The perception of inequality of opportunity in Europe

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Abstract

Does the way scholars measure inequality of opportunity correspond to how people perceive it? What other factors influence individual perception of this phenomenon? To answer these questions we must first clarify how scholars define and measure inequality of opportunity. We discuss the possible mechanisms linking objective measures to subjective perception of the phenomenon, then propose a measure of perceived inequality of opportunity, and finally test our hypothesis by merging data coming from two sources: the European Union Statistics on Income and Living Conditions (2011) and the International Social Survey Programme (2009). We suggest that the prevailing perception of the degree of unequal opportunity in a large sample of respondents is only weakly correlated with its objective measure. We estimate a multilevel model considering both individual and country level controls to explain individual perception of unequal opportunity. Our estimates suggest that one of the most adopted measures of inequality of opportunity has no significant role in explaining its perception. Conversely, other country level variables and personal experiences of intergenerational social mobility are important determinants of how inequality of opportunity is perceived.

Keywords: Inequality of opportunity, inequality perception, intergenerational mobility, attribution theory.

JEL: D63, A14, D31.

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1 Introduction

Equality of opportunity is an increasingly considered topic in economics. In 2015 both the Handbook of Income Distribution (Atkinson and Bourguignon, 2015) and the Oxford Handbook of Well-Being and Public Policy (Adler and Fleurbaey, 2015) devote multiple chapters to different aspects of equal opportunity. The way economists understand and measure inequality of opportunity today is rooted in a debate involving political philosophers and theoretical economists about the egalitarian paradigm. Since the seminal contributions by Rawls in the early '70s, a number of authors have attempted to revise the egalitarian paradigm proposing alternative spaces in which equity should be implemented. Dworkin (1981a, b) suggested that the object of equalization should be individual resource endowment rather than achievements. Arneson (1989) and Cohen (1989) explicitly introduced the idea of responsibility as a source of ethically inoffensive inequality. For all of these authors, society should remove inequality arising from factors that influence individual's outcome for which she cannot be held responsible (Ferreira and Peragine, 2015). Roemer (1998) proposed a definition of equal opportunity in which individuals exerting the same effort are entitled to obtain the same outcome, and any inequality due to circumstances beyond individual control should be removed. More recently Fleurbaey (2008) introduced a framework in which preferences participate together with resources to determine the level of individual welfare. If one agree that individuals should be held responsible for their preferences and choices, then this framework can be used to define and measure equality of opportunity.

The most commonly proposed definitions of equality of opportunity are based on two norms: the principle of compensation, which states that inequality due to circumstances beyond individual control is inequality of opportunity, and the principle of reward, which states that inequality due to choice and effort is not. Different definitions of equality of opportunity originate from the way the two principles are balanced. In the recent years a vast range of definitions of equal opportunity have been proposed, most of them have been translated into measures of inequality of opportunity and employed in a growing empirical literature. However, whether those normative definitions correspond to how people understand and perceive inequality of opportunity remains an unanswered question.

The interest of this question is twofold. On the one hand, individuals are believed to take decisions based on their preferences and constraints. The ability to correctly understand constraints and opportunities is therefore crucial in the process of individual decision-making and welfare maximisation. On the other hand, measures of inequality of opportunity are based on normative principles and a number of assumptions introduced by scholars. Such methodological choices should not be based on public opinion of unequal opportunity. However, as shown by Amiel and Cowel (1992) for the case of inequality, a better understanding of how individuals perceive inequality of opportunity can draw the economist's attention to aspects of inequality traditionally neglected by the literature.

A natural starting point for such an investigation is the literature on the perception of inequality; after all, inequality of opportunity is a particular type of inequality. The importance of the public opinion on the level of inequality in a country is well known; it can influence individual behaviour and social cohesion. Perceived increasing inequality can modify electoral results or even trigger unrest, as it was suggested for Egypt and other countries involved in the Arab Spring (Verme, 2013).

Nevertheless, few authors have explicitly discussed the relationship between measured inequality and the general perception of inequality. According to Runcinam (1966) inequality is perceived and suffered as relative deprivation: individuals compare their own outcome such as

income, consumption, and wealth, with that of a reference group. Their feeling of deprivation is an increasing function of the number of individuals having more than them. If this is the case, as shown by Yitzhaki (1979), the Gini index (multiplied by the average outcome) should correctly aggregate the total perceived deprivation. Although an index *à la* Rucinam is a measure of inequality which aggregates individual deprivations, and not a measure of how individuals perceive the level of inequality in their society. If the two perceptions are close enough, we can expect a strong correlation between perceived inequality and actual inequality measured by the Gini coefficient. However, a number of recent empirical contributions in psychology and economics have shown that the perception of inequality reported by people in opinion surveys does not correspond to income inequality as it is commonly measured (Chambers et al., 2014; Cruces et al., 2013; Gimpelson and Treisman, 2015; Norton and Ariely, 2011; Verme, 2013). Other contributions have shown that a society's structure can be perceived to be considerably less equitable than it actually is (Niehues, 2014). Finally, Keller et al. (2010) compare 27 European countries and suggest a stronger correlation between perception of inequality and measures of poverty than for measures of inequality itself.

It is important to note, however, that the preponderance of the economic literature that has investigated this topic has not focused on the factors that explain the perception of inequality. Perceived inequality has, instead, been generally considered to be an exogenous explanatory variable of the citizens attitude toward redistribution. Beside the classical median voter theory, in which the voters attitude is determined solely by their position in the income distribution, the "tunnel effect" theory - described by Hirschman and Rothschild (1973) - suggests a role for expectations: inequality in the short run can be positively perceived even by worse off individuals if it is interpreted as a signal of general improvement in the future. Similarly, the "prospect for upward mobility" hypothesis–theoretically investigated by Benabou and Ok (2001)–suggests that, when expecting future upward mobility, even individuals with an income below the median will oppose progressive redistributive policies.

In discussing this mechanism, these contributions have often introduced the idea that the degree of equal opportunity and social mobility is crucial in determining the acceptability of inequality. According to Piketty (1995), this idea dates back to De Tocqueville (1835) who suggested that different rates of social mobility in the United States and Europe could explain the differing attitudes toward redistribution. This point of view is shared by a number of authors that have explained different attitudes toward inequality on the two continents by reference to the difference in popular beliefs about the degree of social mobility (Lipset and Bendix, 1959; Alesina and La Ferrara, 2005; Alesina and Angeletos, 2005). A similar explanation has been proposed by Whyte (2010) and Lu (2012) in discussing the reaction to growing inequality in China, and also by Gimpelson and Monusova (2014) in relation to a large sample of countries. According to these theories, perceived inequality depends on the difference between what individuals feel entitled to obtain and what they have obtained or expect to obtain in the future.

Again, these contributions have considered the perception of equality of opportunity and social mobility due to exogenous factors and have included them among the variables explaining peoples attitudes toward inequality and redistributive policies. In what follows we endeavor to take a step back and seek instead to explain how the perception of equality of opportunity is formed and, further, to explain the relationship between this perception and the actual degree of equality of opportunity in a given society. Very few sociological contributions have attempted to shed light on how the individual perception of social mobility is formed (Webb, 2000; Attias-Donfut and Wolff, 2001). Among economists, only Pasquier-Doumet (2005) makes a contribution that focuses on the perception of inequality of opportunity. Her analysis is based on a rich questionnaire of semi-

open questions asked to a sample of 100 individuals in Lima. Unfortunately, her contribution is a descriptive working paper which was never published but nevertheless contains a number of interesting research starting points.

The simplest possible approach to this problem consists in assuming that the cognitive process of quantifying the relative role of choices and circumstances in determining success in life is close enough to the prevailing methodology followed by economists to measure inequality of opportunity. If this is true, we should expect a strong correlation between measured and perceived inequality of opportunity. Of course, individual perceptions may be imprecise due to the complexity of the phenomenon of inequality of opportunity. In order to formulate an opinion on the degree of inequality of opportunity, one must first ascertain the average effect that choices and circumstances have on outcomes. Then, in order to judge the intensity of the phenomenon, one must compare inequality caused by circumstances beyond individual control in her particular country against some benchmark, for example by making a comparison with the same phenomenon in other countries. Individuals will inevitably make mistakes while undertaking this complicated process of reasoning. However, if the expected value of the error is zero and errors are not correlated within and between individuals, the distribution of perception among a large sample of individuals will be approximately normally distributed around the objective measure of inequality of opportunity.

On the other hand, it must also be acknowledged that individual perceptions may be influenced by other factors and, where this occurs, their aggregation may be less straightforward. A case in point would be a country in which institutional characteristics (for example, its fiscal system) affect public perception. In such cases we will find individuals perception to be downward biased or upward biased depending on the fiscal system in place in their country. Moreover, a plausible hypothesis is that perceptions of the relative importance of exogenous circumstances are shaped by personal experience. Assuming that people can at least identify where they stand in respect to income distribution and their exogenous circumstances, we are left with the problem of understanding how individuals quantify the causal contribution of innate characteristics to this outcome.

The economic literature is silent on this issue, but there is extensive literature in the field of social psychology that considers how individuals explain or attribute causes to outcomes. Since Fritz Heider's seminal contributions, the attribution theory represents the main theoretical framework to explain the processes by which individuals attribute causes to events and behaviours (Weimer, 1974). According to this theory attribution can be internal, if individuals consider that an event is due to individual characteristics such as traits or feelings, or external if individuals consider the any given event occurs as a result of situational factors beyond personal control. According to Weimer, attribution can also be classified by other two causal dimensions: stability and controllability.

In this literature, a number of empirical contributions have shown the presence of bias in the perceptual process, especially when individuals make causal inferences with regard to personal outcomes (Miller and Ross, 1975; Russell, 1982). According to these authors, a self-serving bias operates when individuals formulate attributions about the causes of personal successes and failures, distorting the cognitive process in order to maintain self-esteem. When explaining success individuals tend to emphasise the role of internal causes. Failures, on the other hand, tend to be more often perceived as caused by external and uncontrollable factors. This point is particularly relevant for our analysis. When asked about the role of circumstances beyond individual control in determining success in life, interviewees may formulate a judgment based on experiences of success and failure familiar to them. In doing so, their own experience may be disproportionately weighted. Therefore, due to this self-esteem bias, we no longer expect the perception of inequal-

ity of opportunity to be distributed around its objective measure. On average, individuals who perceive their life as a story of success will tend to understate the role of external conditions in determining outcomes and by extension they will underestimate the degree of inequality of opportunity in their country. Conversely, individuals who perceive their life experiences to be failures will tend to overemphasise the importance of circumstances beyond individual control–that is to say that they will overestimate the degree of inequality of opportunity.

