction, the prevailing educational system can be seen as the outcome of a (political) process that aggregates individuals’ preferences for education policy.

The study of the micro-foundations of education policy in terms of individual policy preferences, and their interaction with macro variables is the object of works like Busemeyer and Iversen (2014), Busemeyer (2012), Ansell (2008) and Kitschelt and Rhem (2006). Busemeyer and Iversen (2014) and Busemeyer (2012), for example, analysing survey data for a large number of OECD countries, show that, at the individual level, the impact of income on preferences strongly depends on the interaction between the micro level and the macro level institutional context. This confirms that redistributive implications of investments in education are less clear-cut compared to other public policies. More specifically, they find that - at the micro level - the relationship between individual income and support for education spending depends on two aspects of the macro-level context: the level of economic inequality, as the standard Meltzer Richard’s (1981) argument would suggest, and the inequality in the distribution of human capital. In the specific, high levels of educational inequality, mitigate the negative impact of income on the support for public education, reflecting the fact that children from lower social background have much lower enrolment rates at increasingly higher levels of education.

Ansell (2008) builds a political economy model of public spending on tertiary education based on individual preferences. He argues that the lower the enrolment rate of pupils from low-income families, the higher the probability that poor families form a coalition with rich families against middle-income families to reduce public spending in tertiary education.



While Busemayer (2012) does not distinguish public educational spending across levels of education, Ansell (2008) concentrates on tertiary education spending. To the best of our knowledge, the literature has not yet investigated the micro foundations of education policy, in terms of individual policy preferences, distinguishing between basic (K-12) and tertiary education. In this paper, we aim at filling this gap.

### **3. Stylized facts**

In this section, we provide evidence on educational systems across OECD countries, focusing on expenditures - levels and composition -, source of financing - private vs. public - and school tracking.<sup>12</sup>We also document correlations between these variables and various dimensions of inequality.

Figure 1 shows countries' differences in terms of spending on education as a share of GDP, regardless of the funding system. The OECD average share is 5.2%; three countries (Slovakia, Hungary and Italy) spend less than 4%, while top spenders (New Zealand, Denmark, USA, Great Britain, Norway, Chile and Canada) allocate more than 6% of their GDP to education.<sup>13</sup>

A further dimension of heterogeneity concerns how this flow of resources is distributed among educational stages and, in particular, between non-tertiary or basic (K-12) and tertiary. As expected, all countries allocate the greater share to basic education: 3.7% of GDP on average, compared to 1.5% of GDP to tertiary education. Nevertheless, there is great variability in the distribution of resources, with countries such as USA, Chile, Canada and Korea spending more than 2% of their GDP on tertiary education, which corresponds to around 40% of resources dedicated to education allocated to tertiary education.

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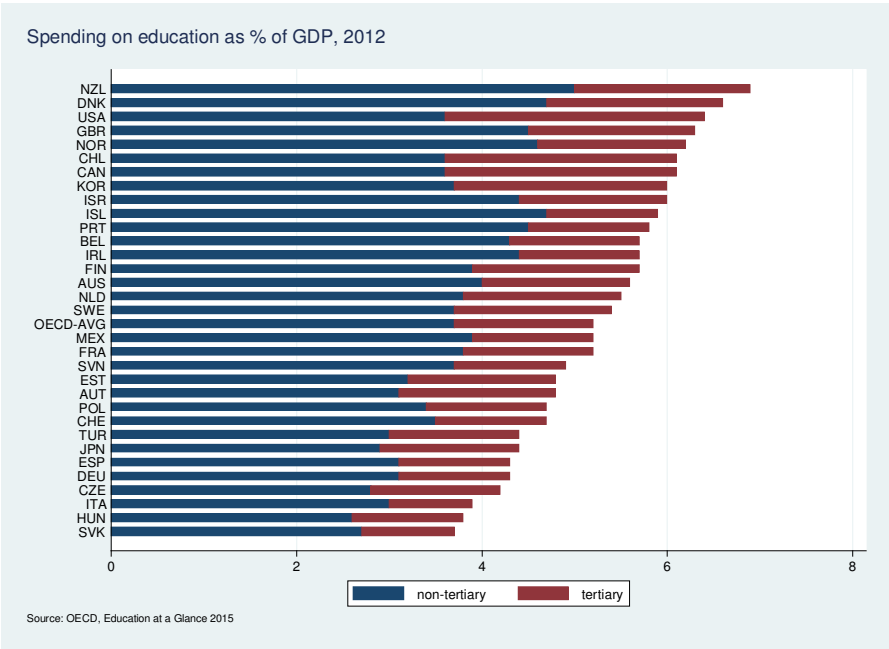
<sup>12</sup>Data are taken from OECD (2015). A summary table, at the bottom, summarizes all the original variables used for the following descriptive analyses.

<sup>13</sup>Please note that if two countries differ in terms of per-capita GDP and demographic structure, a given share of spending corresponds to different levels of spending per student (see summary table at the end of the paper). For this reason, we have eliminated Luxemburg, which is too much of an outlier in terms of GDP per capita.

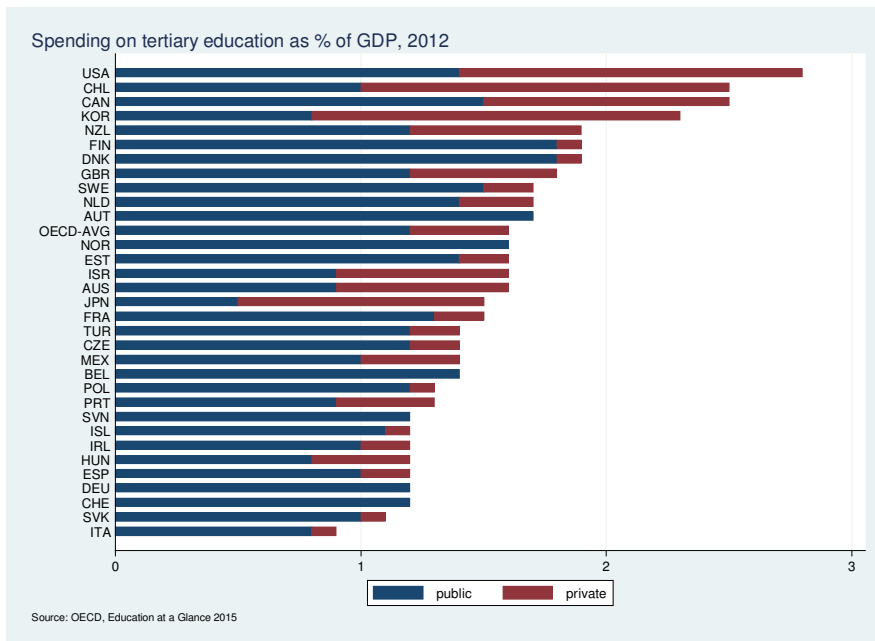
With regard to the source of funding, while non-tertiary education is in general almost entirely publicly funded, huge disparities exist in the degree of public funding towards tertiary level. For example in Slovakia, Israel, Poland, Denmark, Finland, Austria, Germany, Slovenia, Switzerland, Belgium and Norway more than 90% of tertiary education is publicly funded - while in Chile, Japan and Korea the tertiary share is less than 40% and in USA it is 50%. Similarly, public expenditure on tertiary education as a share of GDP ranges between less than or equal to 0.8% in Japan, Italy, Korea and Hungary, and 1.8% in Denmark and Finland (see figure 2).

