



Inequality: Causes and Consequences

Inequality of Opportunity in Europe: Is There a Role for Institutions? ^{*}

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INEQUALITY OF OPPORTUNITY IN EUROPE: IS THERE A ROLE FOR INSTITUTIONS? ☆

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ABSTRACT

This paper studies the cross-country differences in conventional measures of inequality of opportunity in Europe in the space of individual disposable incomes. Exploiting two recent waves of the EUSILC database reporting information on family background (2005 and 2011), we provide estimates of inequality of opportunity in about 30 European

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Inequality: Causes and Consequences

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countries for two sufficiently distant data points, allowing a check of consistency for country rankings. In addition, we exploit two observations available for most of the countries to explore the relationship between many institutional dimensions and inequality of opportunity, finding evidence of negative correlation with educational expenditure (especially at the pre-primary level) and passive labour market policies.

Keywords: Inequality; inequality of opportunities; institutions

JEL classifications: D63; E24; J5

1. INTRODUCTION

The literature on inequality of opportunity has significantly expanded in recent years.¹ There are different reasons for embracing the opportunity perspective. The first is that most of those who worry about inequality do so because they think that it is unjust, or at least partially unjust. In addition, existing surveys show that most people judge income inequalities arising from different levels of effort as less objectionable than those due to exogenous circumstances as gender, race, family origin, etc. The implicit idea is that what matters for a just society is the distribution of opportunities, rather than the distribution of outcomes. Hence, it is interesting to measure that portion of outcome inequality that can be attributed to exogenous circumstances and hence reflects unequal opportunities.

In addition to normative reasons, the analysis of opportunity inequality can have an instrumental value. First, social attitudes towards redistributive policies may be affected by the knowledge, or the perception, of the origin of income inequalities (Alesina & La Ferrara, 2005). By recognising that a small (large) amount of existing inequalities is due to unequal opportunities, one may decrease (increase) the support for redistributive policies. Second, opportunity inequality, rather than income inequality, can be related to aggregate economic performance: it has been suggested (Bourguignon, Ferreira, & Walton, 2007; World Bank, 2006) that the existence of strong

1. For comprehensive reviews of the inequality of opportunity literature, see the recent surveys by Ramos and Van de Gaer (2015), Roemer and Trannoy (2015) and Ferreira and Peragine (2015).

and persistent inequalities in the initial opportunities open to individuals can generate true inequality traps that represent severe constraints to perspectives of future growth of an economy, by preventing entire groups from participation into economic and social life.² Finally, the analysis of opportunity inequality may help the understanding of the generation of income inequality, since it constitutes the layer hardest to remove through public intervention. Nevertheless, the knowledge of the factors determining opportunity inequality can help to identify the more deprived groups in a society, thereby revealing new points of emphasis in social and redistributive policies. These considerations are relevant for many countries and for the debate on social protection and social policies in Europe.³

After the theoretical contributions by [Roemer \(1993, 1998\)](#) and [Fleurbaey \(1995, 2008\)](#), a recent and growing literature in the last 15 years has tried to assess the degree of inequality of opportunity in different countries, and to evaluate the opportunity-equalizing effects of public policies. A number of different measurement and evaluation methodologies have been proposed and an even broader array of empirical applications has been undertaken. However, cross-countries comparisons are less frequent in the literature, probably because of data limitations.⁴ [Ferreira and Gignoux \(2011\)](#), by using different data sets, present comparative evidence on inequality of opportunity over six Latin-American countries, showing

2. For an empirical analysis of the relationship between inequality of opportunity and growth in a sample of US states, see [Marrero and Rodríguez \(2013\)](#), they decompose total inequality into inequality of opportunity and inequality of effort, showing that GDP per capita growth rate is negatively correlated with the former and positively with the latter. A similar line of research has been followed by [Ferreira, Lakner, Lugo, and Ozler \(2014\)](#), with a cross-country analysis involving a sample of 84 countries.

3. To further stress the point, it is worth recalling that the OECD is launching a Centre for Opportunity and Equality, "... a new platform for promoting and conducting policy-oriented research on the trends, causes and consequences of inequalities in society and the economy, and a forum to discuss how policies can best address such inequalities." (from the flyer of presentation).

4. Some papers provide regional disaggregation of the opportunity inequality measures ([Checchi and Peragine \(2010\)](#) for Italy, [Marrero and Rodríguez \(2013\)](#) for US states) but the differences are difficult to interpret when confronted with a homogeneous institutional framework at the national level. There is a parallel literature on cross-country comparisons of intergenerational mobility (see for example [Corak \(2013\)](#)) that we leave aside here, because it focuses on a specific set of circumstances (typically parental income and/or education) neglecting the contribution to inequality of all other components. Comparisons of opportunity inequality and intergenerational mobility indices can be found in [Brunori, Ferreira, and Peragine \(2013\)](#).

that race and region of birth are more relevant in explaining opportunity deprivation than in attaining poverty status. Brunori, Palmisano, and Peragine (2015), use a set of surveys to compute measures of inequality of opportunities over 11 Sub-Saharan African countries, showing that ethnicity and region of birth are the most relevant factors in explaining inequality of opportunity in consumption. While in both Ferreira and Gignoux (2011) and Brunori et al. (2015) cross-countries comparability is severely limited by estimates based on country-specific surveys, Checchi, Peragine, and Serlenga (2010) present cross-country evidence on 25 European countries using a harmonised data set (the EUSILC survey conducted in 2005), finding that ex-ante equality of opportunity exhibits positive correlation with public expenditure in education, whereas ex-post equality of opportunity is also positively associated to union presence and fiscal redistribution. Marrero and Rodríguez (2012) analyse the same data set, showing that opportunity inequality in household equivalised incomes is negatively correlated with development (proxied by GDP per capita), and positively correlated with long-term unemployment and early school leaving, all measured at 1998 values.⁵ Despite using different definitions for the outcome variable,⁶ both papers agree on the fact that Nordic countries and Slovenia are characterised by low inequality of opportunity, while Mediterranean countries (Italy, Greece, Spain and Portugal), Anglo-Saxons (Great Britain and Ireland) and poorer Eastern EU (Estonia, Latvia, Poland, and Lithuania) are among the countries with highest inequality of opportunity.

Our contribution to the literature is mainly empirical. With respect to previous literature we propose a more careful modelling strategy to account for employment opportunities, by including the potential incomes of those who are unemployed (computed according to a selection equation à la Heckman) and focus on individual disposable incomes. In addition, we show that measures of opportunity inequality are more persistent (namely,

5. Marrero and Rodríguez (2012) consider as circumstances parental education and occupation (separately taken for each parent), family economic conditions when young and country of origin; conversely they do not take into account gender and age as additional categories for defining *types*.

6. Marrero and Rodríguez (2012) use disposable equivalent income for those households whose head is between 26 and 50 (though it is not mentioned how they estimate net from gross incomes when the former is not available). Checchi et al. (2010) use post-tax individual earnings (including imputed incomes for unemployed) for individuals aged between 30 and 60, grossifying net incomes based on fiscal legislation that was in order in the previous year.

less cyclical) than measures of total inequality, at least in our sample of European countries. The standard country ranking based on total inequality, where Nordic countries are lowest and Mediterranean and Anglo-Saxons are highest, is only partially confirmed when considering opportunity inequality. Finally, when we correlate total inequality and opportunity inequality to institutions, exploiting the availability of two data points per country, we find significant correlations with educational variables (expenditure in education, especially in pre-primary education) and labour market policies variables (passive labour market policies). An appendix shows the robustness of our findings when we change inequality measures (from Gini index to Mean Log Deviation) as well as definition of opportunity inequality, moving from an ex-ante perspective (which is the one adopted throughout the present paper) to the ex-post one.

This paper is organised as follows. Section 2 briefly reviews the concept of opportunity inequality and discusses some measurement issues. Section 3 describes the data and provides our estimates of total inequality and inequality of opportunity for the periods and countries considered. Section 4 correlates total inequality and opportunity inequality to institutional measures, proposing alternative estimation strategy to check the robustness of our results. Section 5 concludes by discussing the policy implications of our findings and suggesting directions for future research.

2. MEASURING OPPORTUNITY INEQUALITY: A SIMPLE MODEL

Consider a distribution of income x in a given population. Suppose that all determinants of x , including the different forms of luck, can be classified into either a set of *circumstances* C that lie beyond individual control, or as responsibility characteristics, summarised by a variable⁷ e , denoting *effort*. Circumstances belong to a finite set Ω . For example, suppose that the only circumstance variables are race, which can only take values in the set {black, white}, and parental education, that only takes values in the set {college education, high school education}. In this case the set Ω would be the following: $\Omega = (\{\text{black, parents with high school education}\}, \{\text{black,$

7. Effort could also be treated as a vector. However, we follow the literature and treat it as a scalar.

parents with college education}, {white, parents with high school education}, {white, parents with college education}).

Effort may be treated as either a continuous or a discrete variable belonging to the set Θ . The outcome of interest is generated by a function $g : \Omega \times \Theta \rightarrow R$ such that:

$$x = g(C, e) \quad (1)$$

This can be seen as a reduced-form model in which incomes are exclusively determined by circumstances and effort, such that all individuals having the same circumstances and the same effort obtain the same income. Neither opportunities themselves, nor the process by which some particular outcomes are chosen, are explicitly modelled in this framework. The idea is to infer the opportunities available to individuals by observing joint distributions of circumstances, effort and outcomes. Roughly speaking, the source of unfairness in this model is given by the effect that circumstance variables (which lie beyond individual responsibility) have on individual outcomes.

Thus, we have a population of individuals, each of whom is fully characterised by the triple (x, C, e) . For simplicity, treat effort e , as well as each element of the vector of circumstances, C , as discrete variables. Then this population can be partitioned in two ways: into types T_i , within which all individuals share the same circumstances, and into tranches T_j , within which everyone shares the same degree of effort. Denote by x_{ij} the income generated by circumstances C_i and effort e_j . Suppose in addition that there are n types, indexed by $i = 1, \dots, n$, and m tranches, indexed by $j = 1, \dots, m$. In this discrete setting,⁸ the population can be represented by a matrix $[\mathbf{X}_{ij}]$ with n rows, corresponding to types, and m columns, corresponding to tranches:

To the $n \times m$ -dimensional matrix $[\mathbf{X}_{ij}]$ in Table 1, let there be associated an $n \times m$ dimensional matrix $[\mathbf{P}_{ij}]$ where each element p_{ij} represents the proportion of total population with circumstances C_i and effort e_j .

Given this model, the measurement of inequality of opportunity can be thought of as a two-step procedure: first, the actual distribution $[\mathbf{X}_{ij}]$ is transformed into a counterfactual distribution $[\hat{\mathbf{X}}_{ij}]$ that reflects only and fully the unfair inequality in $[\mathbf{X}_{ij}]$, while all the fair inequality is removed. In the second step, a measure of inequality is applied to $[\hat{\mathbf{X}}_{ij}]$. The construction of the counterfactual distribution $[\hat{\mathbf{X}}_{ij}]$ should reflect the principle of *equality of opportunity*.

8. In an alternative formulation, that would treat effort as a continuous variable, $F_i(x)$ would denote the advantage distribution in type i and q_i denote its population share. The overall distribution for the population as a whole would be $F(x) = \sum_{i=1}^n q_i F_i(x)$.

Table 1. Distribution of Outcomes according to Circumstances and Effort.

	e_1	e_2	e_3	...	e_m
C_1	x_{11}	x_{12}	x_{13}	...	x_{1m}
C_2	x_{21}	x_{22}	x_{23}	...	x_{2m}
C_3	x_{31}	x_{32}	x_{33}	...	x_{3m}
\vdots	\vdots	\vdots	\vdots	\vdots	\vdots
C_n	x_{n1}	x_{n2}	x_{n3}	...	x_{nm}

Within this framework, the opportunity egalitarian principle can be decomposed into two distinct and independent sub-principles: the *Reward Principle*, which is concerned with the apportion of outcome to effort and, in some of its formulations, requires to respect the outcome inequalities due to effort,⁹ and the *Compensation Principle*, according to which all outcome inequalities due to C are unfair and should be compensated by society. Any satisfactory measure of opportunity inequality should respect both the compensation and the reward principles. The existing literature has developed two main versions of the compensation principle and two consequent approaches to the measurement of opportunity inequality, namely, the *ex-ante* and the *ex-post* approach.