The rest of this paper is organised as follows: Section 2 introduces the concept of equality of opportunity, one of the most widely adopted approaches to measure it, and proposes an index to measure inequality of opportunity perception. Section 3 presents estimates of inequality of opportunity and its perception in 22 European countries. In Section 4, we empirically investigate what factors influence the individual perception of the degree of equal of opportunity. Section 5 concludes.

2 Inequality of opportunity and its perception

A precondition for our analysis is a precise definition of what we mean when we talk about inequality of opportunity. Inequality of opportunity and social mobility have been at the centre of the research agenda in sociology and economics for at least four decades and a number of definitions, to a large extent overlapping, have been proposed in both disciplines.

Recent economic literature addressing the measurement of inequality of opportunity has grown since the early work done by van de Gaer (1993) and Roemer (1998). As already mentioned a vast range of definitions and measures have been proposed and implemented in the last two decades; the most prominent theoretical definitions in the literature have been recently summarized by Ferreira and Peragine (2015) and Roemer and Trannoy (2015), a survey of the empirical approaches to measure inequality of opportunity can be found in Ramos and Van de Gaer (2012), a meta analysis of the existing evidence is proposed by Brunori et al. (2013).

In the following, we adopt the simple framework introduced by Checchi and Peragine (2010) to measure inequality of opportunity.

2.1 A measure of inequality of opportunity

The conceptual basis for the definition of inequality of opportunity is provided by the distinction between individual efforts and pre-determined circumstances. This approach considers that inequality due to the former is not ethically offensive, whereas it suggests that differences in individual outcome due to the latter represent a violation of the principle of equality of opportunity and should therefore be removed.

Equation (1) is the simplest possible model to study inequality of opportunity: individual desirable outcome (y_i) is obtained as a function of two sets of traits: circumstances beyond individual control ($c = c_1, ..., c_K$) and choice ($e = e_1, ..., e_J$).

$$y_i = f(c_{i,k}, e_{i,j}) \tag{1}$$

Inequality of opportunity is identified as the inequality due to circumstances beyond individual control. In the literature, circumstances beyond individual control include all observable exogenous characteristics such as parental education, parental occupation, sex, and race. Because inequality due to choice or effort is generally unobservable it is obtained residually. To assess the degree of inequality of opportunity (i.e. the severity of the violation of equality of opportunity)

we need a meaningful decomposition of total inequality ($I(y)$) which will allow us to separate inequality due to circumstances ($IOp(y)$) and inequality due to effort ($IOe(y)$))

Unfortunately, a clear distinction between the two components of inequality is generally impossible except in the very unlikely case of constant effect of circumstances on outcome for different effort levels. Whenever the unfair advantage of a circumstance is a function of the effort exerted, it becomes impossible to distinguish the share of inequality due to opportunity from the residual inequality due to choice. This impossibility stems from the tension between the principle of compensation and the principle of reward and is well known in the literature on fair allocation (Fleurbaey, 1995; 2008) and on the measurement of unfair inequalities (Fleurbaey and Shockkaert, 2009; Fleurabey and Peragine, 2011). Because of this tension, any measure of inequality of opportunity can be fully consistent with one of the two principles but only partially satisfies the other. In what follows, we adopt a decomposition of total inequality fully consistent with the principle of compensation, which was proposed by Checchi and Peragine (2010) and has been adopted in the empirical literature.

To obtain such a decomposition of total inequality we first partition the entire population into groups, called types, where each type includes all individuals characterised by the same circumstances. For example, a hypothetical country characterised by two circumstances, sex and race, would be partitioned in four types: black men, black women, white men, white women. Then, following Roemer (1998), we assume that effort (e) is orthogonal to circumstances (c), that is, any inequality correlated with circumstance is inequality due to opportunity. Under this assumption the degree of effort exerted by an individual can be measured as her position in the type specific distribution of outcome. Individuals sitting at the same quantile of the outcome distribution of different types are assumed to have exerted the same degree of effort. For example, a black woman sitting at the top decile of her type-specific income distribution is considered to be exerting the same degree of effort of a white man in the richest 10% of his type-specific income distribution. Our original distribution of income is now twice partitioned: in types (individuals affected by different circumstances) and in quantiles (made of individuals that exert the same degree of effort). We can now measure $IOp(y)$ as inequality between types and IOe as inequality between quantiles. To obtain this decomposition there are a number of methods which unfortunately lead to different IOp estimates (Fleurbaey, 2008; Ferreira and Peragine, 2015). Again, here we follow the popular approach proposed by Checchi and Peragine (2010).

We consider inequality between quantiles as legitimate because this is due to individual effort, whereas inequality within quantiles we consider to be inequality of opportunity. Therefore we modify the original distribution of incomes: we first replace the individuals' income of those sharing same circumstances and same degree of effort with their mean income of (μ_k^j), then we divide types' mean by the mean of their quantile (μ^j) multiplied by the populations average income (μ). This transformation removes all inequality between quantiles (and within types) and leaves intact inequality within quantiles. Inequality in this counterfactual distribution is therefore IOp and the remaining is IOe.

$$IOp = I\left(\frac{\mu_k^j}{\mu^j}\mu\right) = I(y^c) \tag{2}$$

However, not all circumstances are observable. Therefore, IOp is interpreted as a lower bound estimate of inequality due to opportunity in the distribution of y. For our purposes, this measure of IOp has two important features: it is widely adopted in the relevant literature and it has an intuitive meaning. The second property is crucial in this context because we aim to precisely

compare measures and perceptions of the phenomenon. More sophisticated measures of inequality of opportunity may be much more distant from the intuitive meaning of the term[1].

2.2 A measure of inequality of opportunity perception

We now turn to the unexplored problem of quantifying the perceived degree of inequality of opportunity. Equality of opportunity is a largely agreed upon political ideal. However, a part of its popularity may be explained by its vagueness: a large number of markedly heterogeneous interpretations of the terms can be found in the literature and in the public debate. For example, a typical misunderstanding arises when discussing the role of innate ability. Although innate ability is clearly among circumstance beyond individual control, many do not consider it a source of unequal opportunities. Similarly, despite the fact that religious affiliation may be considered a choice and not a circumstance, inequality between religious groups may be considered a signal of inequality of opportunity.

Moreover, even assuming agreement on the sources of legitimate and illegitimate inequality, there exist many meaningful ways to quantify the share of total inequality due to the latter. Equality of opportunity combines two principles: the principle of compensation and the principle of reward. According to the principle of compensation, inequality is unfair when it arises from circumstances beyond individual control e. g. socioeconomic background, gender, race. The principle of reward states that whenever inequality is the result of choices and effort, it is legitimate. A definition of equality of opportunity is a balance between these two principles. There are many possible ways of balancing compensation and reward, and therefore many possible measures of inequality of opportunity. Similarly, there are also many possible ways to perceive the degree of equal opportunity in a given society. The consequence is that when attempting to measure the perceived level of inequality of opportunity, we must be aware that respondents may indicate different things when referring to "equality of opportunity".

However, opinion surveys often contain questions about the relevance of different factors in determining individual success. Answers to questions about the role of circumstances beyond individual control in determining individual success represent without ambiguity measures of the perceived violation of the principle of compensation. Each question, asking about the role of race, gender or socioeconomic background, captures a particular dimension in which the compensation principle is perceived to be violated. Then, the more relevant circumstances beyond individual control in determining outcomes, the higher the inequality of opportunity is perceived. Similarly, answers to questions about the role of effort and choice in determining success in life capture individual beliefs about the extent to which the principle of reward is violated. The more choice and effort are considered crucial to obtain valuable outcomes, the lower is the perceived level of inequality of opportunity.

Therefore a possible measure of perceived inequality of opportunity is a compound measure that aggregates a set of answers about the role of circumstances and responsibility variables in determining outcomes in life. This index should be monotonically increasing in all dimensions that measure perceived violations of the equality of opportunity ideal.

Perceived violations can be retrieved from opinion surveys containing questions about the role of circumstances and choice in determining success in life. What is not obvious is how to

[1] For example, as shown by Brunori and Peragine (2011), the compensation-consistent measure proposed by Checchi and Peragine (2010) is virtually never consistent with the principle of reward. One therefore may consider a measure such as the *fairness gap* introduced by Fleurebaey and Schokkaert (2009) a preferable measure of IOp because it has the property of being also consistent with the reward principle for a reference circumstance. However, we consider the measure proposed by Checchi and Peragine more intuitive because of its reference to averages.

aggregate them in an index of perceived inequality of opportunity.

If questionnaires demand the filling in of answer categories with a cardinal meaning we can obtain such an index as a weighted combination of answers. This can be done following a normative approach: imposing degree of complementarity between dimensions and weights to each component. Alternatively we can rely on multivariate statistical methods, such as the principal component analysis, in order to aggregate information contained in a set of answers. The latter approach is particularly advisable when we suspect that observed dimensions of the phenomenon capture the same latent dimension. This implies a strong correlation between components and a problem of 'double counting' of the latent dimension when aggregating information (Decancq and Lugo, 2013).

However, in most cases, answers contained in value surveys are based on ordinal scales. If this is the case, the ordinal nature of the scale limits the types of operation we can perform with elements drawn from the scale and their aggregation is less straightforward. On the one hand, there exist methods to aggregate ordinal information by assigning values explicitly or implicitly in a numerical scale for all answers. On the other, if the objective is to aggregate information preserving the ordinal nature of the answers, we are compelled to use an algorithm operating directly on a pure ordinal scale (Domingo-Ferrer and Torra, 2003). In what follows, we will endorse the latter approach, proposing an ordinal measure of inequality of opportunity perception based on a set of survey answers.