By crossing these dimensions of variability, one can visualize how the countries are positioned in terms of resources allocation between the two stages of education. The left panel in figure 3 plots total expenditures in tertiary and non-tertiary education as a share of GDP, while the right panel plots public expenditures in tertiary and non-tertiary education as a share of GDP.

**Figure 1: Education expenditures as a share of GDP**



**Figure 2: Expenditures on tertiary education as a share of GDP**

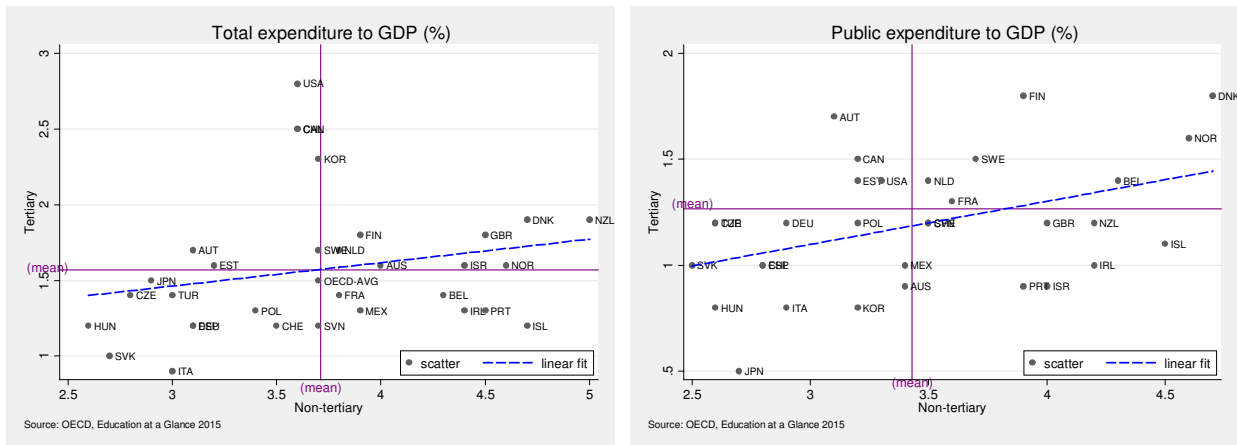


Countries such as Finland, Denmark, Great Britain and New Zealand are high spenders on both levels. Others spend more than the average on tertiary education (USA, Canada and Korea) or on K-12 (Belgium, Israel, Ireland, Norway and Portugal). Finally, countries such as Spain, Italy, Hungary and Slovakia spend less than average on both levels. Among high spenders, Denmark, Norway and Finland show a high share of public spending on both education levels while others, USA and Korea, are more oriented towards private expenditures.

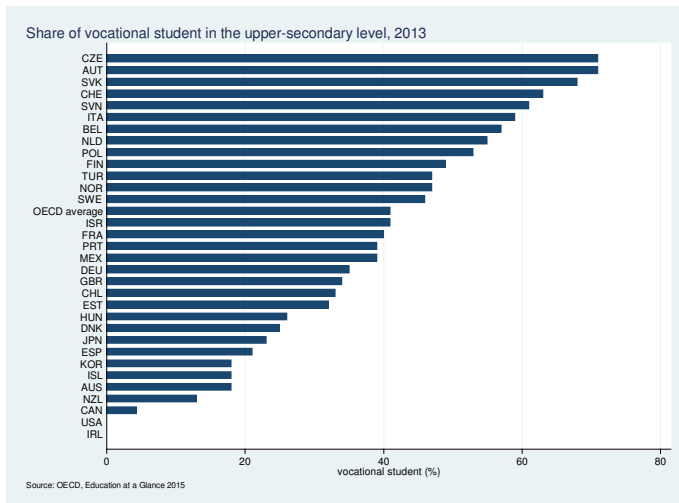
Following the literature (e.g. West and Nicolai, 2013; Ferreira and Gignoux, 2011), we use enrolment in vocational education programs as a proxy for educational tracking which, compared to tracking age, presents higher variability.<sup>14</sup> Figure 4 shows the share of students enrolled in vocational programs at the upper-secondary school level. This variable ranges from zero in Ireland to 71% in Czech Republic with the OECD average being 41%.

<sup>14</sup>Tracking age is reported in the summary table at the end of the paper.

**Figure 3: Tertiary vs Non-tertiary expenditures. Total on GDP (left) and public on GDP (right)**



**Figure 4: Share of vocational students at the upper-secondary level**



To gain further insight and to summarize country's characteristics in terms of educational expenditures and vocational orientation, we apply a principal component analysis (PCA) on the five original variables (tertiary and non-tertiary expenditure on GDP, overall and public; share of upper secondary students enrolled in vocational programs). As shown in table 1 the first three components - which explain 94% of the variance - are easily interpreted as the total share of resources allocated

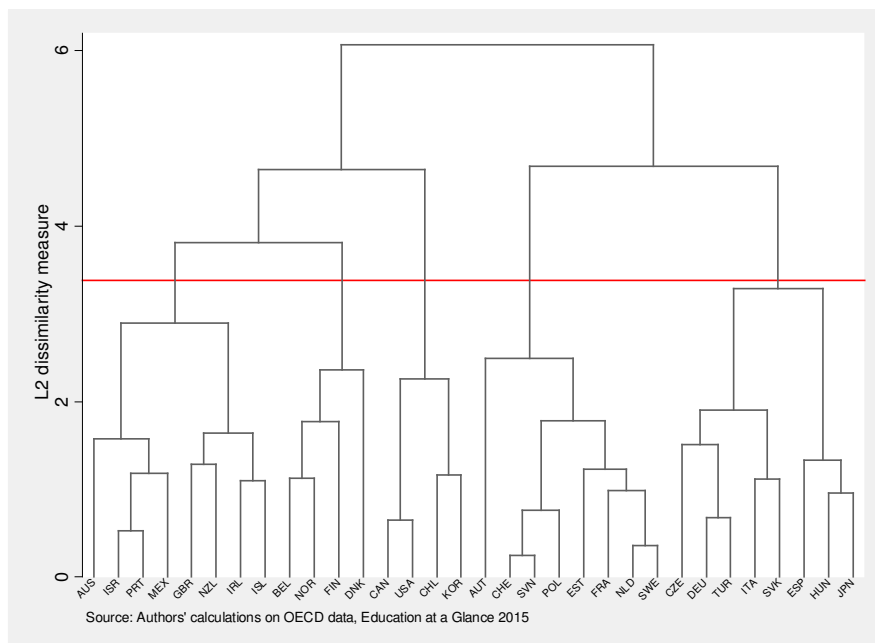
to education (PC1), the intensity of vocational orientation coupled with the degree of public funding of education (PC2) and the relative weight given to tertiary education, especially publicly financed (PC3).

**Table 1: Principal components (eigenvectors)**

Variable	PC1	PC2	PC3
Non-tertiary/GDP	0.60	0.11	-0.34
Tertiary/GDP	0.33	-0.50	0.58
Non-tertiary public/GDP	0.58	0.29	-0.27
Tertiary public/GDP	0.33	0.42	0.66
Vocational students (%)	-0.29	0.69	0.18

The subsequent cluster analysis based on these indicators and the resulting hierarchical tree-diagram (Figure 5) helps us to identify five groups of countries.<sup>15</sup>

**Figure 5: Cluster analysis dendrogram**



<sup>15</sup>A complete-linkage clustering is adopted. The vertical axis of the dendrogram represents the distance or dissimilarity between clusters. The horizontal axis represents the countries and clusters. The purpose is to obtain few groups, each containing elements that are similar among themselves and dissimilar to elements belonging to other groups. In practice, the choice on the number of groups is the choice of the vertical level at which to cut the tree.