According to the *ex-ante approach*, there is equality of opportunity if the set of opportunities is the same for all individuals, regardless of their circumstances. Hence, in the *ex-ante* version, the compensation principle is formulated with respect to individual opportunity sets: it requires reducing the inequality between opportunity sets. In the model introduced above, a given row i , that is the income distribution of a given type, is interpreted as the opportunity set of all individuals with circumstances C_i . Hence, the focus is on the rows of the matrix above: the counterfactual distribution should eliminate the inequality within the rows (*reward*) and reflect the inequality between the rows (*ex-ante compensation*).

9. See Ferreira and Peragine (2015) for a discussion of the different formulations of the reward principle proposed in the literature. One of such formulations, *Utilitarian Reward*, states that society should express full neutrality with respect to inequalities due to effort; since in the *ex-ante* approach the income distribution of types is interpreted as the opportunity set of individuals in that type, it follows that, according to Utilitarian Reward, the social evaluation of the opportunity set is based on the means of the type distribution.

On the other side, according to the *ex-post approach*, there is equality of opportunity if and only if all those who exert the same effort end up with the same outcome. The compensation principle, in the ex-post version, is thus defined with respect to individuals with the same effort but different outcomes: it requires reducing income inequality among the individuals with the same effort. This means that opportunity inequality within this approach is measured as inequality within the columns of the matrix. Hence, the corresponding counterfactual distribution should reflect the inequality within the columns (*ex-post compensation*) but should eliminate the inequality between the columns (*reward*).

Different measures, which are either consistent with the ex-ante or the ex-post approaches, have been proposed in the literature (see Ferreira & Peragine, 2015; Ramos & Van de Gaer, 2015): they express different and sometimes conflicting views on equality of opportunity and in fact the rankings they generate may be different.¹⁰ In addition, their informational requirements are quite different: while for the ex-ante approach, one needs to observe the individual outcome and the set of circumstances, for the ex-post approach, a measure of individual effort is required. Therefore, in addition to normative considerations, the choice of the methodology to adopt should reflect also the data availability. In our case, as will be discussed in the next section, the database we use does not contain a satisfactory measure of effort: for this reason in the rest of this paper, we focus on the ex-ante approach.¹¹

In particular, the measure we use, *Between-Types Inequality*, was variously proposed by Peragine (2002), Checchi and Peragine (2010) and Ferreira and Gignoux (2011). It relies on a counterfactual distribution $[\tilde{\mathbf{X}}_{BT}]$, which is obtained by replacing each individual income x_{ij} by the average income of the type she belongs to (μ_i), abstracting from individual level of effort.¹² This smoothing transformation is intended to remove all inequality within types. Formally (Table 2):

10. See Fleurbaey and Peragine (2013) for a discussion of the clash between ex-ante and ex-post equality of opportunity.

11. However, in the appendix we also provide estimates of inequality of opportunity based on an ex-post approach: for this computation, we adopt Roemer's statistical measure of effort, according to which the individual effort is identified as the rank of individual within the relevant type income distribution.

12. Hence, the between-types measure satisfies *ex-ante compensation* and *utilitarian reward*. See Ferreira and Peragine (2015).

Between-types counterfactual distribution is

$$[\tilde{\mathbf{X}}_{\text{BT}}] : \forall j \in \{1, \dots, m\}, \forall i \in \{1, \dots, n\}, \tilde{x}_{ij} = \mu_i = \frac{\sum_{j=1}^m P_{ij} x_{ij}}{\sum_{j=1}^m P_{ij}}$$

Table 2. Measuring between-Types Inequality ($n = m = 3$).

	e_1	e_2	e_3
C_1	μ_1	μ_1	μ_1
C_2	μ_2	μ_2	μ_2
C_3	μ_3	μ_3	μ_3

Once the smoothed distribution $[\tilde{\mathbf{X}}_{\text{BT}}]$ is obtained, any inequality measure I applied to such distribution, $I(\tilde{\mathbf{X}}_{\text{BT}})$ is to be interpreted as a measure of inequality of opportunity. Following [Aaberge, Mogstad, and Peragine \(2011\)](#), in this paper we use the Gini coefficient.¹³

3. THE EMPIRICAL ANALYSIS: INCOME INEQUALITY AND OPPORTUNITY INEQUALITY IN EUROPE

3.1. Data Description

To obtain information on circumstances and incomes in representative samples of the population, we use data from the 2005 and 2011 waves of the European Survey on Income and Living Conditions (EUSILC), which is annually run by national Central Statistics Offices and collects information on the income and living conditions of different household types. The survey contains information on a large number of individual and household characteristics as well as specific information on poverty and social exclusion. The present study has been made possible by the inclusion in

13. In the Appendix, following [Checchi and Peragine \(2010\)](#), we also compute the mean logarithmic deviation, which is an additively decomposable inequality index ([Theil, 1979a, 1979b](#)) and therefore allows obtaining an exact decomposition of overall inequality (I) into two terms: the between-types inequality (I_{BT}), to be interpreted as inequality of opportunity, and the within-types inequality (I_{WT}), interpreted as inequality due to effort.

both 2005 and 2011 of specific modules providing information for attributes of each respondent's parents during her childhood period when aged 14–16. These additional modules report information on family composition, number of siblings, the educational attainment, occupation as well as the labour market activity status of respondent's mother and father and the presence of financial problems in the household. The 2005 survey includes 26 countries, while the 2011 survey consists of 31 countries.¹⁴ The main advantage of these surveys is the relatively large number of countries which allow the cross-country comparative analysis of inequalities.

In order to study the role of circumstances in determining individual destiny, we study *individual incomes and labour market positions*, instead of equivalised household incomes used by other authors (Marrero & Rodríguez, 2012). There are two reasons for this choice: on one side, family members experience different sets of circumstances (they have different gender, age, sometimes country of origin), and averaging among members attenuates the impact of individual circumstances; on the other side, mating, family formation and fertility are individual choices that may reflect effort, which we do want to keep separate from circumstances.

To account for cross-country differences in labour market transition, we restrict the sample to individuals aged between 30 and 60 who are either working full or part-time, unemployed or fulfilling domestic tasks and care responsibilities. Our outcome variable is the *disposable income*.¹⁵ In

14. The 2005 sample consists of Austria (AT), Belgium (BE), Cyprus (CY), Czech Republic (CZ), Germany (DE), Denmark (DK), Estonia (EE), Greece (EL), Spain (ES), Finland (FI), France (FR), Hungary (HU), Ireland (IE), Iceland (IS), Italy (IT), Lithuania (LT), Luxemburg (LU), Latvia (LV), Netherlands (NL), Norway (NO), Poland (PL), Portugal (PT), Sweden (SE), Slovenia (SI), Slovakia (SK) and Great Britain (UK). In the 2011, Bulgaria (BG), Switzerland (CH), Croatia (HR), Malta (MT) and Romania (RO) are added to the previous list, counting 31 countries in total. We have retained the additional countries available for 2011 because they do not bias the analysis of temporal variation (where they are excluded by construction) but improve the estimate precision when considering the correlation with institutions.

15. The *net individual income* definition includes "(net) employee cash or near cash income" (variable PYN010) plus "(net) cash benefits or losses from self-employment" (variable PYN050 – negative values set equal to zero) plus "(net) non-cash employee income" (this variable not available for all countries – variable PYN020). Capital incomes are excluded because they are only measured at household level, and it would be arbitrary to attribute them to household members. The *disposable income* definition adds "(net) unemployment benefits" (variable PYN090), "(net) survivor benefits" (variable PYN110), "(net) sickness benefits" (variable PYN120), "(net) disability benefits" (variable PYN130) and "(net) education-related allowances" (variable PYN140). The appendix describes the procedure utilised to pass from net to gross incomes (or vice versa) when one of the two definitions was absent in the original files.

addition, being aware of the fact that welfare indicators estimated from micro-data can be very sensitive to the presence of extreme incomes (Cowell & Victoria-Feser, 1996a, 1996b, 2002), we censored the countries' income distributions by dropping the highest percentile.¹⁶

3.2. Circumstances

We consider gender, age, country of origin and family background as circumstances affecting individual incomes irrespective of individual responsibility. Gender is often neglected as circumstance, probably because other authors restrict their analysis to household heads, who are typically men. However, being woman implies a disadvantage in the labour market independently of the responsibility of the individual. Similarly, in the case of age, young people lack experience, but have greater potential, whereas on average old people are characterised by the opposite condition. Since ageing is again out of individual responsibility, we consider five-year age groups.¹⁷ Nationality identifies as native those who declare the country of birth being the same of the country of residence. The family background offers a large set of possible information, regarding education and occupation of fathers and mothers, as well as subjective perception of the family financial conditions of the interviewees when they were young. In order to maintain a minimal sample size for each definition of type, we restrict to parental education as measured by the highest educational attainment in the parent couple.¹⁸

Consequently, the set of circumstances identifies 96 types, as a result of 2 genders \times 2 origins \times 6 age groups \times 4 parental education

16. Van Kerm (2007) discusses how ordinal comparisons of countries are found to be robust to variants of data adjustment procedures such as trimming and winsorizing.

17. Given two surveys, which are six-year distant one from the other, we can potentially distinguish between age groups (being 30- to 35-year old) from birth cohorts (being born between 1980 and 1985). In a previous version of the paper, we replicated the analysis of correlation with institutions treating the two cross-sections as pseudo-panels, controlling for cohort effects. This has the advantage of increasing the degrees of freedom (and therefore the precision of the estimates), however, at the cost of arbitrariness in matching individual with institutional measures. Since the results were not significantly different from what presented in the next section, we have not reported them. Available from the authors.

18. The choice between parental education and parental occupation is driven by the fact that the former is statistically more relevant in affecting children incomes than the latter, given the intergenerational persistence in educational attainments. See Table A3.

categories.¹⁹ It is important to note that the empirical estimates of “between-types” inequality of opportunity are to be interpreted as lower-bound estimates. A formal proof of the lower-bound result is contained in Ferreira and Gignoux (2011), but the intuition is straightforward: the set of circumstances, which is observed empirically and used for partitioning the population into types, is a strict subset of the set of all circumstance variables that matter in reality. The existence of unobserved circumstances guarantees that these estimates of opportunity inequality could only be higher if more circumstance variables were observed.²⁰ Table A2 shows reports summary statistics of both individual and parental characteristics.

3.3. *Labour Market Participation*

Standard analysis of income inequality abstracts from the problem of different pattern of labour market participation by referring to mean (or equivalised) household incomes, thus implicitly assuming income redistribution within the household. This solution is unsatisfactory for the problem of measuring inequality of opportunity at individual level, since part of the effect of circumstances on incomes works through labour market participation. We have considered possible alternatives to cope with this problem: including anyone out of the labour market with zero as income; replacing missing incomes with the mean of each type (corresponding to reweighting of population groups with positive incomes to account for individuals out of the labour market). All strategies avoid the explicit modelling of the selection into remunerated occupations, and for this reason, we preferred to follow an approach à la Heckman. We have estimated a selection equation into employment using parental occupation and marital status as exclusion restrictions, and an income generating process based on circumstances and own educational attainment, country by country. In our view, this represents a closer approximation to the notion of permanent

19. With respect to parental education, group 1 refers to individuals whose parents have at best achieved low levels (pre-primary, primary or lower secondary education), group 2 corresponds to individuals who have at least one of the parents with intermediate levels of education (upper secondary education and post-secondary non-tertiary education), group 3 are individuals with at least one of parent with college degrees (first or second stage of tertiary education) and group 4 includes all cases with missing information on parental information (which constitute a large fraction, especially in the samples of Nordic countries).