Assume we observe k answers measuring perceived violations of the equality of opportunity principle. All answers can assume the same set of ordinal values ($\lambda = A < B < ... < Z$). For each individual we construct the vector $\mathbf{v} = (v_1, ..., v_k)$ that contains the values of all answers ranked in ascending order so that ($v_1 \leq v_2 \leq ... \leq v_k$). $\mathbf{v}$ contains perceived violations of the equal opportunity principle measured over k dimensions. Note that together with the intensity of the perceived violation the rank of dimensions may also vary between individuals. We measure perceived inequality of opportunity with the median based operator $IOpP$ which has a different definition in the following cases:

case 1) k is odd: $IOpP(v_1, ..., v_k) = v_{\frac{k+1}{2}}$

case 2) k is even and $v_{\frac{k}{2}} = v_{\frac{k+1}{2}}$: $IOpP = v_{\frac{k}{2}} = v_{\frac{k+1}{2}}$

case 3) k is even and $v_{\frac{k}{2}} \neq v_{\frac{k+1}{2}}$: $v_{\frac{k}{2}} < IOpP < v_{\frac{k+1}{2}}$

case 4) k is even, $v_{\frac{k}{2}} \neq v_{\frac{k+1}{2}}$, and $\exists$ a nonempty set of values U s.t. $v_{\frac{k}{2}} < u_i, ...u_j < v_{\frac{k+1}{2}}$: $IOpP = median(U)$

In the first two cases $IOpP$ is the median of the vector $\mathbf{v}$, in the third case $IOpP$ defines a new ordinal value "between $v_{\frac{k}{2}}$ and $v_{\frac{k+1}{2}}$", in the fourth case we pick the median of the set of values equal to or higher than $v_{\frac{k}{2}}$ and equal to or smaller than $v_{\frac{k+1}{2}}$.[2]

Consider a simple example: a questionnaire contains four questions: two concerns the perceived violation of the principle of reward and two concern the violation of the principle of compensation. Possible answer are A, B, C, D, E, where A indicates that the principle is not at all violated and the answer E expresses the maximum possible level of perceived violation.

Individual i, j and l report the following answers:

[2]If again the median is not an ordinal value belonging to λ we apply the same method used for case 3 and 4.

	comp. 1	comp. 2	reward 1	reward 2
individual i	D	C	C	A
individual j	D	C	D	C
individual l	E	A	A	E

Then:

$$\mathbf{v}^i = (A, C, C, D)$$
$$\mathbf{v}^j = (C, C, D, D)$$
$$\mathbf{v}^l = (A, A, E, E)$$

and

$$IOpP^i = C$$
$$IOpP^j = CD$$
$$IOpP^l = C$$

Note that for individual j the median of v^j would be the mean between category C and D which cannot be calculated on an ordinal scale. To preserve the ordinal nature of the scale $IOpP$ operator defines a new ordinal value: $C < IOpP^j = CD < D$. The only case in which we are not preserving the ordinal nature of answers is the case in which to calculate the median we must calculate the mean of two non contiguous answers (individual l). Although these cases may be rare in practice, the example above - where $IOpP^i = IOpP^l$ - makes clear that our measure contains a certain degree of cardinality.

In what follows we will adopt $IOpP$ to quantify the perceived level of inequality of opportunity. $IOpP$ is an ordinal measure that assigns same weight to each dimension included in the analysis. $IOpP$ has the needed property of being monotonically increasing in all the relevant dimensions. An increase in any of the values measuring perceived violation of the two principles implies a change of $IOpP$ greater than or equal to zero.

3 Inequality of opportunity and its perception in 22 European countries

The data requirements for studying the relationship between inequality of opportunity and its perception are rather demanding. It requires both information on public opinion and a precise record of incomes and individual circumstances. These two types of information are rarely contained in a unique dataset. We therefore merge information from two sources: the International Social Survey Programme (ISSP 2009) and the European Union Statistics on Income and Living Conditions (EU-SILC 2011). Although the first survey contains opinions recorded in 2009 and the second contains incomes earned in 2010, we consider the two surveys as if they were conducted simultaneously. This small asynchrony may be ignored because the persistence of income distribution may be high across a single year and also because the phenomenon we are dealing with is measured and judged in a time horizon of two generations. Conversely, the fact that ISSP was conducted in the aftermath of the Great Financial Crisis (2007-08) represents a potential threat for the external validity of our analysis. It may be possible that individual perceptions have been modified after a shock that has reduced expectations for future growth, at least in the richest economies.

Given the large overlap of the two samples we are able to study a subsample of 22 European countries included both in EU-SILC 2011 and ISSP 2009: Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), Czech Republic (CZ), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Germany (DE), Hungary (HU), Iceland (IS), Latvia (LT), Norway (NO), Poland (PL), Portugal (PT) Slovak Republic (SK), Slovenia (SI), Spain (ES), Sweden (SE), Switzerland (CH), United Kingdom (UK).

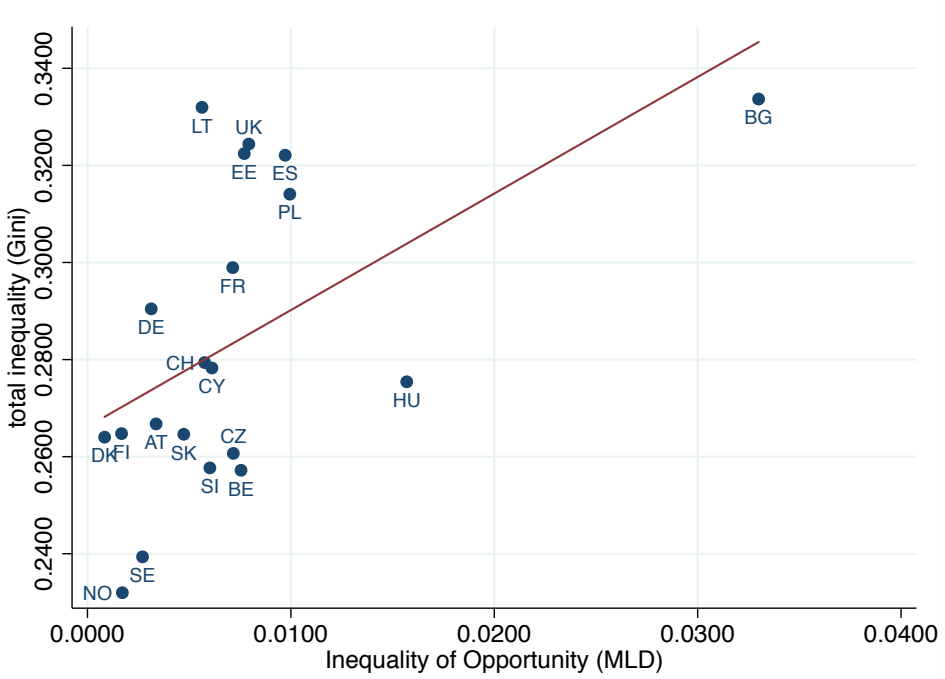
The data needed to measure IOp is a representative survey of individuals containing information about: income, socioeconomic background, country of origin and possibly all the other circumstances beyond individual control that play a role in determining income. Although ISSP 2009 contains all these variables, because its sampling strategy is constructed to correctly represent opinions and not individual economic condition it cannot be considered sufficiently reliable to estimate other phenomena such as the income distribution. In particular, comparing the household income variable - the outcome of interest in this analysis - with official estimates, we have found systematic inconsistencies. We therefore estimate IOp for the sample of European countries exploiting the Survey on Income and Living Conditions, (EU-SILC). EU-SILC is a reliable source for the analysis of the income distribution. Moreover, it has already been utilised by a number of authors in the study of equality of opportunity. The wave collected in 2010 contains a module about intergenerational transmission of disadvantages which includes information about socioeconomic background. We follow other contributions by limiting our analysis to a subsample of respondents: working age, adult individuals aged between 25 and 65 (Marrero and Rodrguez, 2012; Checchi et al, 2015). We implement a non-parametric approach to estimate IOp, identifying groups of individuals sharing same circumstances and then partitioning each group into three income quantiles. This procedure is demanding in terms of sample size and forces us to consider only three circumstances beyond individual control: parental education, parental occupation and gender, Table 6 in the Appendix reports the distribution of circumstances across countries. IOp is then calculated as the mean logarithmic deviation applied to the counterfactual distribution (y^c) where the outcome y is the household income divided by the square root of the number of household components[3]. Other contributions identify individual outcome with earnings or - especially in poorer countries - with per capita consumption. We prefer to use equivalent income which allows us to include in the analysis all individuals without individual earnings which nevertheless benefit from a positive income. Table 1 reports the sample size, mean income, total inequality, and IOp (both in levels and as share of total inequality). IOp varies between 0.0008 (0.53% of total inequality) in Denmark and 0.0330 (16.04%) in Bulgaria. Our estimates in Figure 1 show the well known positive relationship between total inequality and inequality of opportunity (Corak, 2013) and a lower level of equality of opportunity for Mediterranean and transition economies.

To measure the perception of inequality of opportunity, we use opinions recorded in the ISSP 2009. ISSP is a continuing annual programme of cross-national collaboration on surveys covering a number of topics relevant for social scientists. The wave recorded in 2009 contains information about how social mobility and equality of opportunity are experienced and perceived together with a number of individual-level covariates (ISSP Research Group, 2012). ISSP has been widely adopted in the sociological literature and it is increasingly seen as a reliable source of information to analyse individual perception also by economists.[4] Descriptive statistics of the average values of respondents characteristics in the 22 samples are reported in Table 3 in section 4.

[3]Although other inequality measures, such as the Gini, are used to measure IOp, the mean logarithmic deviation has been traditionally adopted because of its perfect and path independent decomposability into between and within groups (Checchi and Pragine, 2010).

[4]See among others (Engelhardt and Wagener, 2014; Kerr, 2014; Gimpelson and Treisman, 2015).