Group 1, with 8 countries: Australia, Great Britain, Ireland, Island, Israel, Mexico, New Zealand and Portugal.

Group 2, with 4 countries: Belgium, Denmark, Finland and Norway.

Group 3, with 4 countries: Canada, USA, Chile and Korea.

Group 4 with 8 countries: Austria, Switzerland, Estonia, France, Netherland, Poland, Slovenia and Sweden.

Group 5, with 8 countries: Czech Republic, Germany, Spain, Hungary, Italy, Japan, Slovakia and Turkey.

Group 1 consists of high-spending countries that favour basic education. They spend more than 4% of GDP in basic education, with a prevalence of public funding. Their program orientation at the secondary level is general. Group 2 consists of high spenders on both education levels. They spend around 6% of GDP in education, almost entirely publicly financed. Their program orientation is mixed with a middle-high share of students enrolled in vocational programs.

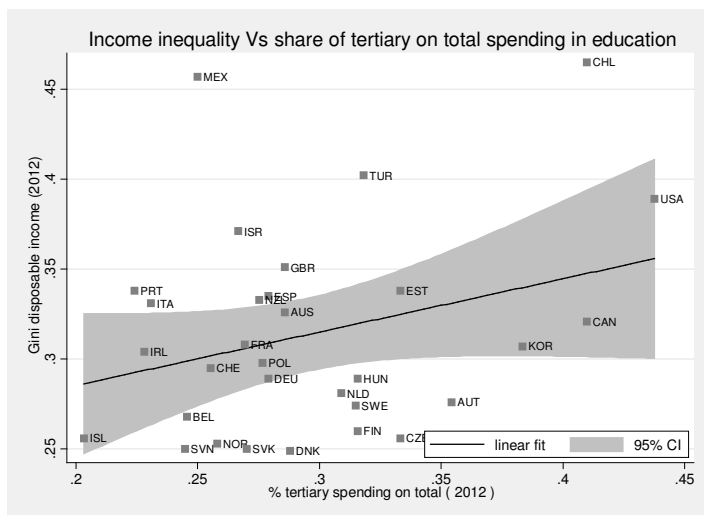
Group 3 consists of high-spending countries (more than 6% of GDP) that favour tertiary education with a high share of private financing. They spend above 2% of GDP on tertiary education, with a high share of private funding. They have a marked general orientation at the (upper) secondary level. Group 4 consists of middle-spending countries, with education almost entirely publicly financed at both levels and a relatively high share of students enrolled in vocational programs. Their total spending ranges between 4.7% of Poland to 5.5% of Netherlands. Finally, group 5 consists of low-spending countries with a middle-high vocational component. Their total spending ranges between 3.7% of Slovakia to 4.4% of Japan.

The causal relationship between the characteristics of the education system and inequality - in education and income - can “go both ways”. On one side, the characteristics of the education system directly contribute to determine the level and the distribution of education in the population and, indirectly, the level and the distribution of income. At the same time, income and education

inequality influence preferences for education and, through the political process, the education system. An econometric analysis at the macro level is outside the scope of the present paper and, in what follows, we look at simple correlations between education variables and socio-economic inequality. More specifically, besides correlations between expenditure on education, on the one hand, and income as well as education inequality, on the other, we consider also correlations between educational tracking and income/education inequality.

Figure 6, where the correlation between disposable<sup>16</sup> income Gini and the share of tertiary spending on total spending in education is considered, shows a clear upward pattern which is consistent with the well-known result that more unequal societies tend to spend relatively more on tertiary education.<sup>17</sup>

**Figure 6: Income inequality and share of tertiary on total spending in education**



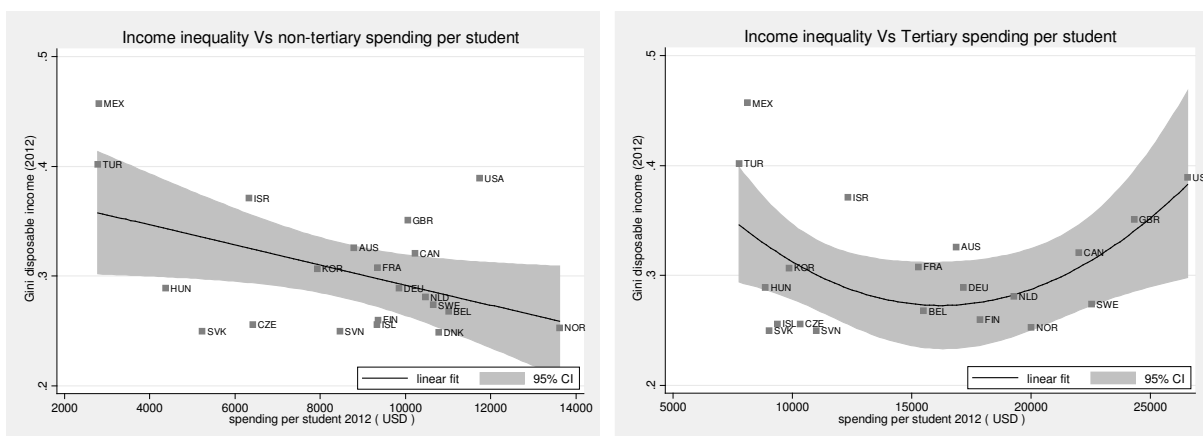
<sup>16</sup>The choice of disposable rather than a market or pre-tax and transfers definition of income is justified by the fact that the focus of this analysis is on the determinants of individual preferences. The former definition is probably better suited to explain preferences (and political demand) while the latter is a better proxy of the outcome related to an education system.

<sup>17</sup>See on this point Di Gioacchino and Sabani (2009) and the literature cited therein.

In figures 7 and 8 we consider the association between inequality and education expenditures per student.<sup>18</sup>Figure 7 plots linear/quadratic fits of the Gini index of disposable income against education spending per student (USD), separately for basic (left) and tertiary (right) education. Figure 8 plots linear fits of the Gini index of disposable income against public education spending per student (USD), separately for basic (left) and tertiary (right) education.

Not surprisingly, being basic education almost entirely publicly financed as well as mandatory, the left panels in figure 7 and 8 are very similar and suggest a clear negative correlation between income inequality and expenditure per-student in the former educational stage. As for tertiary spending per student, while a clear negative correlation emerges for public expenditures, a "U" shape picture emerges for the correlation between the income Gini and total spending per student. This suggests that for tertiary education, in more unequal societies rich families complement (relatively low) public expenditures with private expenditures.