20. The distance between upper and lower bounds is analysed by Niehues and Peichl (2011).

income than other alternatives. In Table A3, we report pooled regressions, estimated separately for each survey, in order to get an idea of (average) magnitude and significance of the coefficients. Therefore, we account for the existence of unemployed *imputing to all individuals with zero income their expected income (namely, the conditional income corrected by the probability of self-selection into employment)*.

3.4. Income and Opportunity Inequality Rankings in Europe

Given this data set, we have computed alternative measures of income inequality. Starting with the estimates of overall income inequalities, we notice that the ranking based on Gini index from our data is quite consistent with the ranking provided by OECD and Eurostat (see the data in Table A4): the Spearman rank correlation between our inequality measure (Gini) and the one calculated by OECD is 0.70 in 2005 and 0.66 in 2011, and a bit lower when compared to Eurostat. This is considerable when recalling that OECD and Eurostat are based on household equivalised incomes, while we are using personal incomes (excluding unemployed for comparability reasons). The rank correlation drastically declines if we use an alternative inequality measure given by the Mean Log Deviation (MLD – see Table 3). This is not surprising, since the MLD put more weight in the calculation on low incomes, while the Gini weights more the bulk of the distribution. For this reason, in the sequel we will discuss our results in terms of Gini indices, while relegating the MLD ones in the appendix.

By looking at Fig. 1, we get a comprehensive view of country differences in terms of disposable income inequality. There is a group of “low inequality” countries, which includes Nordic countries (Sweden, Norway and Denmark) and continental countries (Netherlands and Belgium). There is a second group of “high inequality” countries, gathering market economies (Great Britain, Ireland, as well as Switzerland and Luxemburg) and Baltic countries (Latvia, Lithuania, Estonia plus Poland). A residual third group includes the Mediterranean countries (Italy, Greece, Portugal and Spain) and the central European ones.²¹

21. A particular case is represented by Germany, which registers an unusual high level of income inequality in 2005. Looking at the density distribution (see Fig. A1) it shows a large fraction of low incomes, which could represent the initial effect of flexibilisation introduced by the Hertz reform at the beginning of the initial decade (also known as “one-euro jobs”).

Table 3. Spearman's Rank Correlation between Alternative Inequality Measures.

	Gini Disposable Incomes (OECD)	Gini Disposable Incomes (Eurostat)	Gini Disposable Incomes (Our Sample)	MLD Disposable Incomes (Our Sample)
<i>2005</i>				
Gini household equivalent disposable incomes (OECD)	1.000			
Gini household equivalent disposable incomes (Eurostat)	0.898***	1.000		
Gini individual disposable incomes (our sample)	0.701***	0.537***	1.000	
MLD individual disposable incomes (our sample)	0.294	0.076	0.708***	1.000
<i>2011</i>				
Gini household equivalent disposable incomes (OECD)	1.000			
Gini household equivalent disposable incomes (Eurostat)	0.891***	1.000		
Gini individual disposable incomes (our sample)	0.660***	0.661***	1.000	
MLD individual disposable incomes (our sample)	0.346	0.426**	0.707***	1.000

Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Our choice of considering also the unemployed and those who are out of the labour market with their potential income has an impact in measuring inequality, which varies according to labour market participation in the country. In Fig. 1 we compare the inequality indices computed excluding (horizontal axis) and including these individuals (vertical axis). The vertical distance from the 45° line measures the extent of correction, which in some cases (Greece, Poland and Romania) is significant. In our view, this reinforces the need of accounting for this fraction of population, who are temporarily (or permanently) out of the labour market, also due to circumstances. For this reason, in the sequel of the paper, we rely on inequality measures that include these individuals.

3.5. Measuring Inequality of Opportunities

We move now to the calculation of inequality of opportunity. As illustrated in Section 2, we have replaced individual incomes for each type with their

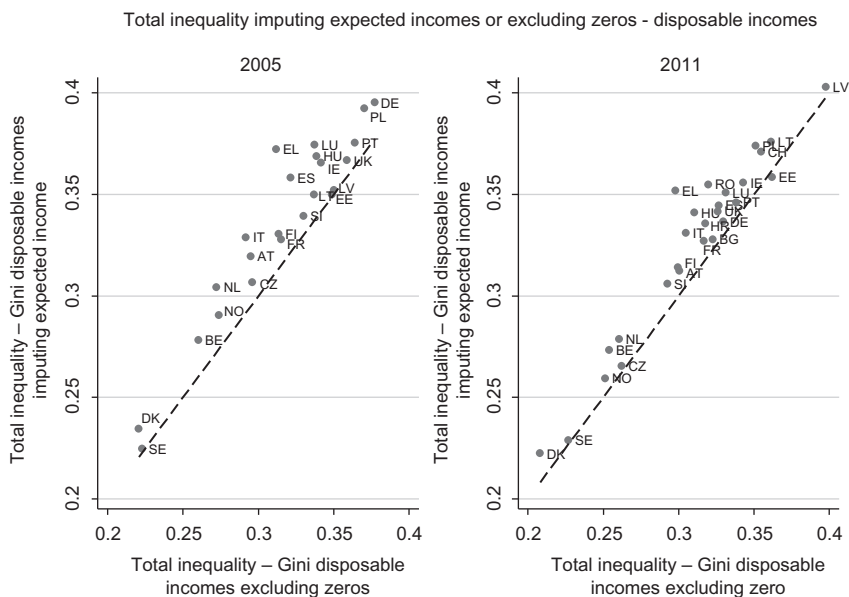


Fig. 1. Total Inequality in Disposable Incomes – EUSILC 2005 and 2011.

means and we have computed the inequality over this counterfactual distribution. This is the inequality that we would observe if all differences in effort were cancelled: this inequality is totally unfair being attributable to circumstances out of individual responsibility (between-group inequality).²²

The ex-ante inequality of opportunity is reported in Table 4 and shown in Fig. 2 (sorting countries according to the mean of the index over the two surveys). It accounts for a large fraction of total inequality: on average it is beyond two fifths of total inequality.²³ What is more interesting is that country ranking is not necessarily identical to the one obtained with total inequality. Rich countries (Switzerland and Luxemburg) rank highest in terms of inequality of opportunities, but also Greece and Great Britain are

22. If we predict individual income using dummies associated to types, the parametric and the non-parametric methods provide identical results. Results do not necessarily coincide in the ex-post approach.

23. Table A5 provides the same measure using the mean log deviation, computed according to both the ex-ante and the ex-post approaches. The fraction of inequality of opportunity on total inequality is on average 0.15 in the ex-ante and 0.20 in the ex-post approach.

Table 4. Total Inequality and Inequality of Opportunities – EUSILC – Disposable Incomes, Imputing Expected Incomes to Zero Incomes, Estimated at Country Level Correcting for Self-Selection.

	Total Inequality – Gini		Opportunity Inequality – Gini		Opportunity Inequality Ratio – Gini	
	2005	2011	2005	2011	2005	2011
Austria	0.319 (0.0028)	0.312 (0.0029)	0.167 (0.0011)	0.154 (0.0010)	0.524	0.494
Belgium	0.278 (0.0028)	0.273 (0.0028)	0.143 (0.0012)	0.134 (0.0012)	0.514	0.491
Bulgaria	na	0.328 (0.0027)	na	0.132 (0.0010)	na	0.402
Switzerland	na	0.371 (0.0031)	na	0.218 (0.0010)	na	0.588
Czech Republic	0.307 (0.0037)	0.265 (0.0021)	0.126 (0.0015)	0.123 (0.0008)	0.41	0.464
Germany	0.395 (0.0022)	0.336 (0.0019)	0.212 (0.0005)	0.18 (0.0006)	0.537	0.536
Denmark	0.234 (0.0023)	0.222 (0.0025)	0.089 (0.0007)	0.073 (0.0008)	0.38	0.329
Estonia	0.35 (0.0032)	0.358 (0.0032)	0.137 (0.0013)	0.129 (0.0011)	0.391	0.36
Greece	0.372 (0.0026)	0.352 (0.0027)	0.19 (0.0013)	0.169 (0.0014)	0.511	0.48
Spain	0.358 (0.0016)	0.344 (0.0017)	0.168 (0.0007)	0.124 (0.0007)	0.469	0.36
Finland	0.33 (0.0021)	0.314 (0.0025)	0.102 (0.0006)	0.096 (0.0008)	0.309	0.306
France	0.328 (0.0021)	0.327 (0.0022)	0.138 (0.0009)	0.129 (0.0008)	0.421	0.394
Croatia	na	0.336 (0.0025)	na	0.125 (0.0011)	na	0.372
Hungary	0.369 (0.0024)	0.341 (0.0022)	0.146 (0.0011)	0.133 (0.0008)	0.396	0.39
Ireland	0.365 (0.0026)	0.356 (0.0031)	0.17 (0.0012)	0.132 (0.0014)	0.466	0.371
Italy	0.329 (0.0014)	0.331 (0.0015)	0.154 (0.0006)	0.143 (0.0005)	0.468	0.432
Lithuania	0.35 (0.0032)	0.376 (0.0028)	0.117 (0.0012)	0.092 (0.0012)	0.334	0.245
Luxembourg	0.374 (0.0033)	0.351 (0.0026)	0.211 (0.0019)	0.197 (0.0014)	0.564	0.561
Latvia	0.352 (0.0036)	0.403 (0.0032)	0.134 (0.0015)	0.119 (0.0010)	0.381	0.295

Table 4. (Continued)

	Total Inequality – Gini		Opportunity Inequality – Gini		Opportunity Inequality Ratio – Gini	
	2005	2011	2005	2011	2005	2011
Netherlands	0.304 (0.0024)	0.279 (0.0020)	0.182 (0.0007)	0.148 (0.0005)	0.599	0.53
Norway	0.290 (0.0029)	0.259 (0.0031)	0.131 (0.0007)	0.112 (0.0010)	0.452	0.432
Poland	0.392 (0.0015)	0.374 (0.0018)	0.146 (0.0009)	0.142 (0.0008)	0.372	0.38
Portugal	0.375 (0.0034)	0.346 (0.0032)	0.142 (0.0020)	0.1 (0.0017)	0.379	0.289
Romania	na	0.355 (0.0027)	na	0.153 (0.0014)	na	0.431
Sweden	0.224 (0.0025)	0.229 (0.0022)	0.098 (0.001)	0.092 (0.001)	0.438	0.402
Slovenia	0.339 (0.0024)	0.306 (0.0018)	0.102 (0.0012)	0.086 (0.0008)	0.301	0.281
Great Britain	0.367 (0.0022)	0.341 (0.0028)	0.155 (0.0008)	0.165 (0.001)	0.422	0.484

Values in brackets report estimates of the standard errors computed via bootstrapping (400 replications).

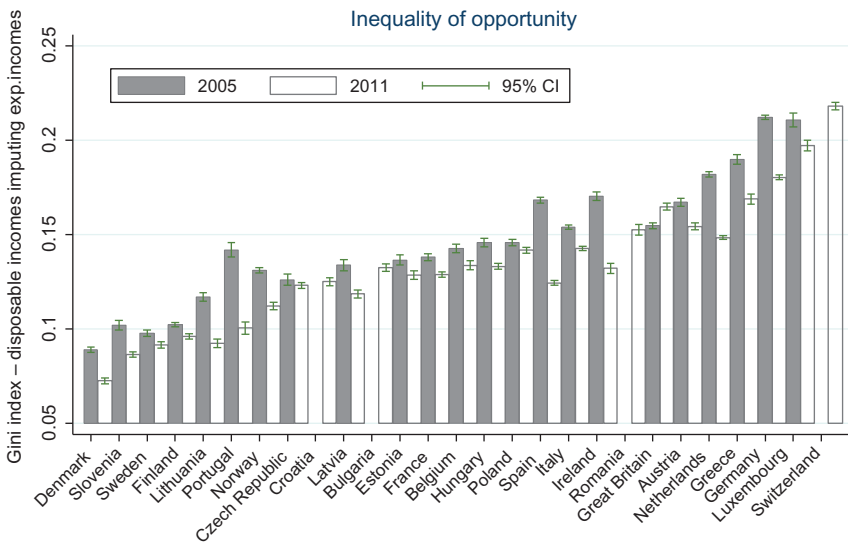


Fig. 2. Inequality of Opportunity – EUSILC 2005 and 2011.

in the group of high opportunity inequality countries. At the other extreme, the Nordic (and now the Baltic) countries rank low. The continental European countries (in particular Italy, France and Spain) are in an intermediate position, with Germany and Netherlands recording high measures of inequality of opportunity.