Figure 1: Inequality and IOp



Inequality of opportunity is inequality due to exogenous variables (IOp in eq. 2).
Source: Author' calculation based on EU-SILC (2011)

Table 1: EU-SILC descriptive statistics

country	sample	mean income	inequality (Gini)	inequality (MLD)	IOp (MLD)	IOp (%)	GDP	GDP growth (%)
AT	6,686	25,110	0.2667	0.1277	0.0034	2.64	35,200	1.11
BE	6,025	22,950	0.2572	0.1263	0.0076	5.98	33,600	1.09
BG	7,398	9,963	0.3337	0.2057	0.0330	16.04	4,900	1.61
CH	7,322	24,177	0.2794	0.1409	0.0058	4.09	55,700	1.10
CY	5,188	27,475	0.2783	0.1365	0.0061	4.48	23,000	1.12
CZ	7,220	13,727	0.2607	0.1200	0.0072	5.98	14,900	1.34
DE	12,185	24,154	0.2904	0.1420	0.0031	2.21	31,500	1.10
DK	2,784	23,155	0.2640	0.1569	0.0008	0.54	43,500	1.03
EE	5,485	11,406	0.3224	0.1993	0.0077	3.87	11,000	1.46
ES	16,104	18,022	0.3221	0.2101	0.0097	4.63	23,200	1.08
FI	5,170	22,796	0.2647	0.1168	0.0017	1.44	34,900	1.14
FR	11,536	23,839	0.2989	0.1573	0.0071	4.54	30,800	1.06
HU	14,327	11,382	0.2754	0.1277	0.0157	12.29	9,800	1.25
IS	1,750	19,228	0.2570	0.1106	0.0014	1.27	31,500	1.15
LT	5,384	9,410	0.3319	0.2151	0.0056	2.62	9,000	3.39
NO	2,752	29,606	0.2320	0.0951	0.0017	1.80	66,200	1.07
PL	15,606	12,151	0.3141	0.1776	0.0099	5.60	9,300	1.46
PT	6,331	15,027	0.3380	0.1975	0.0188	9.55	17,000	1.05
SE	1,143	20,045	0.2394	0.1072	0.0027	2.53	39,400	1.17
SI	5,243	17,026	0.2577	0.1020	0.0060	5.90	17,700	1.26
SK	7,562	13,162	0.2646	0.1329	0.0047	3.56	12,400	1.59
UK	6,598	21,716	0.3244	0.1868	0.0079	4.24	28,900	1.11

Equivalent income and GDP per capita are expressed in euro PPP ESA 2010.
Source: Author' calculation based on EU-SILC (2011) and Eurostat (2015)

In order to estimate *IOpP* we combine the answer to a number of questions that we believe capture the perception of the phenomenon. From the ISSP questions about the importance of different individual characteristics for "getting ahead in life" we select the following:

1. coming from a wealthy family?
2. knowing the right people?
3. a person's race?
4. a person's religion?
5. being born a man or a woman?
6. having ambition?
7. hard work?

Possible answers are: 1=essential, 2=very important, 3=fairly important, 4=not very important, 5=not at all important.

The first five questions measure the perceived violation of the principle of compensation: if the respondent identifies family wealth, connections, religion, race, or gender as important characteristics for success in life, then the degree of inequality of opportunity she perceives is high. The latter two questions measure to what extent the principle of reward is perceived to be satisfied: the more hard work and ambition are considered important determinants of success the higher the degree of perceived equal opportunity. Table 2 reports the share of respondents that considered each determinant at least very important to get ahead in life. The picture we get is very heterogeneous and contains a number of interesting outliers. A low number of respondents consider family wealth to be at least very important, in transition economies (21% in Bulgaria and Poland) while the highest percentage is interestingly found in Finland, the country with the third lowest IOp in our sample. Connections are considered at least very important by almost 40% of the French interviewees but by less than 6% of the Polish and Slovak respondents. Race is considered to be at least very important by over 70% of the Estonian and 78% of the Latvian respondents[5]. Race is apparently perceived to be less important in Hungary (40%). Religion appears as an important determinant of success again in Latvia (89%) and Estonia (88%)[6]. Estonia has also the highest percentage of respondents considering gender essential or very important to success in life (77%). As far as the questions regarding the reward principle are concerned Estonia again signals a high degree of perceived IOp with only 46% of the respondents considering ambition at least very important, the highest percentage is found in Poland (91%). Finally, "hard work" is viewed as an essential element of success in Iceland (93%) while, at the opposite end of the scale is Denmark with only 41% of respondents convinced of its importance. Table 2 shows a large heterogeneity, both in the absolute importance and the ranking of different sources of inequality. Religion is on average considered the main source of unequal opportunity; ambition and hard work are also perceived as important factors to succeed in life. "Knowing the right people" is on average perceived to be the least important of the variables considered.

[5]This may be connected to the problem of access to the labour market for non-native speakers (mainly Russian) more than with the issue of race per se.

[6]Also in this case the religious cleavage overlaps with ethnicity, with a minority of Russian-speaking Orthodox followers in both countries.

Table 2: Determinants to get ahead in life: share of respondents answering 'essential' or 'very important'.

country	family wealth	connections	race	religion	gender	ambition	hardwork
AT	0.3008	0.0826	0.5374	0.6835	0.5321	0.7487	0.6696
BE	0.4692	0.0842	0.5560	0.7194	0.6647	0.5458	0.6403
BG	0.2153	0.0708	0.5360	0.6174	0.5233	0.8454	0.8029
CY	0.3480	0.2220	0.6380	0.6900	0.7280	0.8410	0.8800
CZ	0.4613	0.1344	0.5276	0.8038	0.5462	0.6661	0.7447
DK	0.5501	0.2055	0.6653	0.7022	0.6963	0.6001	0.4065
EE	0.3270	0.1155	0.7096	0.8797	0.7676	0.4613	0.6822
FI	0.6670	0.2424	0.6463	0.8064	0.7234	0.5026	0.6239
FR	0.6158	0.3932	0.6466	0.8312	0.6974	0.6066	0.5336
DE	0.3563	0.0674	0.5419	0.7792	0.6122	0.7799	0.6975
HU	0.2520	0.1465	0.4066	0.7568	0.5254	0.7659	0.7077
IS	0.5861	0.1859	0.6536	0.8205	0.6800	0.8933	0.9271
LT	0.2816	0.1328	0.7848	0.8868	0.7212	0.5575	0.7624
NO	0.4966	0.1951	0.4238	0.6827	0.6058	0.8207	0.7589
PL	0.2109	0.0566	0.6938	0.6840	0.5617	0.9132	0.8494
PT	0.2641	0.1344	0.6122	0.7171	0.6475	0.7142	0.8660
SK	0.3046	0.0559	0.5870	0.7022	0.5604	0.7303	0.7521
SI	0.3277	0.0610	0.6535	0.7099	0.5437	0.7174	0.7099
ES	0.3773	0.1190	0.6336	0.7806	0.6393	0.5634	0.6765
SE	0.5057	0.1671	0.6157	0.7001	0.6157	0.8197	0.7353
CH	0.6168	0.1211	0.6394	0.7884	0.6138	0.6285	0.6690
UK	0.5009	0.1885	0.6028	0.6811	0.6321	0.6138	0.7216

Share of answers are obtained using sample weights when available.
Possible answers: 1=essential, 2=very important, 3=fairly important, 4=not very important, 5=not at all important.
Source: Author' calculation based on ISSP, 2009.

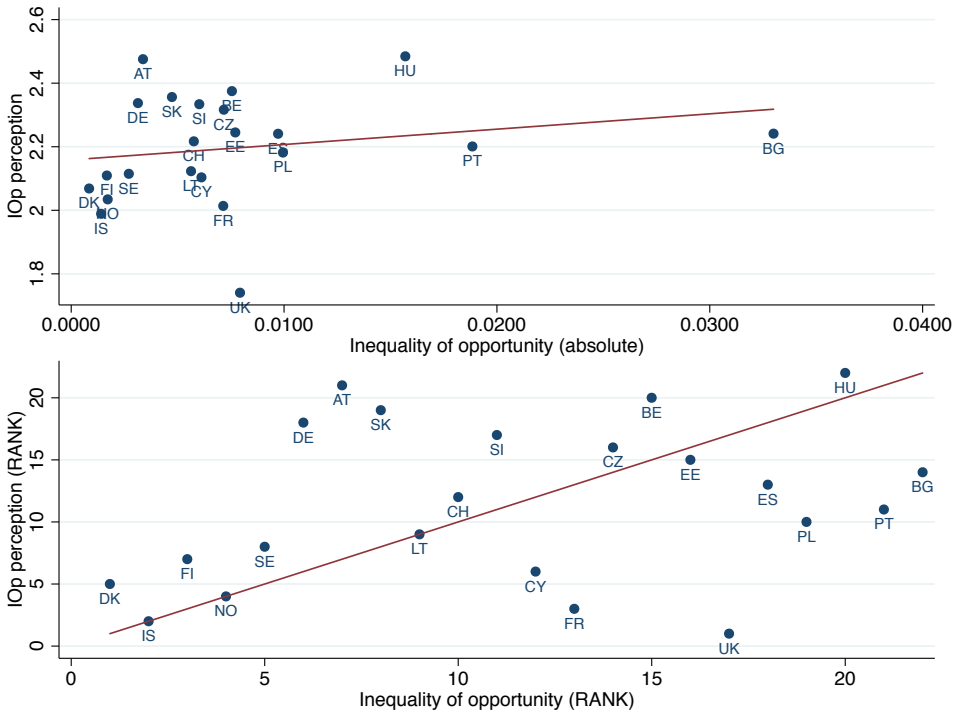
To measure $IOpP$ we first make the five questions about compensation consistent with the other two - that is, we recode them so that 1=not at all important" and 5=essential". Because the number of considered dimensions is odd, the resultant index of inequality of opportunity perception, $IOpP$, is simply the median of the seven answers; it ranges between one and five and has a clear ordinal meaning. $IOpP$ assumes value 1 when at least four of the seven factors violating the principle of equal opportunity are judged as "not at all important" and it assumes value 5 when at least four of the seven violations are perceived as essential.

However, there is an important potential threat to the reliability of our measure of perceived inequality of opportunity. Constructing $IOpP$ we are implicitly aggregating seven dimensions assigning the same relative weight to all questions. In the absence of a criterion to assign different weights, this choice may be legitimate only if the seven questions actually capture distinct dimensions of the phenomenon. If this is not the case, we may risk incurring the problem of double counting. That is, we are adding up dimensions that are proxies of the same latent dimension which end up being disproportionally weighted. However, if this were the case, we should expect to find a strong correlation between answers - a correlation that, in our case, does not seem to occur. Table 8 in the Appendix reports correlations between each pair of answers. The correlations have the expected signs but are rather weak. Therefore we can exclude the double counting problem and we use all seven dimensions to calculate $IOpP$.

Figure 3 reports perceived and measured IOp in the 22 European countries. The top scatterplot

presents both IOp and $IOpP$ in absolute terms. The correlation coefficient calculated on this sample of countries is rather weak (0.1375) and not statistically significant. Although, it should be noted that an increase in IOp is associated with a slight increase in $IOpP$; many countries with a similar degree of equality of opportunity show very different perceptions of the phenomenon. Belgium and United Kingdom have very similar IOp values but are found at the two extremes in terms of perception. Similarly Bulgaria has four times the IOp of Switzerland but very similar average perception. However, it is possible that the perception of inequality of opportunity is an inherently relative concept: respondents tend to assess the relative position of their own countries in terms of equal opportunities rather than the absolute intensity of the phenomenon. The bottom scatterplot reports the same correlation looking at the rank of countries. Again, average perception is very far from the actual ranking of countries based on the IOp measure, with some countries extremely far from what is expected (the 45 degree line).