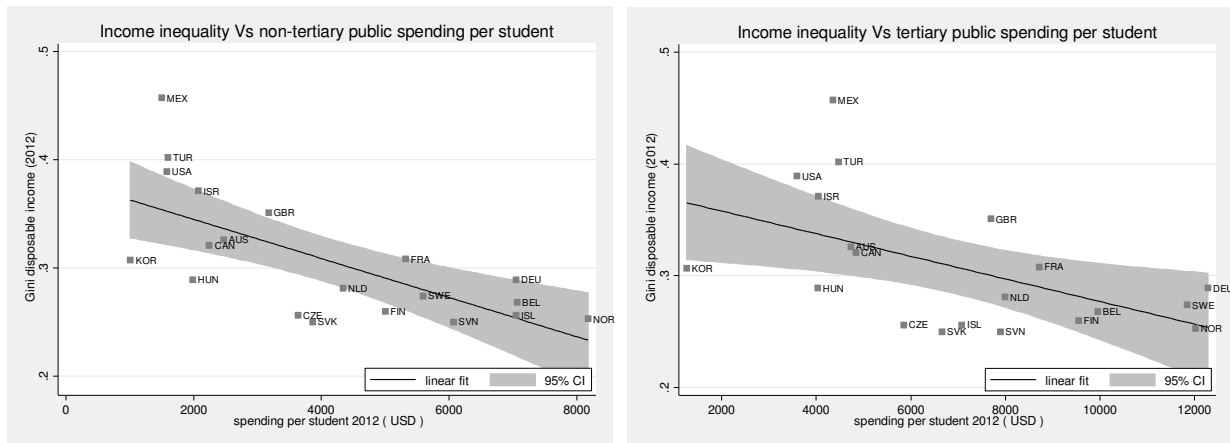
**Figure 7: Income inequality and expenditure per student. Non tertiary (left) and tertiary (right)**



<sup>18</sup>In countries with high-income inequality probably more individuals are liquidity constrained, therefore we expect a low level of demand for tertiary education. So spending as percentage of GDP would be low compared to other countries where disposable income is less dispersed. By considering spending per student instead of spending as percentage of GDP, we should pick up such "demand" effect.



**Figure 8: Income inequality and Public expenditure per student. Non tertiary (left) and tertiary (right)**



The causal relationship between income inequality and tracking is complex and bi-directional. On one side, early tracking may cause high social segmentation and thus high (market) income inequality; on the other hand, in cohesive societies individuals with vocational education may be efficiently placed within the labour market to achieve high levels of production and thus finance generous redistribution programs. Thus, if we consider disposable income Gini, the negative correlation between disposable income inequality and the share of students enrolled in vocational programs shown in figure 9 is not surprising.

Finally, we consider correlations of education expenditures and tracking with education (in)equality. To measure education equality we use the share of population aged 25-64 with tertiary education. In fact, since most people in OECD countries have basic education, higher educational equality can be expressed by a greater share of tertiary educated population.<sup>19</sup>

Figure 10 suggests the existence of striking disparities among OECD countries: the share of population aged 25-64 with tertiary education ranges from less than 20% for Mexico, Italy and

<sup>19</sup>This measure is inversely proportional to the coefficient of variation of a Bernoulli distribution representing the probability of having a tertiary education. A continuous measure of educational inequality can be expressed by a second moment of years of schooling.

Turkey to a value around 50% for Japan, Israel and Canada, the latter being the only country with more than 50% of graduates in the population.

**Figure 9: Income inequality and share of vocational students**

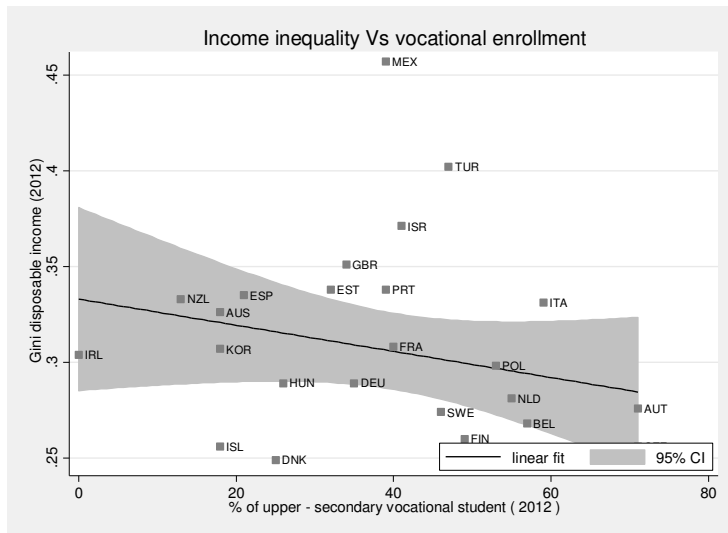
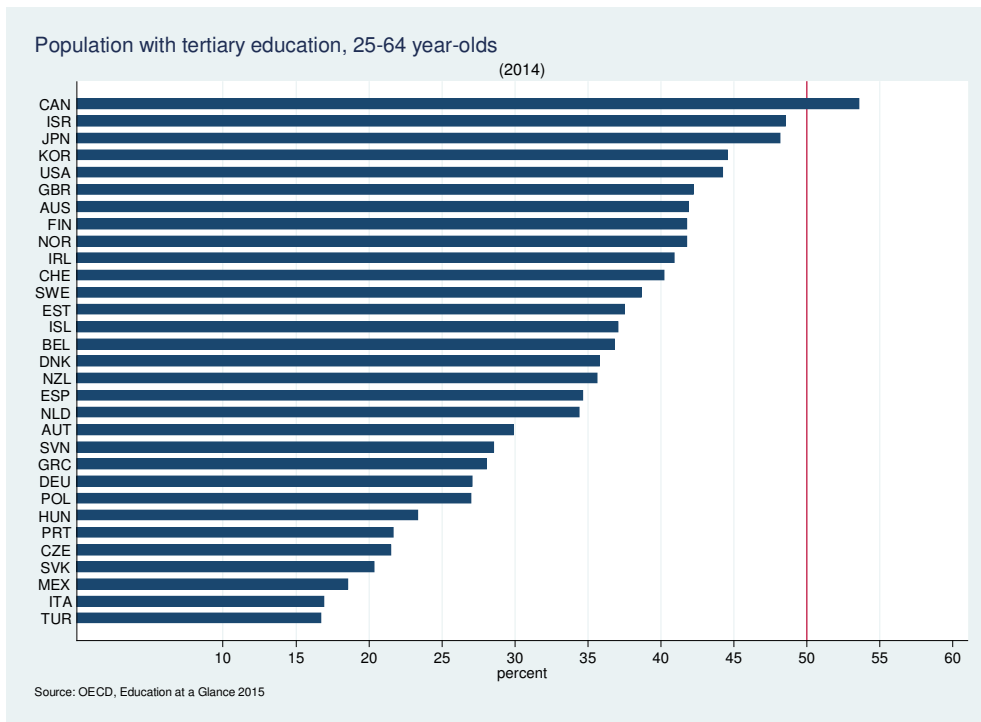


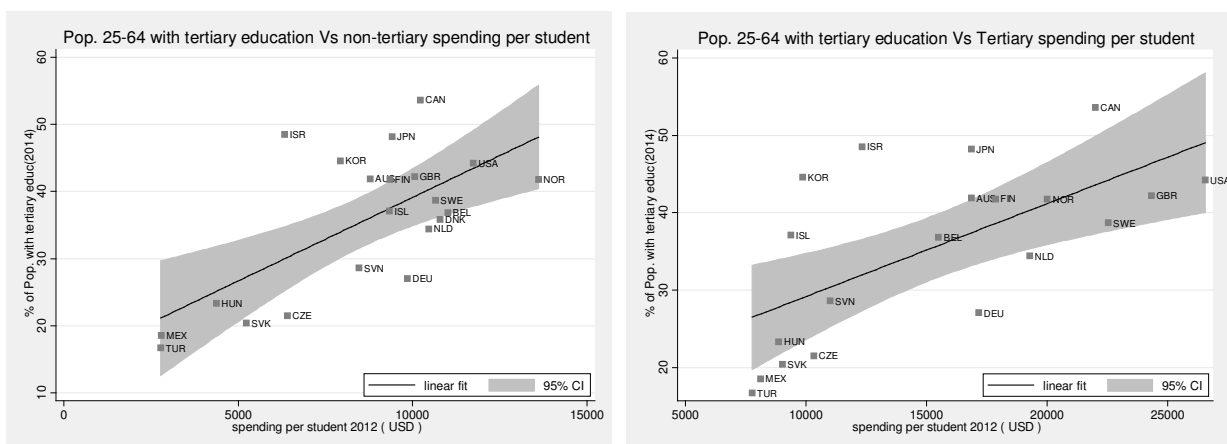
Figure 11 plots non-tertiary and tertiary spending per student against our measure of education equality. Both plots show a clear upward pattern. This evidence agrees with theoretical expectations according to which more educated parents are expected to demand more education for their off-springs.