The relationship between total inequality and inequality of opportunity can be better analysed with the help of Fig. 3. Despite the underlying level of total inequality, some countries seem characterised by a smaller fraction of inequality of opportunity (countries significantly below the regression lines are Slovenia, Lithuania and Finland), whereas other countries score worse in terms of the same index (apart from Switzerland and Luxemburg, countries constantly above the regression line are Germany, Netherlands and Greece). In general, countries with higher income inequality are also characterised by a higher level (portion) of inequality of opportunity. This finding could be interpreted as a generalisation of the so-called “Great Gatsby” curve (Corak, 2013), showing a negative relationship between income inequality and social mobility.

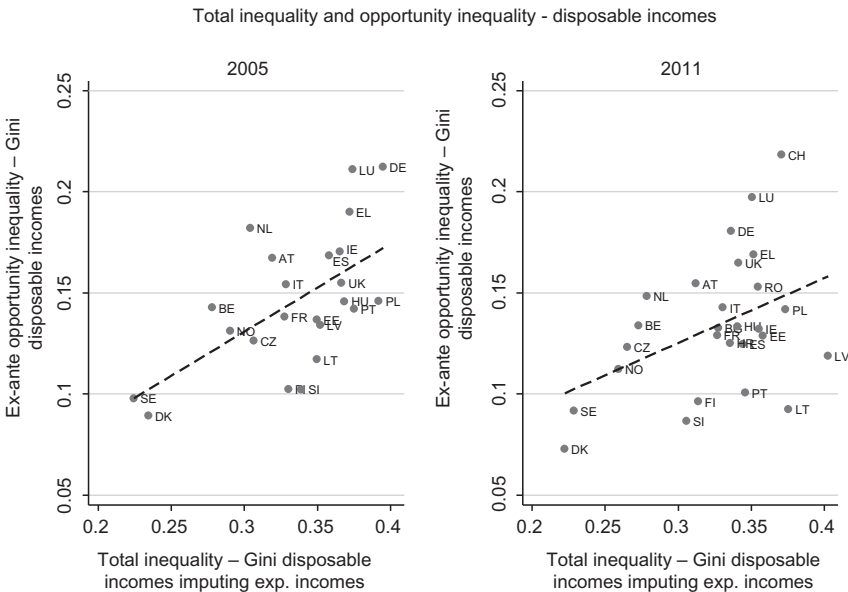


Fig. 3. Total and Opportunity Inequality – EUSILC 2005 and 2011.

We finally compare the changes over time of our inequality measures in Fig. 4. The 2005 survey (recording information on 2004 incomes) reflects a period of substantial growth, while the 2011 survey (data referred to 2010 incomes) is significantly affected by the consequences of the financial crisis. We notice that total inequality exhibits larger cyclical fluctuations when compared to inequality of opportunity, with a general trend to declining values (due to income compressions generated by the crisis). It is also interesting to notice that in few countries the inequality of opportunity remain almost stable over the time interval (Czech Republic, Poland and Hungary, but also Finland and Slovenia at a lesser extent). This may suggest that inequality of opportunity measures capture underlying mechanisms of income generation, which are deeply rooted in the country social systems.

4. THE EMPIRICAL ANALYSIS: INEQUALITY OF OPPORTUNITY AND INSTITUTIONS

There is a wide literature that aims at classifying countries according to the ways in which markets and institutions operate, and the extent of state intervention (think of the “variety of capitalism” literature, distinguishing

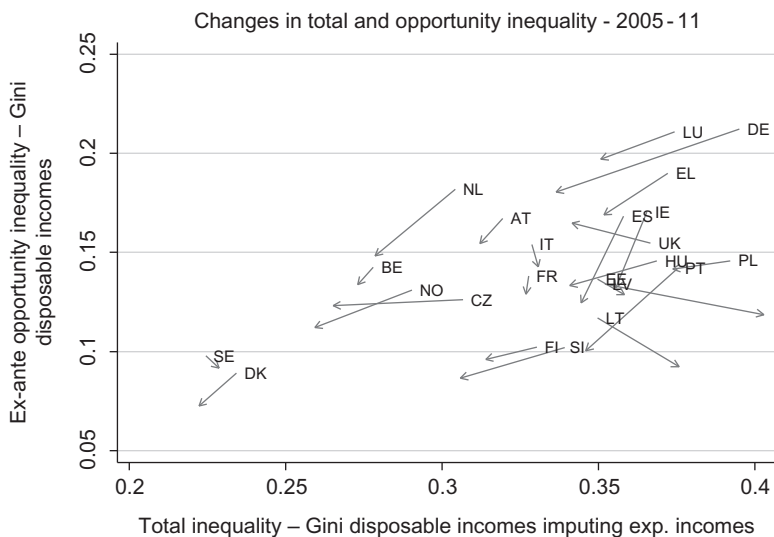


Fig. 4. Changes of Inequality Measures – EUSILC 2005–2011.

between coordinated market economies and liberal market economies – Hall & Soskice, 2001). In our case, we are interested in channels through which circumstances affect the generation of income. There are large arrays of channels through which this may operate: educational attainments, family networking, gender/age/ethnic group discrimination, to quote the most evident ones.²⁴ Different countries have different institutions regulating these dimensions, with different degree of effectiveness. We ask ourselves whether there is any correlation between institutional framework and observed variations (cross-country and over-time) in inequality attributable to circumstances.

In this section, we analyse the potential association between institutional characteristics and opportunity inequality. Since total inequality (and especially inequality of opportunity) are persistent variables, and institutional variables are in many cases even more persistent, it is impossible to provide a clear-cut analysis of causal impacts. Past level of inequality may have affected the access to education, which in turn may shape current level of inequality via the effect of parental education: reverse causation represents a clear issue in our case, and therefore we cannot go beyond simple correlation analysis. However, the availability of two observations for most of the countries allows us to increase the precision of our estimates, since country effects (either fixed or random) control for omitted variables. Let us finally recall that institutions come in clusters (namely, they tend to be collinear) and therefore it is often difficult to isolate the contribution of one specific feature keeping other institutions constant (especially when we can rely on two data points per country only).

Institutional measures are themselves problematic, for they are mostly derived from categorical variables that describe procedures (presence/absence of a provision, alternatives available, and stages to be accomplished) and do not measure their effectiveness. However, we may (partially) account for this by resorting to proxy variables, obtained from observed behaviour of people acting under a given institution. To provide an example, we know that for historical and/or cultural reasons, countries differ in childcare availability. Counting the number of available kindergartens would be a possible candidate for this institutional feature, but data are difficult to collect on a comparable cross-country basis. Resorting to the fraction of children attending kindergarten

24. See the classification proposed by Dardanoni, Fields, Roemer, and Sánchez Puerta (2006).

constitutes a reasonable alternative, which is much simpler to be collected from international/national statistical offices. As with most of institutional measures, this variable is potentially endogenous, since we ignore whether children do not attend kindergartens because they are not available, because their mothers prefer housewifery and/or because most of the population still live in enlarged families (where grandparents take care of nursing). Nevertheless, the literature suggests that early schooling may contribute to reducing the role of parental background in competence formation (e.g. Cunha & Heckman, 2007; Heckman, Krueger, & Friedman, 2002). Therefore, other things constant we expect that countries where children attend kindergarten more be also characterised by lower inequality of opportunity, since income differences generated by circumstances should be lower. In the same vein, we know that the stratification of the educational system may reinforce the impact of parental education, since low-educated parents may prevent their kids from aspiring to more academic-oriented careers (see, e.g. Brunello & Checchi, 2007; Hanushek & Wößmann, 2006). The quality of education may also play a role, since it may compensate the disadvantage of students coming from poor environment. Unfortunately, data on school quality are not easily available (unless one is ready to consider students achievements as a proxy for “revealed” quality). More modestly, we have considered the student/teacher ratio as proxy for quality of education. We have put our best effort to collect information on educational features that were available for the largest set of countries in our sample. In order to minimise the endogeneity risk, we take the institutional measures averaged over the previous five years (2000–2004 for individuals surveyed in 2005 and 2006–2010 for individuals surveyed in 2011). Descriptive statistics are reported in Table 5, while data sources are in Table A6.

When we consider labour market institutions, we expect that wage compressing institutions may reduce within-group variance in earnings (and therefore incomes), with limited impact on between-group inequality. Here, data availability, especially for new entrants in the EU, is limited (since some of them do not belong to OECD, which is our main source of information). We consider here the traditional measures of the degree of institutionalisation: the presence of unions (proxied by union membership over dependent employment, the degree of bargaining coverage, the degree of bargaining centralisation), the degree of employment protection, the presence of minimum wages (relative to mean wages), the unemployment benefit and the tax wedge (which are often correlated, since the latter

Table 5. Descriptive Statistics – 2000–2004 and 2006–2010.

Variable	Obs	Countries	Mean	Std. Dev.	Min	Max
<i>Inequality measures</i>						
Total inequality (Gini) – disposable incomes (excluding richest 1% – imputing expected income to unemployed)	49	26	32.959	4.539	22.222	40.285
Ex-ante inequality of opportunities (Gini) – disposable incomes (excluding richest 1% – imputing expected income)	49	26	13.951	3.421	7.260	21.822
<i>Educational institutions</i>						
Expenditure per student, primary (% of GDP per capita)	55	28	20.529	4.662	10.963	31.072
Expenditure per student, secondary (% of GDP per capita)	56	29	25.603	5.411	14.144	38.640
Expenditure per student, tertiary (% of GDP per capita)	53	27	31.984	11.600	15.955	69.811
Government expenditure on education as % of GDP (%)	56	29	5.403	1.164	3.285	8.385
Expenditure on education as % of total government expenditure (%)	54	28	12.324	2.418	4.531	16.813
Primary education, duration (years)	58	29	5.475	1.073	4.000	8.000
Adjusted savings: education expenditure (% of GNI)	58	29	5.074	1.179	2.899	8.173
Pupil–teacher ratio in primary education	51	26	13.981	2.945	9.640	19.495
Pupil–teacher ratio in secondary education	50	26	11.097	1.697	7.252	15.213
Percentage of students in secondary education enrolled in vocational programmes	58	26	24.911	10.255	6.477	46.810
Gross enrolment ratio, pre-primary, both sexes (%)	57	29	86.716	17.131	47.525	123.083
Expenditure on pre-primary as % of government expenditure on education (%)	54	27	8.961	3.534	0.059	19.777
<i>Labour market institutions</i>						
Union density	58	29	35.395	21.343	7.232	89.609
Coverage rate	57	29	62.846	25.269	11.156	100.000
Bargaining centralisation	56	28	0.386	0.152	0.102	0.928
Employment protection legislation	42	23	2.422	0.666	1.198	4.550
Minimum wage/mean wage	58	29	0.590	0.304	0.287	1.000
Unemployment subsidy replacement rate	56	29	35.454	15.799	5.945	61.774
Tax wedge	56	29	25.162	7.906	8.167	40.593
Active labour market policy/GDP	54	28	0.591	0.439	0.044	1.872
Passive labour market policy/GDP	54	28	0.909	0.663	0.130	2.456
Social expenditure/GDP	57	29	2.184	0.864	1.048	3.678
Parental leave – weeks of absence	42	21	59.482	49.340	16.000	214.000

partially finances the former), the existence of active and passive labour market programmes, the generosity of the welfare state (proxied by social expenditure over the gross domestic product) and the possibility of intra-household redistribution of housewifing (proxied by the availability of parental leaves).