Figure 2: Inequality of opportunity: measure and perception

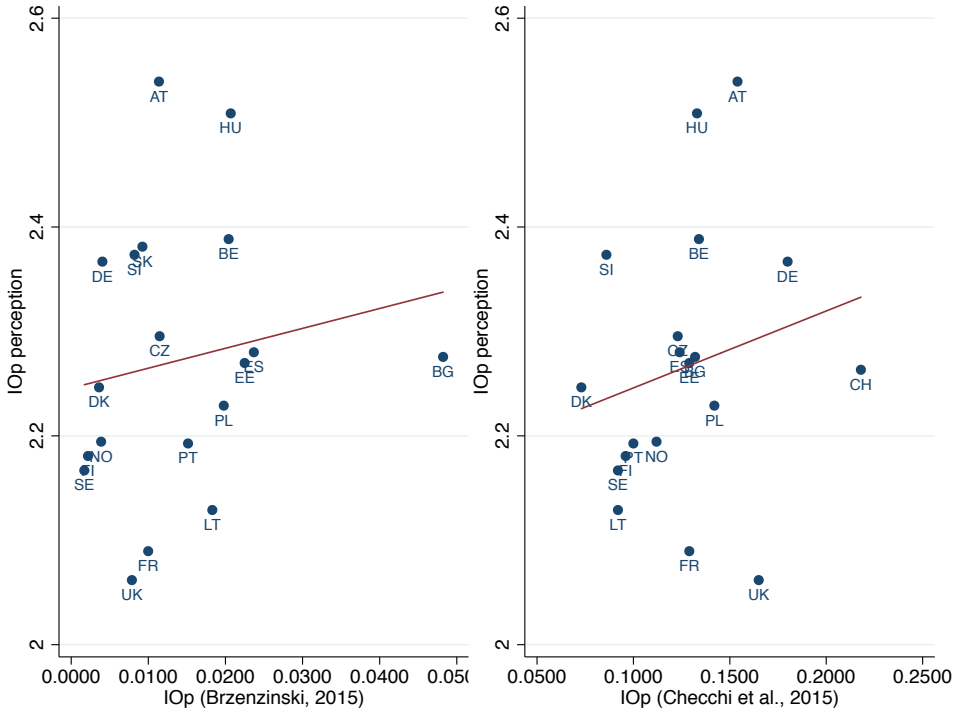


Inequality of opportunity is the share of total inequality due to exogenous variables (IOp in eq. 2).
Attitude toward inequality is the average $IOpP$ index in each country.
Source: Author' calculation based on ISSP (2009) and EU-SILC (2011).

Such descriptive figures suggest that individual perception of inequality of opportunity very weakly correlates with to scholarly measurement of it. Note also that this conclusion is not driven by the way we have aggregated the seven answers. Figure 5 in the Appendix reports seven rank correlations between IOp and its perception when the latter is measured by the answer to a single question. All scatterplots show an even lower level of association between IOp and each dimension of $IOpP$. In the last case, the question about "hard work", the correlation of ranks has the unexpected negative sign.

On the other hand an other possible explanation for such a weak association between the measure and perceived phenomenon could be related to the way we have measured inequality of opportunity. There are many methods to measure inequality of opportunity and different approaches can lead to systematically different estimates. In order to control whether different measures of inequality of opportunity would better correlate with $IOpP$ we consider inequality of opportunity as measured by Checchi et al. (2015) and Brzenziński (2015). The two studies are based on the same data but follow different measurement approaches. Both opt for a reward-consistent measure of inequality of opportunity (ignoring the role of effort) and consider different set of circumstances beyond individual control. Checchi et al. (2015) adopt a non-parametric approach and choose the Gini coefficient to measure inequality in the counterfactual distribution y^c. Brzenziński (2015) follows a parametric approach. Figure 3 shows the correlation between $IOpP$ and these alternative estimates. Although the two figures are not perfectly comparable with ours, because the set of countries in not exactly the same, we nevertheless find a similar positive correlation higher, 0.1618 and 0.2047 respectively, but again not statistically significant[7]. We may therefore exclude that the finding of weak correlation between measure of inequality of opportunity and its perception is exclusively driven by the method chosen to measure IOp.

Figure 3: Inequality of opportunity and its perception: alternative IOp measures



Source: Brzenziński (2015) and Checchi et al. (2015).

[7]The list of countries and IOp estimates for the three studies are reported in Table 7 in the Appendix.

4 Determinants of the inequality of opportunity perception

The descriptive figures presented in the previous section show that individuals' perceptions do not amount to an unbiased average perception of IOp. We have suggested that $IOpP$ may differ from IOp because in quantifying the role of circumstances on successes and failures, individuals may tend to weigh personal experiences too heavily. If this is the case, their evaluation of IOp may be distorted by what is experienced by some reference group of individuals and in particular by personal experience. In what follows we specify a model able to identify a number of determinants of the individual perception of inequality of opportunity. Because we have aggregated the seven answers, preserving their ordinal nature, $IOpP$ is a multichotomous dependent variable. For individual i in country j we assume that there is a latent continuous metric underlying the ordinal answer to the median of the seven questions ($y^*_{i,j}$). We assume also that the latent variable is a linear combination of a number of independent determinants at individual levels (x), a set of cutpoints (μ), and an unobserved individual effect ϵ.

$$y^*_{i,j} = x'_{i,j}\beta + \epsilon_{i,j} \tag{3}$$

Inequality of opportunity varies across countries; it is therefore safe to assume a component of the individual effect is shared by respondents from the same country. If this is the case, $\epsilon_{i,j}$ should be written as the sum of an individual and a country unobservable effect:

$$y^*_{i,j} = x'_{i,j}\beta + \nu_j + \epsilon_{i,j} \tag{4}$$

ν_j can be a fixed effect or can be influenced by a number of country level variables. In the latter case, it can be written as a function of a set of country level variables (z) and an unobserved country specific effect (u).

$$y^*_{i,j} = x'_{i,j}\beta + z'_j\gamma + u_j + \epsilon_{i,j} \tag{5}$$

y^* is not observable. What we observe is:

$$\begin{aligned} y_{i,j} &= \text{not at all important} \ \text{ if } y^*_{i,j} < \mu_1 \\ y_{i,j} &= \text{not very important} \ \text{ if } \mu_1 < y^* \leq \mu_2 \\ &\ldots \\ y_{i,j} &= \text{essential if } \mu_4 \leq y^*_{i,j} \end{aligned} \tag{6}$$

If the mean and variance for ϵ are normalised to be zero and $\pi^2/3$ and assumed independent of u_j we get:

$$\begin{aligned} \text{Prob}(y_{i,j} = \text{not at all important} \,|x,z) &= H(\mu_1 - y_{i,j}) \\ \text{Prob}(y_{i,j} = \text{not very important} \,|x,z) &= H(\mu_2 - y_{i,j}) - H(\mu_1 - y_{i,j}) \\ &\ldots \\ \text{Prob}(y_{i,j} = \text{essential} \,|x,z) &= 1 - H(\mu_4 - y_{i,j}) \end{aligned} \tag{7}$$

Where $y_{i,j}$ can be specified according to equations (3), (4) or (5) and H(.) is the logistic cumulative distribution function. These probabilities and the degree of association with some explanatory variables can be estimated by maximum likelihood with an ordered logit regression model

(Green, 2003; Rabe-Hesketh and Skrondal, 2012). We specify three versions of the ordered logistic model: (3) a pooled model with corrections of the standard error to account for data clustered in 22 countries, (4) a pooled model with country fixed effects, and (5) a mixed two level model. The latter is a two-level model in which individuals are nested in countries. For the first two models we include among regressors individual controls: the age of the respondent, her sex, her education (whether she at least completed upper secondary level education or not), her employment status (worker, unemployed, retired), and area of residency (rural/urban). Moreover, in order to test for the presence of a self-esteem bias, we add two dummy variables: downward mobility and upward mobility. The former takes value one if the respondent considers the job qualification she has today lower than the job qualification that her father had when she was between 14 and 16 years of age. The latter takes value 1 if the respondent considers her job qualification higher[8]. The mixed model includes also country level regressors. Because the inclusion of many cluster level controls has been shown to be problematic for similar numbers of clusters (Bryan and Jankins, 2015) we limit the number of country level controls to three: IOp in 2010, GDP per capita in PPP, and the GDP per capita growth in the 1999-2009 decade. Table 4 contains the coefficients for the three specifications of the model.

Table 3: ISSP descriptive statistics

country	sample	male	age	urban	degree	worker	unemployed	retired	down. mob.	up. mob.
AT	1,019	0.47	46.16	0.32	0.2918	0.5494	0.0530	0.2811	0.2063	0.3814
BE	1,114	0.49	49.07	0.21	0.6196	0.5379	0.0371	0.2606	0.2166	0.3552
BG	983	0.48	47.51	0.47	0.7379	0.5143	0.1173	0.2757	0.1782	0.3594
CH	1,229	0.46	48.49	0.26	0.3453	0.6270	0.0228	0.1704	0.2266	0.4255
CY	1,000	0.49	42.62	0.53	0.7410	0.6920	0.0230	0.0970	0.2250	0.3970
CZ	1,204	0.49	45.10	0.36	0.3802	0.5171	0.0682	0.2263	0.2688	0.2908
DE	1,392	0.50	49.29	0.30	0.2888	0.5309	0.0568	0.2787	0.2565	0.3534
DK	1,418	0.48	49.96	0.40	0.8667	0.5987	0.0261	0.2278	0.1777	0.4485
EE	1,004	0.45	46.43	0.50	0.7484	0.5409	0.0789	0.2015	0.2408	0.3124
ES	1,209	0.49	46.25	0.27	0.4530	0.4102	0.1822	0.2071	0.1984	0.4319
FI	868	0.50	44.04	0.48	0.5703	0.5691	0.0593	0.1744	0.2014	0.4335
FR	2,814	0.48	48.04	0.23	0.5399	0.5735	0.0401	0.2811	0.2471	0.4451
HU	1,010	0.46	47.17	0.39	0.4328	0.4691	0.0779	0.3288	0.2288	0.2957
IS	945	0.48	46.04	N.A.	0.4825	0.6772	0.0328	0.1164	0.2730	0.2455
LT	1,069	0.39	44.36	0.48	0.7755	0.5669	0.0702	0.2011	0.2591	0.2806
NO	1,363	0.49	47.55	0.41	0.8195	0.7102	0.0103	0.1277	0.1959	0.4175
PL	1,256	0.48	44.76	0.30	0.5963	0.5377	0.0850	0.2491	0.3142	0.4013
PT	1,000	0.47	46.70	N.A.	0.3504	0.6055	0.0713	0.1715	0.2154	0.5009
SE	1,123	0.48	48.33	0.42	0.5352	0.6794	0.0374	0.1683	0.2297	0.4203
SI	1,058	0.45	46.54	0.25	0.5662	0.5359	0.0605	0.2543	0.2543	0.3025
SK	1,155	0.48	44.03	0.18	0.4549	0.4998	0.0881	0.2170	0.2572	0.3589
UK	837	0.48	47.74	0.34	0.4491	0.5952	0.0610	0.2131	0.2443	0.4056

Descriptive statistics are calculated using sample weights where available.