To analyse the relationship between tracking and education equality we consider correlations between the share of population with tertiary education and the percentage of upper-secondary students enrolled in a vocational program (figure 12, right). On one side, the higher the enrolment in vocational programs the lower is the number of students expected to continue to university. On the other hand, the literature has emphasised that tracking reduces equality of opportunities in education. In line with these arguments, figures 12 show a clear downward pattern.

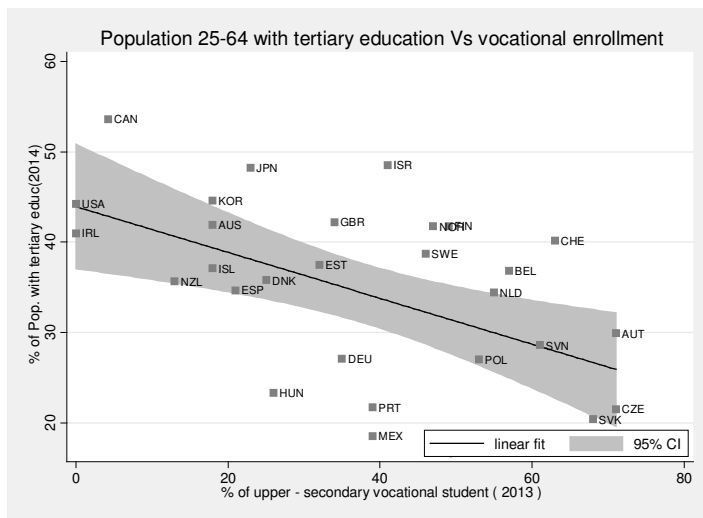
**Figure 10: Population with tertiary education**



**Figure 11: Population with tertiary education Vs non-tertiary (left) and tertiary (right) expenditure per student**



**Figure 12: Educational equality Vs share of vocational students**



#### 4. The model

In the economy, there is a continuum of families of measure one. A family, indexed by  $j$ , consists of a parent (old agent) and a child (young agent). Old agents are endowed with an exogenous income ( $Y_j$ ), consume and make educational transfers to their children.<sup>20</sup> Young agents get educated in a hierarchical schooling system in which basic (K-12) education might be followed by tertiary education. The educational transfer is distributed over the two educational stages and old agents allocate the transfers in order to maximize their expected utility derived from family consumption and returns from the human capital accumulated by their offspring.

Old agents are heterogeneous along two dimensions: income and human capital. Income is distributed in the old population according to a distribution function  $F(\cdot)$  with mean  $Y$ . We assume that the median income is lower than the mean. Child's future income depends positively on the level of accumulated human capital. Moreover, we assume that the premium to education is higher for "connected" families, where family connections are supposed to be

<sup>20</sup> The educational transfer might be thought of as goods or time. In this last case, increased time with children reduces income endowment and, as in the case of investment in goods, reduce disposable income for consumption.

positively correlated with parent's income.<sup>21</sup> Let  $Y_j$  and  $\mu_j$  indicate, respectively, parent's income and family connections (income-related).  $K_i$  indicate parent's level of human capital, with  $i=H,L$ . Without loss of generality, we assume  $K_L = 0$ ,  $K_H = 1$ ; this can be interpreted as a dummy variable indicating whether the parent has graduated from university or not. We assume that a fraction  $k$  of the old agents have got a university degree.

#### 4.1 Human capital formation

Human capital formation is modelled as a two-stage process. The first stage is mandatory and corresponds to primary and secondary education. The second stage (tertiary education) is optional and it is pursued only by a part of the population. Parent's investment ( $B_{ij}$ ) and Government's expenditures ( $B_G$ ) are substitutes in the formation of a child's basic education.<sup>22</sup> Tertiary education expenditures, both private ( $T_{ij}$ ) and public ( $T_G$ ) augment basic education. However, access to higher education is not the same for all children. It depends on parents' human capital: this could be because of inheritability of traits (talent) and/or because of cultural attitudes. Here we assume that if a parent is highly educated, then his child has, for sure, access to tertiary education; if the parent is less educated, the child's access probability is less than one. Formally, let  $p_i = \text{prob}(\text{University}/K_i)$ , then  $p_H = 1$  and  $p_L = p < 1$ . The value of  $p$  depends on the educational system design, with early tracking being associated with lower  $p$  level. The parameter  $p$  can thus be interpreted as an indicator of the fairness of the education system: the higher is  $p$  the less access to tertiary education is correlated to parents' education and the higher is the equality of opportunity in education.

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<sup>21</sup>Note however, that the degree to which connections determine the education premium depends on the structure of the labour market and it is, at least partially, country specific.

<sup>22</sup>Parents' investment in education could be substitutes or complements with public expenditures. Glomm and Ravikumar (1992) and Kaganovich and Zilcha (1999) assume that public and private investment are complements, whereas Becker and Tomes (1986) that they are substitute. See Nordblom (2003) and Arcalean and Schiopu (2010) for a discussion and further references

Assuming the same elasticity ( $\alpha$ ) of basic and tertiary education in the production function, we write the human capital of a child whose parent's education and income are, respectively,  $K_i$  and  $Y_j$ , with  $i=H, L$ , as<sup>23</sup>

$$h_{ij} = \begin{cases} (B_{ij} + B_G)^\alpha (T_{ij} + T_G)^\alpha & \text{if tertiary education is completed} \\ (B_{ij} + B_G)^\alpha & \text{if only basic education is completed} \end{cases}$$

His future income, which depends also on family's connections, is given by

$$y_{ij} = h_{ij}^{\mu_j}$$

#### 4.2 Public and Private educational expenditures

Public education, which is equally provided to all children, is financed by a proportional income tax ( $\tau$ ). Let  $a = k + (1 - k)p$  be access to tertiary education in the whole population. The government budget constraint can be written as:

$$B_G + aT_G = \tau Y$$

Where  $Y$  is average income in the old population.

As customary in this literature, the family utility function is assumed to be logarithmic in parent's consumption and child's future income, with relative weight  $\gamma$  which measures parent's altruism:

$$U_{ij} = \ln c_{ij} + \gamma \ln y_{ij}$$

The utility function is maximised under the family's budget constraint and the non-negativity constraints:

$$c_{ij} + B_{ij} + T_{ij} = (1 - \tau)Y_j$$

$$B_{ij}, T_{ij}, c_{ij} \geq 0$$

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<sup>23</sup> We are using uppercase letters for the parent and lowercase for the child.

It can be shown that the family's optimal choices of investment in basic and tertiary education are, respectively (see appendix)

$$B_{ij}^* = g_{ij}[(1 - \tau)Y_j + T_G] - (1 - g_{ij})B_G \text{ if positive, zero otherwise}$$

$$T_{ij}^* = g_{ij}p_i[(1 - \tau)Y_j + B_G] - (1 - g_{ij}p_i)T_G \text{ if positive, zero otherwise}$$

where  $g_{ij} = \frac{\alpha\gamma\mu_j}{1 + \alpha\gamma\mu_j(1 + p_i)}$ .