In accordance with the literature, we expect that when the labour market is heavily regulated, wages are less related to individual features, since unions press for job-related pay scales (Visser & Checchi, 2009). In addition, employment protection reduces labour turnover, reducing individual income variability (and therefore aggregate wage inequality). Both measures have been proven reducing total income inequality in the aggregate (Checchi & García Peñalosa, 2008). Minimum wages also contribute to the containment of total inequality, which may reflect into the abatement of inequality of opportunity (Salverda & Checchi, 2015). When we consider the role of welfare provisions, we do not have a priori theoretical expectation on their correlation with inequality of opportunity, since taxes and subsidies aim to contain income inequality (through taxation) and to provide income insurance against unforeseeable events (through subsidies), but in few cases they include compensatory measures which attenuate the impact of circumstances. However, as long as fiscal redistribution sustains low incomes (that may be correlated to disadvantaged conditions), we could find some positive correlation with such inequality.

Despite fully recognising the clustered nature of institutions, we start initially with bivariate correlation between different measures of inequality of opportunity and institutional proxies. In Table 6 we report total inequality as reference in column (1) and ex-ante inequality of opportunity in columns (2). We observe that total inequality is reduced in country/years where/when public expenditure in education is high, as well as pre-primary education attracts more pupil and/or vocational education prevent school drop-out. Conversely inequality of opportunity is negatively correlated with fewer dimensions of public expenditure in education. When we consider labour market institutions, correlations are consistent with theoretical expectations: unions and centralised bargaining reduce total inequality, and similar correlation obtains for minimum wage, active and passive labour market policies and social expenditure. Vice versa inequality of opportunity seems rather independent from labour market institutions, except when exhibits negative correlation with union membership and unemployment benefit replacement rate.

Table 6. Pairwise Correlations – 26 Countries – Income Inequality Measured in 2005 and 2011 – Institutions Measured by Average of Previous Five Years.

	(1) Total Incomes Inequality (Gini)	(2) Opportunity Inequality (Gini)
<i>Educational institutions</i>		
Expenditure per student, primary (% of GDP per capita)	-0.075	-0.286*
Expenditure per student, secondary (% of GDP per capita)	-0.494***	-0.474***
Expenditure per student, tertiary (% of GDP per capita)	-0.746***	-0.162
Government expenditure on education as % of GDP (%)	-0.680***	-0.616***
Expenditure on education as % of total government expenditure (%)	-0.267*	-0.443***
Primary education, duration (years)	-0.155	-0.030
Adjusted savings: education expenditure (% of GNI)	-0.588***	-0.638***
Pupil–teacher ratio in primary education	0.064	0.006
Pupil–teacher ratio in secondary education	-0.008	0.276*
Percentage of students in secondary education enrolled in vocational programme	-0.492***	-0.026
Gross enrolment ratio, pre-primary, both sexes (%)	-0.331**	0.107
Expenditure on pre-primary as % of government expenditure on education (%)	0.043	-0.241*
<i>Labour market institutions</i>		
Union density	-0.652***	-0.365***
Coverage rate	-0.533***	-0.091
Bargaining centralisation	-0.338**	-0.037
Employment protection legislation	-0.031	-0.122
Minimum wage/mean wage	-0.465***	-0.107
Unemployment subsidy replacement rate	-0.217	-0.441***
Tax wedge	-0.435***	-0.166
Active labour market policy/GDP	-0.600***	-0.152
Passive labour market policy/GDP	-0.315**	-0.035
Social expenditure/GDP	-0.443***	-0.100
Parental leave – weeks of absence	-0.027	-0.0845

Statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

When we take these correlations to more stringent tests using multivariate analysis (and even controlling for either random or fixed country effects), only few institutional dimensions survive. Some of them have limited variation and are likely to be absorbed by country effects. A serious

problem is the limited number of degrees of freedom, due to missing values.²⁵ In order not to lose information, we have imputed missing values using the sample means over each year, introducing a dummy variable controlling for imputation. In Table 7, we report the OLS regressions when pooling countries and controlling for either random or fixed country effects.²⁶ Educational expenditure (and its share devoted to pre-primary education) are the only educational variables retaining statistical significance with inequality of opportunity, irrespective of the specification: other things constant, an increase in the allocation of public educational expenditure to pre-primary education reduces the inequality of opportunity. In addition, an increase in union density and/or in passive labour market expenditure seems reducing opportunity inequality, but the effects are statistically weaker.

Notice that total inequality and inequality of opportunity obtain statistical significance in correlation with different regressors. Total inequality (which reflects both between-group and within-group components²⁷) is significantly correlated with union density and labour market policies, both of the active and passive variety. Among the educational variables, only the fraction of students in the vocational track (an often used proxy for the degree of secondary school stratification) exhibits negative correlation.

We could therefore conclude that inequality of opportunity seems associated to institutional dimensions that operate before the entrance in the labour market and/or when (temporary) excluded by the same market (as in the case of recipients of unemployment benefits). In particular, the expenditure in education seems the most effective instrument available to governments. Fig. 5 well summarise this point: on the left panel, we observe that countries with the highest level of public expenditure in education are also the countries with the lowest level of inequality of opportunity; symmetrically (but rather independently – the correlation of the two

25. Notice that we cannot include time invariant variables (like duration of primary education, coverage or bargaining centralisation) because they are alternative to country fixed effects. In addition, when we use only non-missing information on all available institutional variables, we are left with 29 observations and 15 countries, which renders the model estimated in Table 7 meaningless.

26. Table A7 replicates the estimates using the MLD as inequality measures, both under ex-ante and ex-post approaches. Results are similar with those commented in the text and will not be discussed further.

27. Though the Gini index is not neatly decomposable in these two components, the Mean Log Deviation reported in the Appendix is, but results are very similar.

Table 7. Inequality and Institutions – 26 Countries – 2005 and 2011 – Disposable Incomes (Imputing Expected Incomes to Zero Incomes).

	Total inequality (Gini)			Ex-ante opportunity inequality (Gini)		
	1	2	3	4	5	6
	Pooled	Random effects	Fixed effects	Pooled	Random effects	Fixed effects
Education expenditure (% of GNI)	-0.25 [0.836]	-0.695 [0.777]	-0.85 [1.055]	-1.702** [0.775]	-1.417** [0.628]	-0.485 [0.592]
Pupil–teacher ratio in primary education	-0.146 [0.186]	-0.228 [0.200]	-0.432 [0.310]	-0.24 [0.142]	-0.081 [0.125]	-0.006 [0.102]
% Students in secondary education enrolled in vocational programmes	-0.106** [0.046]	-0.099* [0.053]	0.214* [0.118]	0.057 [0.037]	0.02 [0.044]	0.029 [0.081]
Expenditure on pre-primary as % of govern. expenditure on education	-0.208 [0.132]	-0.215 [0.156]	-0.073 [0.240]	-0.309*** [0.097]	-0.317** [0.131]	-0.380** [0.140]
Union density	-0.094** [0.038]	-0.101** [0.042]	-0.25 [0.187]	-0.090** [0.038]	-0.088* [0.045]	-0.022 [0.095]
Parental leave – weeks of absence	-0.016 [0.016]	-0.006 [0.016]	0.065** [0.025]	-0.023* [0.013]	-0.01 [0.011]	-0.006 [0.011]
Unemployment subsidy replacement rate	-0.029 [0.044]	0.000 [0.047]	0.054 [0.078]	-0.060* [0.033]	-0.021 [0.034]	0.132* [0.064]
Active labour market policy/GDP	-8.478*** [1.768]	-6.184*** [1.456]	5.144 [3.705]	1.6 [1.624]	2.012* [1.128]	1.868 [1.364]
Passive labour market policy/GDP	3.216*** [1.136]	2.455** [1.017]	-0.731 [1.414]	-0.893 [0.892]	-0.785 [0.605]	-1.977** [0.826]
Minimum wage/mean wage	1.089 [1.612]	0.789 [1.593]	23.374 [26.470]	3.578* [1.868]	3.355 [2.277]	27.171 [17.443]
Observations	49	49	49	49	49	49
Number of country	26	26	26	26	26	26
R ² (within)	0.749	0.201	0.591	0.714	0.654	0.839
Hausman test (<i>p</i> -value)		9.48 (0.57)			19.62 (0.05)	

Robust standard errors in brackets – *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ errors clustered by country – constant and year included.

expenditure variable is -0.22), the right panel shows that favouring pre-primary education among other items of public expenditure is also associated to low opportunity inequality. We find therefore additional supportive evidence to the argument put forward by Heckman et al. (2002) that pre-primary education is a powerful instrument to attenuate social disparities.

Conversely, standard labour market institutions contribute to the attenuation of income inequality. It is worth remembering that these inequalities are measured at individual level, and are therefore more pronounced than those recorded when intra-household redistribution takes place (as in the case when equivalised incomes are considered).

5. CONCLUDING REMARKS

In this paper, we present measures of total income inequality and inequality of opportunities in 26 European countries by using the EU-SILC database, for two survey years, 2005 and 2011. Inequality has been measured by

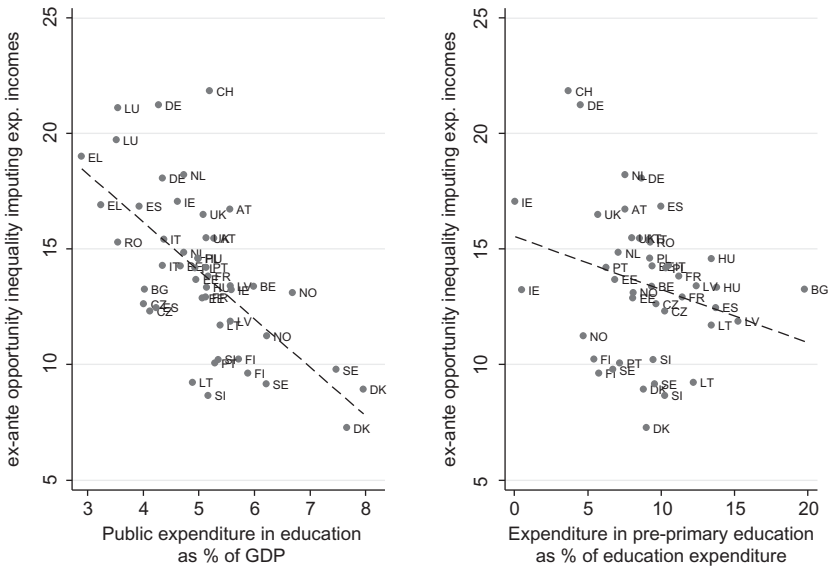


Fig. 5. Educational Expenditure and Inequality of Opportunity.

taking into account both individuals with positive incomes and individuals without income, by imputing them their potential incomes: as a consequence, total inequality tends to be higher than usually recorded by official statistics, for a large set of countries. We have shown that standard income inequality and inequality of opportunities do not necessarily offer the same type of country orderings, even if Nordic countries score low under both measures. At the other tail of the ranking, rich countries (like Switzerland and Luxemburg) score highest, but also Netherlands and Germany are characterised by high inequality of opportunity.

We have also shown that total income inequality exhibits larger fluctuations than inequality of opportunities, indicating that the latter is more persistent than the former. This could be taken as evidence of income formation being deeply affected by the set of circumstances we have selected (gender, age, nationality and parental education).