Source: Author' calculation based on ISSP, 2009.

Estimates are consistent across specifications. However, the likelihood-ratio test ($\chi^2 = 356.33$, $Prob > \chi^2 = 0.0000$) suggests that there is enough variability between countries to prefer a multilevel ordered logistic model over a standard ordered logistic model. We therefore focus on the interpretation of model (5).

We first assess whether the categories constructed by aggregating the seven answers are distin-

[8]Note that we are assuming that individuals are able to assess their level of qualification relative to that of their parents, which is not necessarily always the case (Webb, 2000).

Table 4: Individual IOp percetpion: ordered logit estimates

	(3) pooled	(4) pooled (FE)	(5) mixed two level
number of observations	17,950	17,950	17,950
education	-0.0412	0.0193	0.0448
male	0.0430	0.0500†	0 .0523†
age	0.0041***	0.0058***	0.0058***
worker	-0.0741	-0.0804	-0.0955†
retired	-0.0460	-0.0642	-0.0730
unemployed	0.2397**	0.2190**	0.2125**
urban	0.0682*	0.0975**	0.0991***
upward mover	-0.1326***	-0.10708***	-0.1133***
downward mover	0.1120†	0.1605**	0.1481**
country effects	no	yes	yes
IOp			1.1466
growth rate 2000-2010			-0.1887**
GDP per capita 2010			-0.00360**
cut points	95% conf. int.	95% conf. int.	95% conf. int.
μ_1	[-1.7906 -1.4538]	[-1.2234 -0.7749]	[-2.0160 -1.5602]
μ_2	[0.6145 0.9480]	[1.224092 1.6739]	[0.4311 0.8836]
μ_3	[2.9004 3.2550]	[3.5387 4.0059]	[2.7454 3.213]
μ_4	[4.8686 5.3518]	[5.5240 6.0951]	[2.7454 3.213]
random effects			95% conf. int.
var(intercept)			[0.0809 0.12224]

95% confidence intervals in parentheses

† $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Author' calculation based on ISSP, 2009; EU-SILC, 2011, Eurostat, 2015.

guishable categories for the respondents looking at the cutpoints $(\mu_1, ..., \mu_4)$ confidence intervals. Categories with overlapping confidence intervals in an ordinal model are interpreted as signaling that ordinal categories are indistinguishable and would suggest to collapse those categories. However, in our case the values of the perception variable seem to be perceived as well distinguished by individuals. Threshold parameters are significantly different at a 95% level of confidence. Indeed, thresholds are equally spread out, suggesting that the categories we have constructed do not differ much in scope.

The interpretation of the coefficients varies depending on the category considered. An increase in one of the regressors with a positive coefficient is equivalent to shifting the distribution to the right. This shift has an unambiguous consequence on the first and last categories (minimum and maximum perceived level of IOp) because it shifts some mass out of the first interval $[-\infty, \mu_1]$ and toward the last interval $[\mu_4, \infty]$. Therefore, to be older or unemployed reduces the probability of having the lowest possible perception of inequality of opportunity. Urban residency, a variable often included as a proxy for reference group in models of relative deprivation, significantly increases the degree of inequality of opportunity perceived. The self-esteem hypothesis is confirmed for the lowest and highest category by the highly significant coefficients for the downward and upward mobility variables. Moreover, we may interpret the sign of the control for unemployment status as part of the same mechanism. As far as country variables are concerned, GDP per capita and its growth increase the probability to have the lowest possible perception of unequal

opportunities. The sign of the control for economic growth recalls the "tunnel effect" proposed by the literature to explain a lower aversion to inequality in more dynamic countries. Interestingly enough, the objective measure of IOp seems to have no significant impact in the perception of inequality of opportunity itself. However, these interpretations cannot be extended to the three middle categories because the shift of the distribution implies that some mass will move into each of the middle categories but some will also move out.

To evaluate the effect of our control across all the IOpP categories, we report the marginal effects for all categories and all variables in Table 5.

Table 5: Individual IOp percetpion: ordered logit marginal effects calculated for model (5)

	category 1	category 2	category 3	category 4	category 5
average probability	0.1522	0.5222	0.28040	0.0391	0.0061
education	-0.0006	-0.0040	0.0079	0.0016	0.0002
male	-0.0067†	-0.0047†	0.0092†	0.0019†	0.0003†
age	-0.0007***	-0.0005***	0.0010***	0.0002***	0.0001***
worker	0.0122†	0.0088†	-0.0169†	-0.0035†	-0.0005†
retired	0.0095	0.0064	-0.0128	-0.0026	-0.0004
unemployed	-0.0256**	-0.0223*	0.0381*	0.0085*	0.0014*
urban	-0.0126***	-0.0092**	0.0175***	0.00373***	0.0006**
upward mover	0.0146***	0.0102***	-0.0200***	-0.0042***	-0.0008 ***
downward mover	-0.0182 **	-0.0149**	0.0264**	0 .0058**	0.0009 **
IOp	-0.1479	-0.1038	0.2023	0.0425	0.0069
growth rate 2000-2010	0.0243**	0.0170***	-0.0333***	-0.0069***	-0.0011***
GDP per capita 2010	0.0004***	0.0003**	-0.0006**	-0.0001**	-0.0001***

† $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

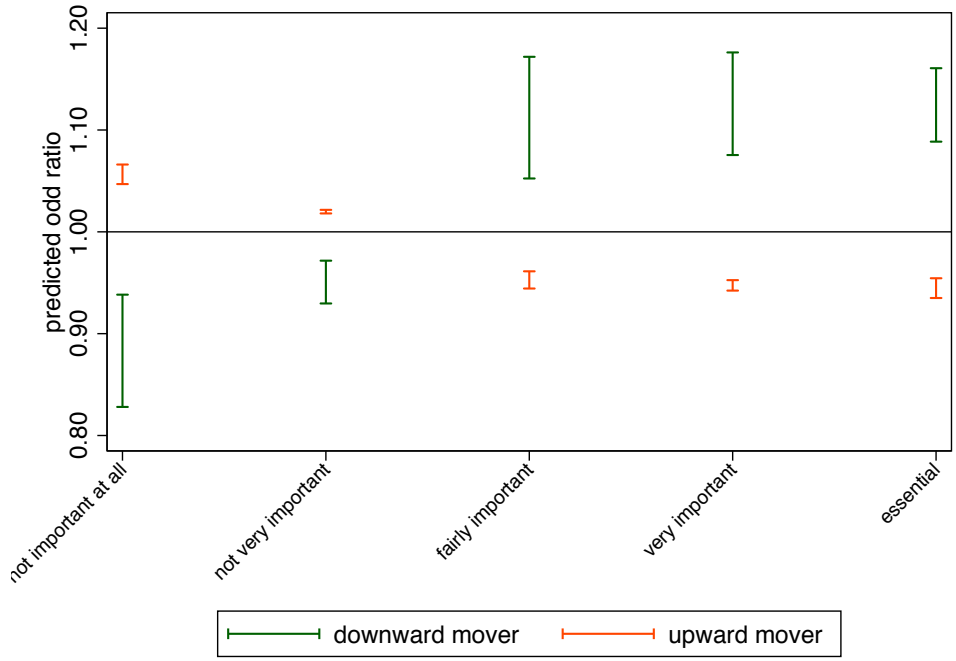
Source: Author' calculation based on ISSP, 2009; EU-SILC, 2011, Eurostat, 2015.

As expected, the marginal effects for the first category have the opposite sign of the coefficients. A positive coefficient indicates that an increase in the regressor reduces the probability of the lowest category; this implies a negative marginal effect for the probability to be in the first category. Age, unemployment status, urban residency, and having experienced downward mobility reduce the probability of having a low perception of inequality of opportunity. Conversely, respondents who have experienced upward mobility are more likely to perceive a low level of inequality of opportunity. Marginal effects for the probability of being in the second category, where we find the majority of respondents, have all the same signs but are lower in terms of magnitude. For example, being a downward mover instead of an upward mover reduces the probability of being in the first category by 3.32%, this difference is reduced to slightly more than 2.51% in the second category. All the statistically significant marginal effects have the opposite sign for the three highest categories. The country level controls show that, after controlling for all the other observable covariates, GDP per capita and GDP growth in the last decade affect $IOpP$: the perception of inequality of opportunity decreases in richer and more dynamic countries. However, as already shown in Table 4, another interesting result is that the measure of inequality of opportunity included among controls does have the expected effect on its perception (reduces the probability to be in the first categories) but this effect is not statistically significant.

Although we are reluctant to conclude that the way economists measure inequality of opportunity has nothing to do with the way it is perceived by people, these estimates suggest that the other country characteristics and individual variables play a much clearer role in determining IOp perception.

Finally, in Figure 4 we report for each category the 95% confidence interval for predicted odd ratios of the two type of respondents: upward movers and downward movers. Although the precision of the estimates is very different for the two groups (there are twice as many upward movers as there are downward movers) the distribution of the odd ratios across categories show that, other things held constant, the experience of intergenerational mobility significantly modifies the perception of inequality of opportunity. Note that $IOpP$ is constructed by aggregating information about seven questions, but none of them explicitly refers to occupational mobility. Moreover, questions about personal experiences of social mobility are unlikely to have framed these answers because they are asked later in the questionnaire. Aware that the controls available are limited, leaving a large part of $IOpP$ variability unexplained or explained by country fixed effect, we interpret our results as evidence of the role of individual experience in biasing inequality of opportunity perception.