Families choose private expenditures to balance marginal benefit from basic and tertiary education, thus they spend relatively more on the level of education in which the Government spends less. As expected, the above solution shows that richer and more connected families spend more on both education levels. Moreover, highly educated parents, knowing that their children will attend university with probability one, spend more on tertiary education and less on basic education than low educated parents.

### 4.3 Preferences for education

In our model, the education system is characterized by the level and composition of public education expenses  $(\tau, B_G, T_G)$  and by the parameter  $p$ , which we consider as exogenously given.

To derive preferences for public education expenditures, we write the family's indirect utility as a function of Government's choice variables:

$$W_{ij}(\tau, B_G, T_G) = \ln c_{ij} + \alpha\gamma\mu_j \ln(B_{ij}^* + B_G) + \alpha\gamma\mu_j p_i \ln(T_{ij}^* + T_G)$$

Given its budget constraints, the Government can choose only two variables. Thus, we only consider welfare effects from  $B_G$  and  $T_G$ , which, after simple computation can be shown to be, respectively:

$$\frac{\partial W_{ij}}{\partial B_G} = \left(1 - \frac{Y_j}{Y}\right) (1 + \alpha\gamma\mu_j(1 + p_i))$$

$$\frac{\partial W_{ij}}{\partial T_G} = \left(1 - \frac{\alpha Y_j}{Y}\right) \left(1 + \alpha \gamma \mu_j (1 + p_i)\right)$$

Net benefits from basic education are positive (negative) for families whose income is above (below) the average, suggesting that public spending in basic education is a way of redistributing income.

Net benefits from tertiary education are positive (negative) if income is lower (higher) than the threshold level  $\frac{Y}{a}$ , which depends positively on old average income and negatively on population access to university.<sup>24</sup>

Thus, with regard to preferences for education, we have three groups of families: poor ( $Y_j < Y$ ), middle (income) ( $Y < Y_j < \frac{Y}{a}$ ) and rich ( $Y_j > \frac{Y}{a}$ ).<sup>25</sup>

In the appendix, we derive the (corner) solutions shown in the table below:<sup>26</sup>

**Fig. Preferences for education expenditures**

	$B_{ij}$	$T_{ij}$	$B_G$	$T_G$	$\tau$
Poor ( $Y_j < Y$ )	0	0	$g_{ij}Y$	$g_{ij}p_i \frac{Y}{a}$	$g_{ij}(1 + p_i) < 1$
Middle ( $Y < Y_j < \frac{Y}{a}$ )	$g_{ij}Y_j$	0	0	$g_{ij}p_i \frac{Y}{a}$	$g_{ij}p_i$
Rich ( $Y_j > \frac{Y}{a}$ )	$g_{ij}Y_j$	$g_{ij}p_i Y_j$	0	0	0

As can be noticed from the table, rich agents prefer the minimum level of public expenditures in both basic and tertiary education independently of  $p_i$ . Clearly, their position in the income ladder fully drives their preferences

<sup>24</sup>Being connected and/or highly educated does not change preferences, but it increases net benefits (or losses) from each education level.

<sup>25</sup>Note that as access to university increases, preferences of middle-income families converge to those of rich families. The reason is that as the number of students who benefit from public funding of universities increases, middle income families pay more than average for tertiary funding but receive the average benefit from it.

<sup>26</sup>Note that  $g_{ij}p_i = 1 - \frac{1 + \alpha \gamma \mu_j}{1 + \alpha \gamma \mu_j (1 + p_i)}$  is increasing in  $p_i$ .



Middle-income agents always prefer the minimum level of public expenditures in basic education; their preferred level of public expenditures in tertiary education, which increases with  $p_i$ , is always higher than that of poor families with the same human capital.

Poor families' preferred allocation of public funds over the two stages of education depends on  $p_i$  (and  $a$ ). As  $p_i$  increases, the preferred level of public expenditures in basic education decreases, while that in tertiary education rises more than proportionally. Thus, among the poor those with high human capital prefer an overall higher level of expenditures in education, with a lower level in basic and a higher level in tertiary than poor with low human capital. In the extreme case, if  $p_L=0$ , the preferences for tertiary education of poor with low human capital would coincide with those of rich families.

Finally, it is important to note that preferences for public expenditures in education depend also on the human capital formation technology parameter ( $\alpha$ ) and on the premium to education ( $\mu_j$ ). These parameters are, at least partially, country-specific being related to the productive and social structure of the country itself.

For simplicity, let  $\mu_j = 1$ , for  $Y_j < Y$ ,  $\mu_j = \mu > 1$  for  $Y < Y_j < \frac{Y}{a}$  and  $\mu_j \geq \mu$  for  $Y_j > \frac{Y}{a}$ . We can now summarise the ranking of preferences (from lowest to highest) for basic and tertiary education respectively, as follows:<sup>27</sup>

Basic:  $B_{HR} = B_{LR} = B_{HM} = B_{LM} < B_{HP} < B_{LP}$

Tertiary: if  $\mu * p > 1$ ,  $T_{HR} = T_{LR} < T_{LP} < T_{HP} < T_{LM} < T_{HM}$

To see how conflicting preferences are composed in a political equilibrium, one would need to specify the political process and find the pivotal voter or the winning coalition. The outcome of the political process would depend on the intensity of the conflict on each dimension of heterogeneity (income and human capital), which in turn depends on inequality in that dimension. In a situation

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<sup>27</sup>We denote by LP the poor with low human capital; by HP the poor with high human capital; by LM the middle-income with low human capital; by HM the middle-income with high human capital; by HR the rich with high human capital and by LR the rich with low human capital.

with a low level of social conflict, *i.e.* low income inequality and high access to university,<sup>28</sup> we expect the political equilibrium to be characterized by high public expenditures in education, balanced over the two stages. On the other hand, if income inequality is high and access to university is limited, the outcome would depend on the identity of the pivotal voter or winning coalition. If the pivotal voter were poor, we would anticipate an overall high level of public education expenditures unbalanced towards basic education; if the pivotal voter were middle-income the outcome would probably be an overall high level of public education expenditures unbalanced towards tertiary education. If the pivotal voter were rich, a low level of public expenditures on both education levels is expected.

Turning to coalitions, the political equilibrium should be somewhere in between the preferences of the groups in the coalition. So, for example, an overall low level of public education expenditure unbalanced towards basic education, could be justified by a political coalition between the poor and the rich, while an overall low level of public education expenditure unbalanced towards tertiary education would be justified by a political coalition between middle income and rich families.

A detailed analysis of the electoral competition and the political equilibrium is outside the scope of the present paper; nevertheless, our insights might help reading the stylised facts described in section 3. In comparing the results of the cluster analysis developed in the previous section with the analysis of preferences derived from our model, one has to bear in mind that other, country-specific, variables influence preferences as well as the identity of the pivotal voter.<sup>29</sup> With this caveat, we now turn to this comparison.

Countries in group 1, 2 and 3 feature a high share of individuals with tertiary education. We therefore expect the pivotal voter to be highly educated. In group 1 (e.g. Great Britain) income inequality is high and program orientation is general. Countries in this group are high spenders, especially in basic education. This could be the outcome of a coalition between HP and HR.

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<sup>28</sup>*i.e.*  $p$  close to 1 for all agents so that  $a$  is approximately 1.

<sup>29</sup>As for example, the demographic structure of the country.