Different social and economic mechanisms may generate the income and opportunity inequalities we observe: the working of the educational system contributes to attenuating the influences of some circumstances, which can be effective pre-market (like family background, ethnicity or even gender). Once the individual enters the labour market (an event which is also dependent on the same set of circumstances), other types of institutions (like unions or labour policies) may contribute to contain income inequalities.

Our search for correlation between inequalities and institutional variables shows that labour market institutions are negatively associated to total inequalities, while educational expenditure (and pre-primary education expenditure in particular) is negatively associated with inequality of opportunities.

Two *caveats* should be kept in mind while evaluating our results. The first *caveat* concerns the selection of circumstances. We have assumed that the selected circumstances affect income formation, but we formally do not prove it. In principle, we should include in the set of circumstances only factors that causally affect income formation. Take, for example, the variable “country of origin”. This variable implies a negative premium in income formation in most countries. However, being born in a different country may be the reflection of an intentional choice (migration) or the effect of parental choice, or even the outcome of accidental events (marriage). The impossibility of distinguishing among these alternatives renders our exercise a purely descriptive one, where inequality is decomposed according to arbitrary (though plausible) assumptions.

The second *caveat* relates to the treatment of effort in the equality of opportunity framework and, specifically, in the ex-ante approach.

According to this approach, once the circumstances are identified, any other factor affecting income is treated as socially acceptable. This includes effort, but also unobservable ability or simply luck. Moreover, we have used a reduced form model, where the individual choice of effort is only implicit and not explicitly modelled. This strategy is obviously constrained by data availability, but is exposed to possible criticisms. As openly discussed by Ravallion (2015), any social evaluation of inequalities, both total or opportunity ones, should be sensitive to the individual effort and to the disutility of effort associated with a given income level. After all, we measure income inequality because we are ultimately interested in the distribution of welfare among individuals. And, the argument goes, the disutility of effort, together with the income attained, is a component of the individual welfare. While this point is well taken, its full recognition requires an explicit theoretical model of the choice of effort which goes beyond the reduced form approach followed in this paper (and in most of the literature developed so far), requiring a richer data set to identify individual effort. The search for better ways to model and to measure intentions and efforts is our future line of research. In this respect, the EUSILC surveys do not offer a large array of measures for potential effort, and we have to resort to national data sets, undermining the comparability of the results.

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APPENDIX

The original data files report information on gross or net incomes according to country-specific collection rules. The survey conducted in 2011 was the first one requiring all countries (31) to report information on gross values, while only two-thirds (20 countries) provided information on net incomes.²⁸

We have taken advantage of the existence of both gross and net values in 2005 to estimate a tax schedule (net values regressed on a polynomial of the gross values up to 4th grade, plus control for gender and marital status) for two countries (Germany and Great Britain). Under the assumption of invariance of the tax legislation, these schedules have then been used to obtain net income values for 2011. Conversely, for other five countries (Greece, Spain, Italy, Latvia and Portugal), we exploited the existence of gross and net values in 2011 to impute gross values in 2005. For five more countries (Denmark, Finland, Hungary, Netherlands and Norway), we have used information on the country tax legislation to obtain net values from gross ones, again under the assumption of constant legislation (see tables 8–12 in *Checchi et al., 2010*).

The imputed values are italicized in *Table A1*, which reports mean incomes (in Euros). As a result, we are able to compute inequality indices for 57 countries/year using gross incomes, and 50 countries/year using disposable incomes.

Table A2 provides descriptive statistics for the output variables (gross and disposable income) and for the available circumstances. Samples are rather similar across the two waves as far as gender and age composition, while parental education is improving over surveys in almost all countries. Variations in median incomes and fraction of population with zero gross income (a proxy for the unemployment rate) reflect different growth trajectories and cyclical fluctuations.

Table A3 estimates the income generating function, controlling for self-selection into positive values for disposable incomes, pooling all countries together; country fixed effects are included, in order to control for country differences (in means). In the calculation of inequality measures, we have estimated an identical model for each occurrence country/survey, in order to improve the fit of the model to the country-specific data. The conditional income multiplied by the probability of selection constitutes our imputed expected incomes for individuals who record zero incomes. Since additional

28. Cyprus provided information on net incomes for only 62 individuals over 4,589, and we have therefore considered these cases equivalent to missing.

Table A1. Information on Availability on Gross and Net Values – Mean Incomes.

Country	2005		2011	
	Gross income	Disposable income	Gross income	Disposable income
Austria AT	20594.0	15576.8	26584.6	19576.1
Belgium BE	21395.2	15985.6	25850.1	19573.0
Bulgaria BG	na	na	2776.9	2396.6
Switzerland CH	na	na	47821.7	41383.3
Cyprus CY	15033.2	na	19821.1	na
Czech Republic CZ	4718.6	3463.4	8342.1	6169.3
Germany DE	22097.8	16061.0	25259.7	19212.4
Denmark DK	35916.8	26050.4	44467.0	31187.5
Estonia EE	3536.4	2943.0	6104.4	5294.6
Greece EL	10729.3	9063.6	11552.7	9370.8
Spain ES	9850.6	9812.1	12967.8	11830.3
Finland FI	22850.4	20390.3	29434.4	25667.3
France FR	19192.6	16486.3	22368.3	19304.1
Croatia HR	na	na	5789.5	4885.8
Hungary HU	3493.3	2739.2	4606.7	3543.3
Ireland IE	21644.0	18480.1	22182.4	19348.5
Iceland IS	33299.2	na	26366.8	na
Italy IT	16395.5	13124.6	20077.1	15363.0
Lithuania LT	2763.8	2070.0	4363.6	3563.2
Luxemburg LU	30754.4	26200.2	36022.4	29931.5
Latvia LV	2255.6	2178.7	4753.7	4073.4
Malta MT	na	na	11322.1	na
Netherlands NL	24814.4	21649.2	33934.9	27639.7
Norway NO	32261.2	29502.2	49110.3	41660.4
Poland PL	2756.0	2234.9	5481.0	4349.5
Portugal PT	8185.9	7077.7	9826.2	7978.5
Romania RO	na	na	2147.4	1752.1
Sweden SE	23653.7	18367.7	29136.8	23356.2
Slovenia SI	10516.0	7930.6	13993.8	10647.3
Slovakia SK	3029.9	na	6714.1	na
United Kingdom UK	25413.5	19205.9	22306.7	17012.2

information (like own education, parental occupation and marital status) do not enter the set of circumstances, the imputed incomes for the unemployed and they have not contain additional information beyond their circumstances.

Table A4 compares inequality measures from alternative sources (OECD, Eurostat and our own sample), and it is used to compute the correlation matrix reported in Table 3 in the text.

Table A2. Descriptive Statistics – EUSILC – Population Aged 30–60.

2005	AT	BE	BG	CH	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU
Obs	5,703	5,418			4,740	4,338	13,371	7,017	4,626	6,070	15,672	12,999	10,144		7,428
Median gross income (>0)	23,800	27,932			17,226	5,362	25,365	37,834	3,806	14,541	12,449	24,011	21,303		3,840
Median disposable income (>0)	16,949	17,287				3,951	16260	28,212	2,914	11,900	12,000	22,368	16,941		3,145
Female	0.52	0.52			0.53	0.53	0.57	0.52	0.54	0.52	0.53	0.51	0.52		0.52
Age (years)	44.67	44.85			44.87	45.61	45.52	45.35	45.53	44.66	44.48	46.67	44.96		44.98
Foreign	0.09	0.08			0.09	0.01	0.05	0.04	0.15	0.06	0.05	0.02	0.09		0.02
Parental education: primary	0.06	0.05			0.01	0.02	0.09	0.52	0.06	0.01	0.03	0.54	0.04		0.03
Parental education: secondary	0.54	0.58			0.79	0.21	0.14	0.19	0.41	0.86	0.83	0.30	0.65		0.48
Parental education: college	0.36	0.21			0.14	0.70	0.48	0.20	0.37	0.08	0.06	0.09	0.22		0.41
Pop. with zero gross incomes	0.20	0.27			0.21	0.18	0.17	0.08	0.17	0.32	0.30	0.11	0.18		0.24
2011	AT	BE	BG	CH	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU
Obs	6,097	5,892	6,989	7,433	4,544	8,538	12,342	5,781	5,233	5,990	15,174	9,550	10,859	6,808	13,067
Median gross income (>0)	28,200	31,013	3,068	50,460	20,800	9,377	29,512	46,181	6,520	15,740	17,080	30,519	24,060	8,068	5,304
Median disposable income (>0)	19,946	20,700	2,454	43,648		7,214	17,608	33,506	5,113	12,902	13,800	27,613	19,658	5,762	4,322
Female	0.53	0.52	0.51	0.54	0.55	0.52	0.54	0.53	0.52	0.52	0.52	0.50	0.52	0.52	0.54
Age (years)	45.36	45.03	46.19	45.73	45.57	45.56	46.50	46.66	45.77	45.26	45.07	46.52	45.70	47.05	46
Foreign	0.10	0.11	0.00	0.10	0.12	0.01	0.06	0.05	0.13	0.08	0.07	0.03	0.07	0.11	0.00
Parental education: primary	0.02	0.09	0.06	0.10	0.01	0.24	0.10	0.53	0.07	0.10	0.04	0.51	0.05	0.12	0.02
Parental education: secondary	0.37	0.47	0.49	0.22	0.72	0.46	0.10	0.15	0.32	0.71	0.81	0.24	0.73	0.53	0.61
Parental education: college	0.47	0.23	0.35	0.52	0.19	0.23	0.54	0.19	0.41	0.12	0.07	0.14	0.10	0.29	0.27
No incomes	0.16	0.23	0.16	0.10	0.17	0.17	0.17	0.07	0.19	0.31	0.31	0.10	0.14	0.36	0.22
Yearly change median gross income	2.87	1.76			3.19	9.76	2.56	3.38	9.39	1.33	5.41	4.08	2.05		5.53
Yearly change median disposable inc	2.75	3.05				10.55	1.34	2.91	9.82	1.36	2.36	3.57	2.51		5.44

2005	IE	IS	IT	LT	LU	LV	MT	NL	NO	PL	PT	RO	SE	SI	SK	UK
Obs	5,988	3,575	24,795	5,041	4,234	3,766		10,941	6,855	19,611	5,252		6,412	12,305	6,709	10,608
Median gross income (>0)	27,066	32,911	20,570	2,894	36,780	2,436		28,278	35,064	3,909	8,010		25,672	10,541	3,648	28,291
Median disposable income (>0)	20,327		15,836	22,78	29,190	2,165		27,282	33,635	2,431	6,838		18,450	8,024		19,639
Female	0.53	0.51	0.51	0.55	0.51	0.55		0.52	0.51	0.53	0.52		0.52	0.51	0.53	0.52
Age (years)	45.48	44.75	44.45	45.62	44.24	45.07		44.71	44.73	45.58	45.28		45.32	45.29	45.49	44.68
Foreign	0.03	0.02	0.04	0.06	0.09	0.16		0.05	0.05	0.00	0.01		0.09	0.11	0.00	0.10
Parental education: primary	0.29	0.58	0.01	0.03	0.04	0.03		0.54	0.51	0.04	0.06		0.54	0.66	0.03	0.26
Parental education: secondary	0.55	0.16	0.84	0.64	0.55	0.51		0.30	0.13	0.57	0.89		0.32	0.19	0.39	0.47
Parental education: college	0.10	0.21	0.12	0.24	0.29	0.34		0.09	0.20	0.34	0.02		0.07	0.13	0.50	0.15
No incomes	0.29	0.06	0.25	0.20	0.27	0.22		0.15	0.09	0.39	0.26		0.09	0.06	0.21	0.23
2011	IS	IT	LT	LU	LV	MT	NL	NO	PL	PT	RO	SE	SI	SK	UK	IS
Obs	4,233	3,648	20,652	5,296	6,632	6,296	4,654	11,179	4,927	15,238	5,755	7,699	6,469	12,926	6,712	7,245
Median gross income (>0)	29,483	25,905	23,385	4,677	39,169	4,787	16,412	35,465	51,118	7,035	10,191	2,880	30,967	14,925	7,500	24,197
Median disposable income (>0)	20,960		17,944	3,791	31,163	3,889		31,864	45,198	4,844	7,899	2,092	24,082	11,102		14,721
Female	0.53	0.51	0.52	0.54	0.52	0.55	0.52	0.53	0.51	0.52	0.53	0.52	0.52	0.51	0.53	0.54
Age (years)	44.08	45.67	45.32	47.58	44.57	45.95	46.52	46.22	45.50	45.96	46.03	46.18	45.67	45.58	45.62	45.59.00
Foreign	0.07	0.04	0.06	0.06	0.10	0.14	0.06	0.05	0.05	0.00	0.06	0.00	0.10	0.12	0.00	0.09
Parental education: primary	0.26	0.57	0.03	0.06	0.01	0.05	0.08	0.52	0.50	0.09	0.02	0.09	0.61	0.65	0.02	0.18
Parental education: secondary	0.35	0.13	0.75	0.55	0.53	0.39	0.68	0.19	0.12	0.45	0.92	0.78	0.13	0.24	0.35	0.45
Parental education: college	0.27	0.23	0.17	0.28	0.33	0.40	0.18	0.18	0.21	0.40	0.03	0.10	0.16	0.07	0.55	0.19
No incomes	0.35	0.07	0.21	0.24	0.23	0.21	0.36	0.11	0.07	0.30	0.25	0.30	0.08	0.16	0.17	0.22
Yearly change median gross income	1.44	-3.91	2.16	8.33	1.05	11.92		3.85	6.48	10.29	4.10		3.17	5.97	12.76	-2.57
Yearly change median disposable inc	0.51		2.10	8.86	1.10	10.25		2.62	5.05	12.18	2.43		4.54	5.56		-4.69