Figure 4: Perception of IOp for upward and downward movers



Intervals correspond to 95% confidence intervals
Source: ISSP(2009) and EU-SILC (2011).

4.1 Robustness checks

We perform a number of robustness checks to exclude that the obtained results are driven by methodological choices about how $IOpP$ is constructed and how inequality of opportunity is measured.

We know that our measure of $IOpP$ has been obtained by aggregating seven components, following only one of the possible procedures. In order to check the robustness of our results, we run our analysis using two alternative measures of inequality of opportunity perception.

The first alternative consists in assigning cardinal meaning to ordinal scale (one to five) and

constructing a variable of perception summing all components in a scalar. We then estimate a mixed linear model that explains the sum of seven components with the same controls, estimates are reported in Table 9 in the Appendix. Comparing the results with estimates in Table 4 we notice a number of differences: the controls for the level of education and employed status are statistically significant and have a negative sign, and being male significantly increases the perceived inequality of opportunity. Although country level variables have the same signs, they all lose significance. On the other hand, controls interpreted as signs of the self-esteem bias (mobility and unemployment status) have the same sign and are highly statistically significant.

The second alternative represents the opposite approach: instead of reducing seven dimensions to one, we specify a mixed ordered logit model for each dimension of the index in order to verify the consistency of our results across dimensions. Table 10 in the Appendix reports the sign and significance of the seven models. We already know that the components are weakly correlated and therefore we expect heterogeneity of coefficients across dimensions. The majority of coefficients do not have the same sign in the seven specifications. Only the coefficient of the dummy for upward movers is negative in all models and significant in the majority of cases.[9] Such a large heterogeneity of coefficients indicates that different aggregation methods to obtain $IOpP$ - for example based on weighted aggregation of the components - could lead to different estimates. We have opted for an unweighted aggregation of the components; a different choice is possible provided that we can propose a reasonable criterion to set question-specific weights.

To verify the consistency of our results to different measures of inequality of opportunity we estimate model (5) replacing IOp with the inequality of opportunity measure proposed by Checchi et al. (2015) and Brzenziński (2015). Table 11 and 12 in the Appendix report the estimates obtained. Recall that the three estimates are only partially comparable because each study considers a slightly different set of countries. Coefficients obtained using Brzenziński (2015) IOp are very similar to those in Table 4. The only difference concerns the statistical significance of three coefficients: the control for retired respondent becomes significant, the country level variable IOp becomes significant at 10%, and the GDP per capita control loses statistical significance. Very similar results are also obtained if the model is specified using IOp as estimated by Checchi et al. (2015): all coefficients maintain their sign except the coefficient for IOp which becomes negative but not statistically significant.

Finally, Iceland and Portugal are included in the list of countries for which IOp and $IOpP$ are estimated, but are excluded from the analysis because their surveys do not include information about the area of residency (urban/rural). To check whether their exclusion affects our results we estimate the mixed ordered logit model, not controlling for the area of residency but including Iceland and Portugal; estimates are reported in Table 13 in the Appendix. All the coefficients maintain their sign and changes in significance are marginal. Note however that the coefficient estimated for the variable IOp is statistically significant at 1% in this specification of the model.

All the robustness checks we have performed show a rather consistent picture. When the dependent variable is an aggregation of all the dimensions of inequality of opportunity perception a number of controls have the same sign and similar level of significance across all specifications. Among the individual controls, experience of social mobility, unemployment, and urban residency have a consistent and clear relationship with perceived inequality of opportunity. The sign of the controls for experience of social mobility is extremely robust, respondents that have experienced upward intergenerational social mobility tend to have a lower level of perceived inequality of opportunity. This is true for all the considered measures of perception and for each one of the ob-

[9] Interestingly, being male increases the perceived level of inequality of opportunity in all dimensions except when the question concerns the role of gender in shaping individual opportunities.

servable dimensions of the phenomenon. Among country level controls economic growth and the level of GDP are negatively correlated with inequality of opportunity perception; on the contrary, the association with measures of inequality of opportunity does not have a clear sign and is not significant in the majority of cases.

5 Conlusion

The perception of economic phenomena such as growth, inequality, and discrimination can have a large impact on the beliefs and choices of individuals. Investment choices, electoral behaviour, reproductive decisions may be based on perceived phenomena rather than on objective measurement of them. This explains why perceptions and expectations are recognized as important signals to interpret and predict socioeconomic outcomes, and also explains the popularity of sentiment indicators, such as the European Economic Sentiment Indicator the German IFO Business Climate Index, among policy makers and investors.

However, reality and perception can easily come into conflict. When the Arab Spring spread throughout the majority of Arab countries in 2010, many commentators suggested that protests were triggered by increasing inequality. However, there exists no clear evidence of increasing income inequality in those countries in the preceding years. Nevertheless, perceived inequality have been growing and may be among the causes of one of the most important revolutionary waves of the last decades.

Beliefs and perceptions are often included among explanatory variables in the analysis of individual or collective behaviours. However, perceptions are often considered exogenous variables and the analysis of how they are formed is rarely the focus of these studies.

This paper is the first attempt to empirically explain individual perception of inequality of economic opportunity. There are many possible definitions of equal opportunity, ranging from definitions prescribing that outcomes should be allocated according to talent and merit, to fully egalitarian interpretations of the same principle. However, the vast majority of these definitions distinguish between fair and unfair sources of inequality, and list among the latter circumstances beyond individual control such as race, gender, and socioeconomic background.

We adopted one of the most popular definitions and we estimated a widely used measure of inequality of opportunity in a sample of 22 European countries. For the same countries we construct an individual ordinal measure of perceived unequal opportunities and in merging the two measures, we show a weak correlation between prevailing perceived inequality of opportunity and objective measures of the same phenomenon. A weak correlation is found looking at both the absolute perception and the ranking of countries. Among possible models to explain the individual perception of the phenomenon, we opted for a a mixed ordinal logit model. Together with a country random effect, (including two of the three country level explanatory variables), GDP per capita, and economic growth are shown to explain a significant share of the total perception variability. In richer and more dynamic countries, the perceived inequality of opportunity is lower. Conversely, our model suggests that, after controlling for all the other variables, the estimated inequality of opportunity does not play a significant role in determining its perception. Further, we found a number of individual characteristics to have an impact on the degree of perceived inequality of opportunity. Among them, unemployment and experiencing downward intergenerational mobility significantly increase the probability of a person perceiving a lower degree of equal opportunity in her country. We interpret these relationships as signals of the existence of a self-esteem bias in the cognitive process of how people view equality of opportunity: respondents that have good reasons to perceive their experience in the labour market as a failure systematically overemphasise the role

of external causes in determining socioeconomic success.

Our results suggest that the popular perception of inequality of opportunity may be very weakly linked to objective measures of the same phenomenon produced by scholars. Conversely, other country characteristics - such as wealth and growth - together with individual experiences play a determining role in shaping our perception of complex phenomena such as inequality of opportunity. These findings suggest an interesting direction for future research: can public perception about inequality of opportunity teach something to economists about how to measure inequality of opportunity? Is it possible to construct an index of relative IOp obtained by aggregating individual perceptions? Can Yitzhak's approach to relative deprivation be transferred to inequality of opportunity?

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Appendix

The partition in types to obtain the counterfactual distribution

The measure of inequality of opportunity is obtained partitioning the population into 16 types based on three circumstances: sex, parental education, and parental occupation. Parental occupation is coded into two groups: higher when at least one parent completed upper secondary, and lower otherwise. Parental occupation status is based on the highest ISCO 88 occupation status of the parents, grouped into three categories: highly skilled non-manual (ISCO codes 11-34), lower-skilled non-manual (41-52), skilled manual (61-83) and elementary occupation (91-93).

Table 6: EU-SILC descriptive statistics

		parental education		parental occupation			
country	female	low	high	elementary occupation	skilled manual	lower-skilled non-manual	highly skilled non-manual
BE	0.5006	0.4815	0.5185	0.0128	0.1149	0.1498	0.7225
BG	0.4965	0.4555	0.5445	0.1148	0.3273	0.2435	0.3144
CH	0.5024	0.2799	0.7201	0.0161	0.1262	0.2239	0.6338
CY	0.5213	0.6368	0.3632	0.0378	0.2171	0.1586	0.5866
CZ	0.5632	0.5576	0.4424	0.0278	0.2646	0.3887	0.3189
DE	0.4966	0.1367	0.8633	0.0232	0.1177	0.2582	0.6009
DK	0.5031	0.0858	0.9142	0.0000	0.0924	0.2849	0.6228
EE	0.5269	0.2494	0.7506	0.0241	0.2374	0.2447	0.4937
ES	0.4947	0.8039	0.1961	0.0193	0.0736	0.0914	0.8156
FI	0.4785	0.4420	0.5580	0.1463	0.1553	0.1941	0.5044
FR	0.5148	0.7388	0.2612	0.0507	0.1074	0.2405	0.6014
HU	0.5076	0.5695	0.4305	0.0560	0.2773	0.2791	0.3877
IS	0.5014	0.2753	0.7247	0.0099	0.1508	0.2820	0.5574
LT	0.5248	0.4647	0.5353	0.1562	0.2753	0.1899	0.3786
NO	0.4769	0.2326	0.7674	0.0083	0.1067	0.3674	0.5176
PL	0.5070	0.3961	0.6039	0.0254	0.3665	0.2110	0.3970
PT	0.5047	0.9013	0.0987	0.0310	0.2739	0.1391	0.5560
SE	0.4709	0.4298	0.5702	0.0080	0.0727	0.2309	0.6883
SI	0.4975	0.6402	0.3598	0.0613	0.1836	0.2777	0.4773
SK	0.5108	0.3156	0.6844	0.0858	0.2281	0.3554	0.3307
UK	0.5303	0.5346	0.4654	0.0177	0.1103	0.2403	0.6317

Source: Author' calculation based on EU-SILC (2011)

Other inequality of opportunity measures

IOp is only one possible measure of inequality of opportunity. Other two published papers have estimated inequality of opportunity in Europe exploiting the EU-SILC 2011 dataset. Table 7 show our measures together with estimations produced by Brzenziński (2015) and Checchi et al. (2014). In the former study inequality of opportunity is estimated as inequality between types, that is the reward-consistent approach. parametrically including among circumstances: parental education, parental occupation, citizenship. Checchi et al. (2015) add to those circumstances gender and adopt a non-parametric approach. The measure of inequality in the counterfactual distribution they use is the Gini coefficient instead of the mean logarithmic deviation. There is a large overlapping in the sets of countries considered with few exceptions.