Similarly, in group 3 (e.g. USA) income inequality is high and program orientation is general. Countries in this group are high spenders, especially in tertiary education. This could be the outcome of a coalition between HP and HM. Differently, in group 2 income inequality is low. In these countries, high spending on both levels of education is associated with a high share of students enrolled in vocational programs. We can interpret this result as the outcome of a political process in which the pivotal voter is HM or, as in the previous group, the winning coalition is HP and HM.

In countries with a low share of population with tertiary education, we expect the pivotal voter to be low educated and therefore demand for tertiary education to be low. Moreover, if the pivotal voter is rich then also expenditures in basic education are low. This is consistent with the characteristics of group 5: expenditures are low and program orientation is vocational.

Finally, group 4 in the cluster analysis, is composed of countries with medium/low income inequality, a high share of students enrolled in vocational programs and a relatively high share of population with tertiary education. Compared to group 2 it has greater income inequality. Compared to group 5 it has lower income inequality and a higher share of population with tertiary education. Consistently, countries in this group display a level and a composition of education expenditures that is similar but lower than that of countries in group 2. We can interpret this result as the outcome of a political process in which the pivotal voter is HM or the winning coalition is HP and HM as in group 2. The greater distributive conflict, relative to group 2, between middle income and poor families leads to an overall lower level of education expenditures.

## **5. Concluding remarks and policy implications**

This paper documents differences in education systems across OECD and considers their implications for equality of opportunities in education. We stress that ultimately the education system observed in a country is the result of a complex interaction between preferences for

education and political competition, both of which depend on the characteristics of the underlying conflict of interest. To analyse this issue, we put forward a model of individual preferences and interpret our theoretical predictions in terms of stylized facts observed on country level data with particular reference to a cluster analysis carried out on educational systems features.

The empirical analysis suggests that income inequality, program orientation and share of population with tertiary education are all related to the level and composition of education expenditure. A general result is that total education expenditures are high where tertiary education is widespread, suggesting a strong demand effect. Moreover, in countries with high-income inequality, education expenditures are positively associated with general program orientation. On the contrary, vocational programs combined with high level of education expenditures seem to receive political support in countries with highly redistributive welfare states. Overall, the results of our model are consistent with the clustering evidence in terms of possible results of preference aggregation through the political process.

The main policy message of our analysis is that focusing on public expenditures to favour equality of opportunities in education is not enough. In fact, how these expenditures are allocated to different education stages and also the specific design of the education system are crucial dimensions in shaping the outcome. Both these aspects determine how resources are distributed across the population and thus the degree of equality of opportunities achieved. Furthermore, from a political economy perspective, our theoretical analysis of preferences highlights the fact that although less affluent households are the segment of population that should strive more to increase equality of opportunities, they could accept a coalition with the richer segment of population to reduce the overall level of education expenditures. The likelihood of this event is greater in countries where the education premium is strongly related to family ties and/or where the share of population with tertiary education is low and the specific design of the education system is not of an inclusive type. Since these choices are self-reinforcing, they can lock countries into “low education” traps. Indeed, the cluster analysis seems to confirm that the amount of resources devoted to both

levels of education is low in poorly educated societies, which is precisely where more investment in education is needed.

We leave to future research an empirical analysis on the micro and macro level determinants of education policy preferences to test our model predictions.

## Appendix 1

$$\begin{aligned}
 EU_{ij} &= \ln c_{ij} + \gamma \left\{ p \ln [(B_{ij} + B)^\alpha (T_{ij} + T_G)^\alpha]^{\mu_j} + (1 - p) \ln [(B_{ij} + B_G)^\alpha]^{\mu_j} \right\} = \\
 &= \ln c_{ij} + \alpha \gamma \mu_j \ln (B_{ij} + B_G) + \alpha \gamma \mu_j p \ln (T_{ij} + T_G)
 \end{aligned}$$

The utility function is maximised under the family's budget constraint and the non-negativity constraints:

$$\begin{aligned}
 c_{ij} + B_{ij} + T_{ij} &= (1 - \tau)Y_j \\
 B_{ij}, T_{ij}, c_{ij} &\geq 0
 \end{aligned}$$

FOC

$$\frac{\partial EU_{ij}}{\partial B_{ij}} = \frac{-1}{c_{ij}} + \frac{\alpha \gamma \mu_j}{B_{ij} + B_G} \leq 0, \quad (A1)$$

$$B_{ij} \geq 0, \quad \frac{\partial EU_{ij}}{\partial B_{ij}} I_{ij} = 0$$

$$\frac{\partial EU_{ij}}{\partial T_{ij}} = \frac{-1}{c_{ij}} + \frac{\alpha \gamma \mu_j p}{T_{ij} + T_G} \leq 0, \quad (A2)$$

$$T_{ij} \geq 0, \quad \frac{\partial EU_{ij}}{\partial T_{ij}} ET_{ij} = 0$$

If  $B_{ij} > 0$  condition (A1) holds with equality: the marginal utility loss from reduced consumption is equal to the marginal utility gain from increased child's income. If condition (A1) holds as inequality, we have a corner solution in which  $B_{ij} = 0$ . Parent would reduce  $B_{ij}$  because  $B_G$  provides enough education for the child.

Analogously, if  $T_{ij} > 0$  condition (A2) holds with equality: the marginal utility loss from reduced consumption is equal to the marginal utility gain from increased child's income. If condition (A2) holds as inequality, then we have a corner solution in which  $T_{ij} = 0$ . Parent would reduce  $T_{ij}$  because  $T_G$  provides enough education for the child.

In case of an interior solution ( $B_{ij} > 0, T_{ij} > 0$ ), it can easily be shown that

$$B_{ij}^* = g_{ij} [(1 - \tau)Y_j + T_G] - (1 - g_{ij})B_G$$

$$T_{ij}^* = g_{ij}p [(1 - \tau)Y_j + B_G] - (1 - g_{ij}p)T_G$$

$$c_{ij}^* = [1 - g_{ij}(1 + p)][(1 - \tau)Y_j + B_G + T_G].$$

## Appendix 2

To derive preferences for public education, write the indirect utility as a function of Government's choice variables

$$W_{ij}(\tau, B_G, T_G) = \ln c_{ij}^* + \alpha\gamma\mu_j \ln(B_{ij}^* + B_G) + \alpha\gamma\mu_j p \ln(T_{ij}^* + T_G)$$

Given its budget constraint, the Government can choose only two variables. Substituting for  $\tau = \frac{B_G + aT_G}{Y}$  in the optimal solution, gives

$$B_{ij}^* + B_G = g_{ij} \left[ Y_j + \left(1 - \frac{Y_j}{Y}\right) B_G + \left(1 - \frac{aY_j}{Y}\right) T_G \right]$$

$$T_{ij}^* + T_G = g_{ij}p \left[ Y_j + \left(1 - \frac{Y_j}{Y}\right) B_G + \left(1 - \frac{aY_j}{Y}\right) T_G \right]$$

$$c_{ij}^* = [1 - g_{ij}(1 + p)] \left[ Y_j + \left(1 - \frac{Y_j}{Y}\right) B_G + \left(1 - \frac{aY_j}{Y}\right) T_G \right]$$

Therefore,

$$\begin{aligned} W_{ij}(B_G, T_G) &= \ln[1 - g_{ij}(1 - p)] \left[ Y_j + \left(1 - \frac{Y_j}{Y}\right) B_G + \left(1 - \frac{aY_j}{Y}\right) T_G \right] \\ &\quad + \alpha\gamma\mu_j \ln \left\{ g_{ij} \left[ Y_j + \left(1 - \frac{Y_j}{Y}\right) B_G + \left(1 - \frac{aY_j}{Y}\right) T_G \right] \right\} + \\ &\quad + \alpha\gamma\mu_j p \ln \left\{ g_{ij}p \left[ Y_j + \left(1 - \frac{Y_j}{Y}\right) B_G + \left(1 - \frac{aY_j}{Y}\right) T_G \right] \right\} \end{aligned}$$

Simple computations show that

$$\frac{\partial W_{ij}}{\partial B_G} = \left(1 - \frac{Y_j}{Y}\right) (1 + \alpha\gamma\mu_j(1 + p))$$

$$\frac{\partial W_{ij}}{\partial T_G} = \left(1 - \frac{aY_j}{Y}\right) (1 + \alpha\gamma\mu_j(1 + p))$$

Thus, we have three groups of families: poor ( $Y_j < Y$ ), middle-income ( $Y < Y_j < \frac{Y}{a}$ ) and rich ( $Y_j > \frac{Y}{a}$ ).