Table A3. Income Generating Process with Self-Selection into Employment – EUSILC.

Dependent variable	1	2	3	4
	Log disposable income 2005	Selection into positive incomes 2005	Log disposable income 2011	Selection into positive incomes 2011
Survey year				
Female	-0.426*** [0.044]	-0.691*** [0.076]	-0.376*** [0.038]	-0.555*** [0.067]
Foreign born	-0.140*** [0.035]	-0.308*** [0.068]	-0.178*** [0.028]	-0.278*** [0.060]
Age group = 36–40	0.087*** [0.012]	0.088*** [0.026]	0.099*** [0.010]	0.091*** [0.020]
Age group = 41–45	0.160*** [0.017]	0.106*** [0.026]	0.173*** [0.012]	0.118*** [0.034]
Age group = 46–50	0.186*** [0.018]	0.083** [0.035]	0.204*** [0.013]	0.122*** [0.038]
Age group = 51–50	0.151*** [0.026]	-0.024 [0.049]	0.184*** [0.017]	0.014 [0.041]
Age group = 56–60	-0.018 [0.064]	-0.437*** [0.053]	0.077*** [0.025]	-0.329*** [0.057]
Personal attainment = primary education	0.196 [0.122]	0.192 [0.129]	0.086 [0.063]	0.203** [0.099]
Personal attainment = lower secondary education	0.369*** [0.123]	0.293*** [0.104]	0.244*** [0.064]	0.303*** [0.104]
Personal attainment = (upper) secondary education	0.577*** [0.131]	0.562*** [0.112]	0.511*** [0.070]	0.606*** [0.106]
Personal attainment = post-secondary non tertiary education	0.712*** [0.159]	0.715*** [0.093]	0.665*** [0.068]	0.798*** [0.122]
Personal attainment = first or second stage of tertiary education	0.962*** [0.145]	0.938*** [0.096]	0.919*** [0.073]	1.007*** [0.105]
Highest parental education = lower than secondary	-0.034** [0.014]		-0.046*** [0.013]	
Highest parental education = upper secondary	0.055*** [0.014]		0.041*** [0.011]	
Highest parental education = tertiary	0.037** [0.018]		0.044*** [0.009]	
Highest parental occupation = blue-collar		0.009 [0.033]		0.04 [0.033]
Highest parental occupation = white-collar		0.043 [0.028]		0.084** [0.033]
Highest parental occupation = salariat		0.028 [0.030]		0.079*** [0.029]
Married		-0.119* [0.066]		-0.070* [0.042]
Observations		205,392		230,356
Censored values		32,679		31,696
Countries		23		27
<i>p</i> -Value rho = 0		0.46		0.11

Robust standard errors clustered by countries in brackets – *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A4. Alternative Measures of Total Income Inequality – Disposable Incomes.

Year	Equivalised Household Disposable Incomes after Taxes and Transfers – Population 18–65 (Gini OECD)		Equivalised Household Disposable Incomes after Taxes and Transfers – (Gini Eurostat)		Personal Disposable Incomes (after Taxes and Transfers) Excluding Zero Incomes – (Gini our Sample)	
	2005	2011	2005	2011	2005	2011
Austria	0.259	0.283	0.263	0.274	0.295	0.301
Belgium	0.277	0.262 ^a	0.280	0.263	0.261	0.254
Bulgaria			0.250	0.350		0.323
Cyprus			0.287	0.292		
Czech Republic	0.259	0.256	0.260	0.252	0.296	0.262
Denmark	0.227	0.250	0.239	0.278	0.221	0.208
Estonia	0.328	0.324	0.341	0.319	0.349	0.362
Finland	0.266	0.268	0.260	0.258	0.314	0.300
France	0.288	0.310	0.277	0.308	0.315	0.317
Germany	0.304	0.298	0.261	0.290	0.377	0.346
Greece	0.343	0.341	0.332	0.335	0.312	0.298
Hungary	0.300	0.293 ^b	0.276	0.268	0.339	0.311
Iceland	0.279	0.250	0.251	0.236		
Ireland	0.321	0.308	0.319	0.298	0.342	0.343
Italy	0.325 ^c	0.324	0.328	0.319	0.292	0.305
Latvia			0.362	0.351	0.350	0.398
Lithuania			0.363	0.330	0.337	0.362
Luxembourg	0.287	0.275	0.265	0.272	0.337	0.332
Malta			0.270	0.272		
Netherlands	0.285	0.287 ^a	0.269	0.258	0.272	0.261
Norway	0.284 ^c	0.260	0.282	0.229	0.274	0.252
Poland	0.333	0.306	0.356	0.311	0.370	0.351
Portugal	0.370	0.339	0.381	0.342	0.364	0.338
Romania			0.310	0.332		0.320

Table A4. (Continued)

Year	Equivalised Household Disposable Incomes after Taxes and Transfers – Population 18–65 (Gini OECD)		Equivalised Household Disposable Incomes after Taxes and Transfers – (Gini Eurostat)		Personal Disposable Incomes (after Taxes and Transfers) Excluding Zero Incomes – (Gini our Sample)	
	2005	2011	2005	2011	2005	2011
Slovak Republic	0.280	0.258	0.262	0.257	0.330	0.293
Slovenia	0.241	0.245	0.238	0.238		
Spain	0.307	0.348	0.322	0.340	0.321	0.327
Sweden	0.236 ^c	0.268	0.234	0.244	0.223	0.227
Switzerland		0.278		0.297		0.355
United Kingdom	0.335	0.346	0.346	0.330	0.359	0.433

Sources: Data from OECD are downloaded from <http://stats.oecd.org/> (section “Social protection and well-being/income distribution and poverty”) – Data from Eurostat are based on the SILC database and are downloaded from <http://ec.europa.eu/eurostat/web/income-and-living-conditions/data/main-tables>).

^aRefers to 2010.

^bRefers to 2012.

^cRefers to 2004.

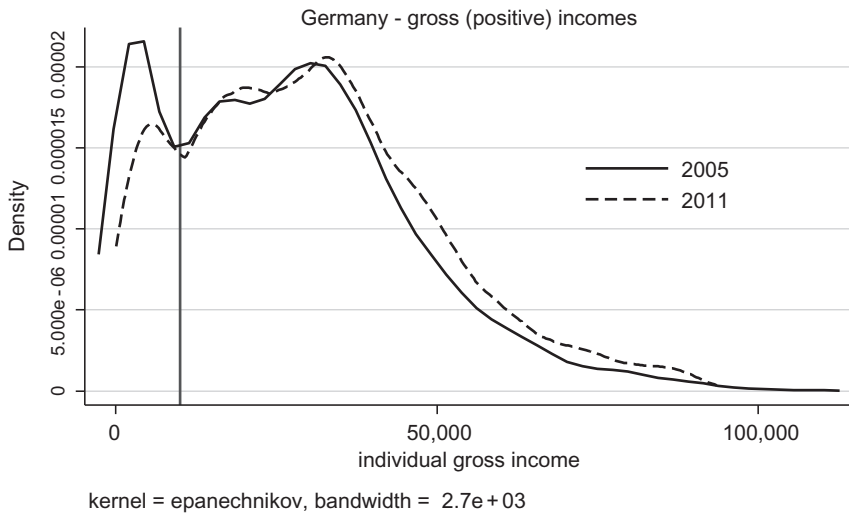


Fig. A1. Income Distribution in Germany – EUSILC 2005 and 2011.

Fig. A1 highlights the anomalous increase in inequality recorded in the German sample for 2005, where a significant mass of individual earned a low income below 5,000 Euros (mostly earnings from dependent employment). This hump is gradually absorbed in the subsequent waves.

Table A5 provides total inequality, inequality of opportunity and their ratio using a different measure of inequality, the Mean Log Deviation, which has the desirable property of exact decomposition (i.e. the total inequality minus inequality of opportunity provides an estimates of the inequality due to effort). The opportunity inequality can be computed according to two approaches, as illustrated in Section 2, the *ex-ante* (which is the perspective adopted in the main text) and the *ex-post*. This latter measure is obtained according to Roemer's statistical solution: given the non-observability of effort, we need to deduce the degree of effort from some observable behaviour. Following Checchi and Peragine (2010), we assume that all individuals at the p th quantile of the income distribution in their types have exerted a comparable degree of effort. Given the assumed monotonicity of the income function, this corresponds to the quantile in the effort distribution of the type. Thus, we define the tranche p in a population as the subset of individuals whose income is at the p th rank of the income distributions of their respective types. Specifically, in order to retain

Table A5. Total Inequality and Inequality of Opportunities – EUSILC – Disposable Incomes, Imputing Expected Incomes to Zero Incomes, Estimated at Country Level Correcting for Self-Selection.