Table 7: Existing IOpP estimates based on EU-SILC 2011

country	s IOp	Checchi et al., 2015	Brzenziński, 2015
AT	0.0034	0.1540	0.0114
BE	0.0076	0.1340	0.0204
BG	0.0330	0.1320	0.0482
CH	0.0058	0.2180	
CY	0.0061		
CZ	0.0072	0.1230	0.0115
DE	0.0031	0.1800	0.0040
DK	0.0008	0.0730	0.0036
EE	0.0077	0.1290	0.0225
ES	0.0097	0.1240	0.0237
FI	0.0017	0.0960	0.0022
FR	0.0071	0.1290	0.0100
HU	0.0157	0.1330	0.0207
IS	0.0014		
LT	0.0056	0.0920	0.0183
NO	0.0017	0.1120	0.0039
PL	0.0099	0.1420	0.0198
PT	0.0188	0.1000	0.0152
SE	0.0027	0.0920	0.0017
SI	0.0060	0.0860	0.0082
SK	0.0047		0.0092
UK	0.0079	0.1650	0.0079

Source: Checchi et al. (2015), Brzenziński (2015).

Perception components

Table 8 shows the correlation between the seven dimensions of inequality of opportunity perception (answers are coded in a scale from 1 to 5).

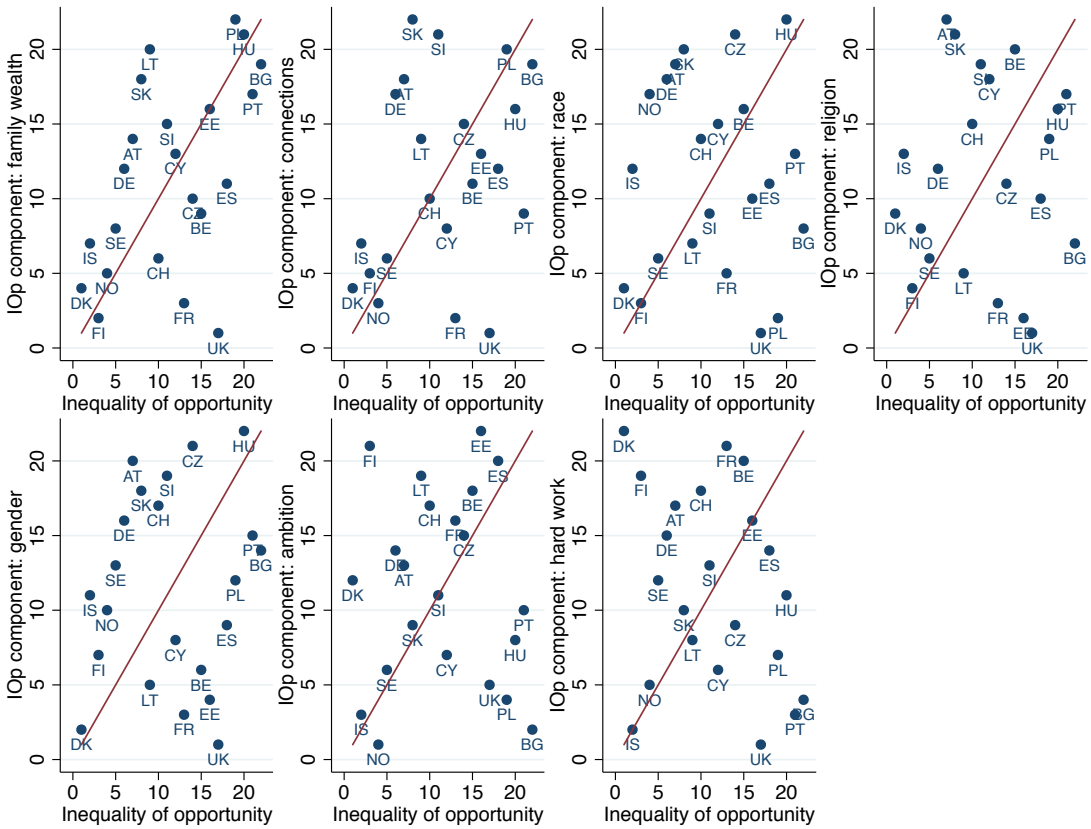
Table 8: Answers correlation across $IOpP$ components

	family wealth	connections	race	religion	gender	ambition	hard work
family welath	1						
connections	0.6560	1					
race	0.0832	0.0970	1				
religion	0.2855	0.2803	0.4373	1			
gender	0.4183	0.5368	0.6075	0.5583	1		
ambition	-0.3234	-0.2030	-0.3474	-0.5543	-0.5288	1	
hard work	-0.4338	-0.3156	-0.0308	-0.1495	-0.1847	0.6295	1

Source: Author' calculation based on ISSP, 2009.

Figure 5 shows the correlation between measured IOp and the answer to each one of the seven questions aggregated in the $IOpP$ index.

Figure 5: Inequality of opportunity components: measure and perception (ranks)



Inequality of opportunity is the rank of the country according to IOp in eq. 2.
Perception is the rank of the country according to the average answer to each one of the seven questions.
Source: Author' calculation based on ISSP (2009) and EU-SILC (2011)

5.0.1 Robustness checks

Table 9: Mixed linear model: dependent variable sum of all components

Variable	Coefficient	(Std. Err.)
degree	-0.018*	(0.009)
male	0.035**	(0.008)
age	0.001**	(0.000)
upward mover	-0.026**	(0.008)
downward mover	0.062**	(0.016)
unemployed	0.062**	(0.021)
retired	-0.045**	(0.017)
employed	-0.044**	(0.015)
urban	0.039**	(0.008)
IOp	0.834	(4.346)
GDP per capita 2010	-0.003	(0.002)
growth rate 2000-2010	-0.041	(0.056)
Intercept	2.483**	(0.132)

Significance levels : † : 10% ∗ : 5% ∗∗ : 1%

Source: Author' calculation based on ISSP, 2009 and EU-SILC, 2011.

Table 10: Significant coefficients for different components of $IOpP$

	family wealth	connections	race	religion	gender	ambition	hard work
education		$-^{***}$		$-^{***}$	$+^{***}$		
male	$+^{***}$	$+^{***}$	$+^{***}$		$-^{***}$	$-^{*}$	
age		$-^{***}$	$+^{**}$	$+^{***}$	$+^{***}$	$+^{***}$	
urban	$+^{***}$		$+^{***}$	$-^{*}$	$+^{**}$		
employed	$-^{**}$	$-^{**}$					$-^{\dagger}$
unemployed		$+^{***}$	$-^{*}$				
retired		$-^{**}$			$-^{\dagger}$		
upward mover	$-^{***}$		$-^{\dagger}$			$-^{***}$	$-^{***}$
downward mover	$+^{***}$	$+^{***}$	$+^{*}$		$+^{***}$	$-^{**}$	
IOp	$+^{***}$	$+^{***}$	$+^{***}$	$-^{***}$	$-^{***}$		$-^{***}$
GDP per capita 2010	$-^{***}$	$-^{***}$	$+^{*}$		$-^{***}$		$-^{***}$
growth rate 2000-2010		$+^{***}$	$-^{***}$	$-^{***}$	$+^{**}$	$+^{***}$	$-^{***}$

Source: Author' calculation based on ISSP, 2009 and EU-SILC, 2011.

Table 11: Mixed ologit model: IOp as estimated by Brzenziński (2015)

Variable	Coefficient	(Std. Err.)
degree	0.031	(0.033)
male	0.076*	(0.030)
age	0.006**	(0.001)
urban	0.066*	(0.032)
employed	-0.130*	(0.060)
unemployed	0.135	(0.084)
retired	-0.133†	(0.068)
upward mover	-0.126**	(0.032)
downward mover	0.182**	(0.062)
IOp (Brezinski, 2015)	3.347†	(1.916)
GDP per capita 2010	-0.002	(0.001)
growth rate 2000-2010	-0.174**	(0.038)
cut points		
μ_1	-1.710**	(0.124)
μ_2	0.710**	(0.123)
μ_3	2.993**	(0.127)
μ_4	5.011**	(0.153)

Significance levels : † : 10% * : 5% ** : 1%

Source: Author' calculation based on ISSP, 2009 & EU-SILC, 2011.

Table 12: Mixed ologit model: IOp as estimated by Checchi et al. (2015)

Variable	Coefficient	(Std. Err.)
degree	0.055†	(0.033)
male	0.054†	(0.030)
age	0.008**	(0.001)
urban	0.084**	(0.032)
employed	-0.111†	(0.059)
unemployed	0.174*	(0.085)
retired	-0.147*	(0.067)
upward mover	-0.106**	(0.032)
downward mover	0.176**	(0.062)
IOp (Gini)	-0.537	(0.472)
GDP per capita 2010	-0.003*	(0.001)
growth rate 2000-2010	-0.171**	(0.039)
cut points		
μ_1	-1.737**	(0.140)
μ_2	0.718**	(0.139)
μ_3	3.063**	(0.143)
μ_4	5.084**	(0.168)

Significance levels : † : 10% * : 5% ** : 1%

Source: Author' calculation based on ISSP, 2009 & EU-SILC, 2011.

Table 13: Mixed ologit model: Portugal and Iceland included (urban/rural control excluded)

Variable	**Coefficient**	**(Std. Err.)**
degree	0.063*	(0.029)
male	0.039	(0.028)
age	0.007**	(0.001)
upward mover	-0.111**	(0.029)
downward mover	0.153**	(0.056)
unemployed	0.250**	(0.078)
retired	-0.066	(0.061)
employed	-0.069	(0.054)
IOp	14.240**	(2.754)
GDP per capita 2010	-0.002†	(0.001)
growth rate 2000-2010	-0.164**	(0.037)
cut points		
μ_1	-1.562**	(0.113)
μ_2	0.874**	(0.112)
μ_3	3.201**	(0.116)
μ_4	5.264**	(0.143)

Significance levels : † : 10% * : 5% ** : 1%

Source: Author' calculation based on ISSP, 2009 & EU-SILC, 2011.