Poor prefer the maximum level of public expenditures in both basic and tertiary education. To compute these preferred values, note that increasing  $B_G$  and  $T_G$  would imply a corner solution for private expenditures, that is:  $B_{ij}^* = T_{ij}^* = 0$ . In this case,  $c_{ij}^* = (1 - \tau)Y_j = \left(1 - \tau = \frac{B_G + aT_G}{Y}\right)Y_j$  and

$$W_{ij}(B_G, T_G) = \ln c_{ij}^* + \alpha\gamma\mu_j \ln B_G + \alpha\gamma\mu_j p \ln T_G$$

FOC

$$\frac{\partial W_{ij}}{\partial B_G} = \frac{-1}{c_{ij}} \frac{Y_j}{Y} + \frac{\alpha\gamma\mu_j}{B_G}$$

$$\frac{\partial W_{ij}}{\partial T_G} = \frac{-1}{c_{ij}} \frac{aY_j}{Y} + \frac{\alpha\gamma\mu_j p}{T_G}$$

Solving, gives  $B_G = \frac{aT_G}{p} = g_{ij}Y$

Middle-income families prefer  $B_G = 0$  and the maximum level of public expenditures in tertiary education. That is, they prefer to privately provide basic education to their children and have the Government pay for tertiary education. To compute their preferred level of public expenditure in tertiary education, notice that increasing  $T_G$  would imply a corner solution for private expenditures in tertiary education:  $T_{ij}^* = 0$ .

In this case,  $c_{ij}^* = (1 - \tau)Y_j - B_{ij}^*$  and  $B_{ij}^* = g_{ij}[(1 - \tau)Y_j + T_G]$

$$W_{ij}(0, T_G) = \ln c_{ij}^* + \alpha\gamma\mu_j \ln B_{ij}^* + \alpha\gamma\mu_j p \ln T_G$$

Solving the FOC, gives

$$\frac{aT_G}{p} = g_{ij}Y$$

Lastly, rich prefer  $B_G = 0$  and  $T_G = 0$ , because they prefer to privately provide basic and tertiary education to their children. This implies  $\tau = 0$  and an interior solution for the family's utility maximization so that



$$B_{ij}^* = g_{ij} Y_j$$

$$T_{ij}^* = g_{ij} p Y_j$$

$$c_{ij}^* = [1 - g_{ij}(1 + p)] Y_j$$

**[Summary table: about here]**

Country	(1) non-tertiary spending/GDP	(2) tertiary spending/GDP	(3) non-tertiary/students	(4) tertiary spending/students	(5) public spending on tertiary/educ. spending	(6) non-tertiary public spending/students	(7) tertiary public spending/students	(8) 25-64 tertiary pop.	(9) % vocational student - uppersecondary	(10) gini disposable income	(11) age of tracking
AUS	4	1.6	8790	16859	44.9	2467	4730.9	41.9	18.0	0.33	16
AUT	3.1	1.7	-	-	95.3	-	-	29.9	71.0	0.28	10
BEL	4.3	1.4	11007	15503	89.9	7068	9955.0	36.9	57.0	0.27	12
CAN	3.6	2.5	10226	22006	54.9	2246	4832.5	53.6	4.3	0.32	16
CHE	3.5	1.2	-	-	-	-	-	40.2	63.0	-	12
CHL	3.6	2.5	-	-	34.6	-	-		33.0	-	16
CZE	2.8	1.4	6419	10319	79.3	3636	5845.0	21.5	71.0	0.26	11
DEU	3.1	1.2	9843	17157	85.9	7046	12281.6	27.1	35.0	0.29	10
DNK	4.7	1.9	10780	-	-	-	-	35.8	25.0	0.25	16
ESP	3.1	1.2	-	-	73.1	-	-	34.7	21.0	0.34	16
EST	3.2	1.6	-	-	78.2	-	-	37.5	32.0	0.34	15
FIN	3.9	1.8	9353	17863	96.2	4998	9547.0	41.8	49.0	0.26	16
FRA	3.8	1.4	9338	15281	79.8	5322	8710.3		40.0	0.31	16
GBR	4.5	1.8	10056	24338	56.9	3179	7693.6	42.2	34.0	0.35	16
HUN	2.6	1.2	4371	8876	54.4	1982	4023.8	23.4	26.0	0.29	11
IRL	4.4	1.3	-	-	81.8	-	-	41.0	0.0	0.30	15
ISL	4.7	1.2	9333	9377	90.6	7046	7079.6	37.1	18.0	0.26	16
ISR	4.4	1.6	6325	12338	52.4	2072	4040.5	48.5	41.0	0.37	15
ITA	3	0.9	-	-	66	-	-	16.9	59.0	0.33	14
JPN	2.9	1.5	9408	16872	34.3	2151	3858.0	48.2	23.0		15
KOR	3.7	2.3	7934	9866	29.3	1011	1256.9	44.6	18.0	0.31	14
MEX	3.9	1.3	2801	8115	69.7	1502	4351.1	18.6	39.0	0.46	15
NLD	3.8	1.7	10464	19276	70.5	4339	7993.9	34.4	55.0	0.28	12
NOR	4.6	1.6	13611	20016	96.1	8175	12022.4	41.8	47.0	0.25	16
NZL	5	1.9	-	-	52.4	-	-	35.6	13.0	0.33	16
POL	3.4	1.3	-	-	77.6	-	-	27.0	53.0	0.30	16
PRT	4.5	1.3	-	-	54.3	-	-	21.7	39.0	0.34	15

SVK	2.7	1	5231	9022	73.8	3861	6658.5	20.4	68.0	0.25	11
SVN	3.7	1.2	8457	11002	86.1	6068	7893.8	28.6	61.0	0.25	14
SWE	3.7	1.7	10652	22534	89.3	5595	11837.2	38.7	46.0	0.27	16
TUR	3	1.4	2784	7779	80.4	1599	4467.1	16.7	47.0	0.40	11
USA	3.6	2.8	11732	26562	37.8	1584	3585.9	44.2	0.0	0.39	16

Source: OECD.Stat.

Notes: Denmark figures for tertiary spending/GDP are missing in 2012 and have been imputed from 2009-2011 values. The information on the share of technical and vocational enrolment is missing for USA and has been assumed to be virtually zero. The information at the upper-secondary level is missing for Canada and has been assumed to be equal to value reported for the secondary level as a whole. The reference year is 2012 except for (8) - 2013 - and for (11) that is 2009.

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