	Total Inequality – MLD		Ex-Ante Opportunity Inequality – MLD		Ex-Ante Opportunity Inequality Ratio – MLD		Ex-Post Opportunity Inequality – MLD		Ex-Post Opportunity Inequality Ratio – MLD	
	2005	2011	2005	2011	2005	2011	2005	2011	2005	2011
Austria	0.22 (0.0061)	0.209 (0.0058)	0.046 (0.0008)	0.039 (0.0005)	0.039	0.209	0.06 (0.0004)	0.048 (0.0003)	0.273	0.23
Belgium	0.166 (0.0067)	0.18 (0.0082)	0.034 (0.0006)	0.031 (0.0006)	0.031	0.205	0.035 (0.0001)	0.03 (0.0001)	0.211	0.167
Bulgaria		0.214 (0.0041)		0.028 (0.0005)	0.028			0.036 (0.0002)		0.168
Switzerland		0.316 (0.0058)		0.079 (0.0009)	0.079			0.12 (0.0008)		0.38
Czech Republic	0.241 (0.0041)	0.144 (0.0033)	0.029 (0.0005)	0.024 (0.0009)	0.024	0.12	0.035 (0.0002)	0.03 (0.0001)	0.145	0.208
	0.241 (0.0041)	0.144 (0.0033)	0.029 (0.0005)	0.024 (0.0009)	0.024	0.12	0.035 (0.0002)	0.03 (0.0001)	0.145	0.208
Germany	0.394 (0.0067)	0.211 (0.0025)	0.075 (0.0004)	0.053 (0.0004)	0.053	0.19	0.113 (0.0005)	0.065 (0.0002)	0.287	0.308
Denmark	0.166 (0.0063)	0.153 (0.008)	0.014 (0.0003)	0.01 (0.0009)	0.01	0.084	0.015 (0.0001)	0.009 (0.0001)	0.09	0.059
Estonia	0.254 (0.0064)	0.269 (0.0065)	0.029 (0.0006)	0.027 (0.0006)	0.027	0.114	0.029 (0.0001)	0.026 (0.0001)	0.114	0.097
Greece	0.268 (0.0064)	0.233 (0.0038)	0.061 (0.0007)	0.049 (0.0009)	0.049	0.228	0.078 (0.0004)	0.064 (0.0004)	0.291	0.275
Spain	0.245 (0.0029)	0.226 (0.0029)	0.049 (0.0004)	0.026 (0.0003)	0.026	0.2	0.064 (0.0002)	0.03 (0.0001)	0.261	0.133
Finland	0.290 (0.0061)	0.257 (0.0056)	0.018 (0.0003)	0.016 (0.0003)	0.015	0.062	0.026 (0.0001)	0.02 (0.0001)	0.09	0.078

France	0.224 (0.0042)	0.24 (0.0048)	0.031 (0.0004)	0.027 (0.0004)	0.027	0.138	0.036 (0.0001)	0.034 (0.0002)	0.161	0.142
Croatia		0.213 (0.0039)		0.026 (0.0004)	0.026			0.034 (0.0001)		0.16
Hungary	0.284 (0.0058)	0.249 (0.0035)	0.035 (0.0006)	0.028 (0.0004)	0.028	0.123	0.053 (0.0003)	0.045 (0.0002)	0.187	0.181
Ireland	0.258 (0.0045)	0.243 (0.0060)	0.049 (0.0008)	0.028 (0.0007)	0.028	0.19	0.064 (0.0003)	0.032 (0.0002)	0.248	0.132
Italy	0.218 (0.0022)	0.23 (0.0026)	0.039 (0.0003)	0.033 (0.0002)	0.033	0.179	0.05 (0.0001)	0.042 (0.0001)	0.229	0.183
Lithuania	0.225 (0.0048)	0.268 (0.0056)	0.022 (0.0005)	0.015 (0.0004)	0.015	0.098	0.026 (0.0001)	0.018 (0.0001)	0.116	0.067
Luxembourg	0.277 (0.0062)	0.246 (0.0051)	0.073 (0.0012)	0.062 (0.0008)	0.062	0.264	0.093 (0.0005)	0.075 (0.0003)	0.336	0.305
Latvia	0.223 (0.0056)	0.343 (0.0068)	0.028 (0.0007)	0.023 (0.0005)	0.023	0.126	0.032 (0.0001)	0.025 (0.0001)	0.143	0.073
Netherlands	0.223 (0.0040)	0.188 (0.0037)	0.058 (0.0005)	0.036 (0.0002)	0.036	0.26	0.088 (0.0005)	0.054 (0.0003)	0.395	0.287
Norway	0.247 (0.0067)	0.193 (0.0070)	0.029 (0.0004)	0.022 (0.0005)	0.022	0.117	0.045 (0.0005)	0.029 (0.0004)	0.182	0.15
Poland	0.283 (0.0028)	0.265 (0.0028)	0.038 (0.0004)	0.034 (0.0004)		0.134	0.042 (0.0001)	0.041 (0.0001)	0.148	0.155
Portugal	0.250 (0.0051)	0.212 (0.0041)	0.034 (0.0011)	0.019 (0.0008)	0.019	0.136	0.044 (0.0002)	0.023 (0.0001)	0.176	0.108
Romania		0.27 (0.0048)		0.039 (0.0006)	0.04			0.071 (0.0006)		0.263
Sweden	0.119 (0.0043)	0.129 (0.0045)	0.017 (0.0003)	0.015 (0.0004)	0.143	0.116	0.018 (0.0002)	0.017 (0.0001)	0.151	0.132
Slovenia	0.392 (0.0078)	0.213 (0.0044)	0.031 (0.0008)	0.014 (0.0002)	0.079	0.066	0.091 (0.0008)	0.018 (0.0001)	0.232	0.085
Great Britain	0.262 (0.0042)	0.202 (0.003)	0.038 (0.0004)	0.043 (0.0005)	0.145	0.213	0.046 (0.0001)	0.050 (0.0002)	0.176	0.248

Table A6. Data Sources or Institutional Variables.

	Sources
<i>Educational Institutions Variables</i>	
Expenditure per student, primary (% of GDP per capita)	World Bank (http://data.worldbank.org/indicator)
Expenditure per student, secondary (% of GDP per capita)	World Bank (http://data.worldbank.org/indicator)
Expenditure per student, tertiary (% of GDP per capita)	World Bank (http://data.worldbank.org/indicator)
Government expenditure on education as % of GDP (%)	Unesco (http://data.uis.unesco.org/)
Expenditure on education as % of total government expenditure (%)	Unesco (http://data.uis.unesco.org/) – updated using World Bank growth rates when missing
Primary education, duration (years)	World Bank (http://data.worldbank.org/indicator)
Adjusted savings: education expenditure (% of GNI)	World Bank (http://data.worldbank.org/indicator)
Pupil–teacher ratio in primary education	headcount based – Unesco (http://data.uis.unesco.org/)
Pupil–teacher ratio in secondary education	headcount based – Unesco (http://data.uis.unesco.org/)
Percentage of students in secondary education enrolled in vocational programmes	both sexes – Unesco (http://data.uis.unesco.org/)
Gross enrolment ratio, pre-primary, both sexes (%)	both sexes – Unesco (http://data.uis.unesco.org/)
Expenditure on pre-primary as % of government expenditure on education (%)	Unesco (http://data.uis.unesco.org/)
<i>Labour market institutions</i>	
Union density	ICTWSS database (Visser 2013 – http://www.uva-aias.net/208)
Coverage rate	ICTWSS database (Visser 2013 – http://www.uva-aias.net/208)
Bargaining centralisation	ICTWSS database (Visser 2013 – http://www.uva-aias.net/208)
Employment protection legislation	Strictness of employment protection – overall – version 1 – source: OECD http://www.oecd.org/employment/emp/oecdindicatorsofemploymentprotection.htm)
Minimum wage/mean wage	Minimum relative to mean wages of full-time workers – set equal to 1 if minimum wage provision is absent – source: OECD (except Iceland) http://stats.oecd.org/Index.aspx?DataSetCode=RMW

Table A6. (Continued)

Sources	
Unemployment subsidy replacement rate	Unemployment insurance and unemployment assistance benefits – gross replacement rate for a full-time adult worker – source: OECD historical series – combination of GRR(APW) until 2001 and GRR(AW) afterward – available in odd years, inter-year means introduced in even years – http://www.oecd.org/els/benefitsandwagesstatistics.htm
Tax wedge	Average tax wedge (sum of social contributions and income taxes to the average wage) – average between single worker and one-earner married couple with two children – source: OECD http://www.oecd.org/tax/tax-policy/taxing-wages.htm
Active labour market policy/gdp	OECD http://stats.oecd.org/Index.aspx?DataSetCode=LMPEXP
Passive labour market policy/gdp	OECD http://stats.oecd.org/Index.aspx?DataSetCode=LMPEXP
Social expenditure/gdp	cash benefit + benefit in kind in percentage of GDP – source: OECD (available on quinquennial base then interpolated) http://www.oecd.org/social/expenditure.htm
Parental leave – weeks of absence	weeks of paid leave for child birth – source: Thévenon and Solaz (2013) – further documentation at http://www.oecd.org/social/soc/oecdfamilydatabase.htm

a sufficient number of individuals in each cell, we redefined types using gender, age and parental education (48 types) and we partitioned the type distributions in five quintile. Values in brackets report the estimate of the standard errors obtained from bootstrapping (400 replications).

Table A7 represents the counterpart of Table 7, replacing Gini index with MLD as dependent variable. Columns (7)–(9) introduce the ex-post measure of inequality of opportunity. The main results are confirmed (or even strengthened): expenditure in education over GDP and the share of expenditure in pre-primary education are negative and statistically significant regressors for inequality of opportunity, and similarly occurs for passive labour market policies.

Table A7. Inequality and Institutions – 26 Countries – 2005 and 2011 – Disposable Incomes (Imputing Expected Incomes to Zero Incomes).

	1 Total inequality (MLD)			4 Ex-ante opportunity inequality (MLD)			7 Ex-post opportunity inequality (MLD)		
	Pooled	Random effects	Fixed effects	Pooled	Random effects	Fixed effects	Pooled	Random effects	Fixed effects
Education expenditure (% of GNI)	-0.894 [1.282]	-1.067 [1.334]	-4.088 [3.214]	-0.981** [0.384]	-0.835** [0.335]	-0.443 [0.314]	-1.591*** [0.563]	-1.512*** [0.571]	-1.439 [0.921]
Pupil–teacher ratio in primary education	-0.119 [0.283]	-0.205 [0.310]	-1.651 [1.185]	-0.137* [0.070]	-0.083 [0.075]	-0.095 [0.060]	-0.182 [0.115]	-0.241 [0.171]	-0.545 [0.325]
% Students in secondary education enrolled in vocational programmes	-0.061 [0.097]	-0.056 [0.101]	0.613** [0.269]	0.027 [0.020]	0.017 [0.024]	0.043 [0.032]	0.055 [0.037]	0.056 [0.042]	0.092 [0.068]
Expenditure on pre-primary as % of govern. expenditure on education	-0.394 [0.232]	-0.432* [0.249]	-0.448 [0.725]	-0.175*** [0.055]	-0.203*** [0.070]	-0.283*** [0.051]	-0.279** [0.109]	-0.339*** [0.126]	-0.532*** [0.175]
Union density	-0.069 [0.062]	-0.073 [0.064]	0.189 [0.513]	-0.037* [0.021]	-0.038 [0.023]	0.004 [0.045]	-0.052 [0.032]	-0.057 [0.036]	0.223 [0.163]
Parental leave – weeks of absence	0.015 [0.029]	0.019 [0.031]	0.150* [0.085]	-0.008 [0.007]	-0.001 [0.006]	0.000 [0.006]	-0.007 [0.012]	-0.003 [0.013]	-0.01 [0.024]
Unemployment subsidy replacement rate	0.078 [0.072]	0.089 [0.076]	0.196 [0.182]	-0.016 [0.015]	0.009 [0.019]	0.095*** [0.024]	0.002 [0.029]	0.017 [0.029]	0.189*** [0.060]
Active labour market policy/GDP	-7.949** [3.633]	-7.180** [3.427]	18.440* [9.982]	1.202 [0.759]	1.310** [0.586]	1.259 [0.816]	2.183** [1.011]	2.051** [0.817]	2.981 [2.105]
Passive labour market policy/GDP	3.118 [2.135]	2.872 [2.099]	-4.678 [3.747]	-0.605 [0.394]	-0.593* [0.320]	-1.428*** [0.355]	-1.318*** [0.463]	-1.244** [0.565]	-3.029*** [0.989]
Minimum wage/mean wage	2.572 [3.205]	2.412 [3.148]	43.307 [67.202]	1.622 [1.031]	1.585 [1.211]	19.897** [7.499]	2.509 [1.676]	2.538 [1.808]	33.613* [18.882]
Observations	49	49	49	49	49	49	49	49	49
R ² (within)	0.372	0.172	0.571	0.696	0.695	0.887	0.598	0.511	0.777
Number of country	26	26	26	26	26	26	26	26	26
Hausman test (<i>p</i> -value)		10.51 (0.48)			53.43 (0.00)			11.30 (0.41)	

Robust standard clustered by country errors in brackets – *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$ – constant and survey control included.