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THE PERCEPTION OF INEQUALITY OF OPPORTUNITY IN EUROPE

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Abstract

Does the way in which 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 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 the two most adopted measures of inequality of opportunity have no clear 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.

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1. INTRODUCTION

The way in which 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 1970s, a number of authors have attempted to revise the egalitarian paradigm by 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 due to factors that influence an individual's outcome for which she cannot be held responsible. 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.

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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 in which the two principles are balanced. In recent years, a vast range of definitions of equal opportunity have been proposed, and 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, if individuals make decisions based on their preferences and constraints, their ability to correctly understand the opportunities they have is crucial in the process of individual decision-making and welfare maximization. On the other hand, measures of inequality of opportunity are based on normative principles introduced by scholars, and do not stem from people's opinions. However, as shown by Amiel and Cowell (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 behavior and social cohesion. A perceived increase in inequality can modify electoral results or even trigger unrest, as has been suggested for Egypt and other countries involved in the Arab Spring (Verme, 2014) or in a number of Latin American countries (Justino and Martorano, 2016).

Moreover, 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 (Norton and Ariely, 2011; Cruces *et al*., 2013; Verme, 2014; Chambers *et al*., 2014; Gimpelson and Treisman, 2015). 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.

Perceived inequality has, instead, been generally considered to be an exogenous explanatory variable of citizens' attitude toward redistribution. 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 who 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 Angeletos, 2005; Alesina and La Ferrara, 2005).

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 people's 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-Doumer (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 posed 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 method 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.

Individuals will inevitably make mistakes when undertaking the complicated process of quantifying the role of circumstances and choice in determining outcomes. 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. Fiscal systems, educational policy, or other public interventions may be endogenous to people's preferences. It may be the case, then, that in countries characterized by higher aversion to inequality of opportunity, institutions do more to equalize opportunities than in others. Such a mechanism will lower the correlation between perceived and measured inequalities observed. Moreover, a plausible hypothesis is that perceptions of the relative importance of exogenous circumstances are shaped by personal experience. Assuming that individuals 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 behaviors (Weiner, 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 that any given event occurs as a result of situational factors beyond personal control. According to Weiner, 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 emphasize 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 inequality of opportunity to be distributed around its objective measure. On average, individuals who perceive their life as a story of success—because, for example, they are experiencing upward mobility—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—because, for example, they are unemployed—will tend to overemphasize the importance of circumstances beyond individual control, that is, they will overestimate the degree of inequality of opportunity.

In what follows, we will empirically investigate the relationship between commonly used measures of inequality of opportunity and subjective measures of the same phenomenon. We will first introduce a very common method to measure inequality of opportunity proposed by Checchi and Peragine (2010) and largely adopted by the empirical literature. We will then propose a method to measure the inequality of opportunity perception based on ordinal answers to questions in opinion surveys. We will then merge information from two sources, an opinion survey and a survey on household incomes, to show the degree of correlation between measured and perceived inequality of opportunity in 23 European countries. Finally, we will propose a model that explains individual perception of inequality of opportunity as both a function of individual traits and country-level variables. Such a specification allows for the simultaneous evaluation of the role of individual characteristics, including individual experience of success and failure in the labor market, and variable describing the main characteristics of their country.

The rest of this paper is organized 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 23 European countries. In Section 4, we empirically investigate which 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 past 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), while 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. *Two Measures of Inequality of Opportunity*

The conceptual basis for the definition of inequality of opportunity is provided by the distinction between individual efforts and predetermined circumstances. This approach considers that inequality due to the former is not ethically offensive, whereas 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 ($c = c_1,\ldots,c_K$) and effort ($e = e_1,\ldots,e_J$):

$$y_i = f(c_i, e_i). \tag{1}$$

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 ($IOe(y)$).

There exist two prevailing methods to measure inequality of opportunity, both based on Roemer's definition of equality of opportunity and translated into measures of inequality of opportunity by a number of authors (see Ferreira and Peragine, 2015; Roemer and Trannoy, 2015). Here, we will follow the method introduced by Checchi and Peragine (2010).

Ex post Inequality of Opportunity

The *ex post* approach is based on the so-called "Roemer's strong equality of opportunity definition," which requires that individuals exerting the same degree of effort should obtain the same level of outcome. An *ex post* measure of inequality of opportunity is therefore a measure of the inequality between individuals exerting same effort. To obtain such a measure, we first partition the entire population into groups, called *types*, where each type includes all individuals characterized by the same circumstances. For example, a hypothetical country characterized by two circumstances, sex and race, would be partitioned into four types: black men, black women, white men, and 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 their type-specific outcome distribution are assumed to have exerted the same degree of effort and form a *tranche*. 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 as a white man in the richest 10 percent of his type-specific income distribution; they are part of the top 10 percent tranche. Our original distribution of income is now twice partitioned: into types (individuals affected by different circumstances) and into tranches (made of individuals that exert the same degree of effort). We can now measure *IOp* as the inequality between types and *IOe* as the inequality between tranches. To obtain this decomposition, there are a number of methods which unfortunately lead to different *IOp* estimates (Fleurbaey, 2008; Fleurbaey and Peragine, 2013). Again, here we follow the popular approach proposed by Checchi and Peragine (2010).

We consider inequality between tranches as legitimate because this is due to individual effort, whereas we consider inequality within tranches to be inequality of opportunity. Therefore, we modify the original distribution of incomes: we first replace the income of individuals who share the same circumstances and same degree of effort with their mean income of (μ_k^j). Then we further modify the distribution, dividing μ_k^j by the mean outcome of the tranche (μ^j). This transformation removes all inequality between tranches and leaves inequality within tranches intact. Inequality in this counterfactual distribution is therefore *IOp* and the remainder is *IOe*:

$$IOp_{EP} = I\left(\frac{\mu_k^j}{\mu^j}\right). \tag{2}$$

Ex ante Inequality of Opportunity

Roemer's strong definition of equal opportunity is a very demanding condition that requires that the distributions of outcome conditional on effort to be identical for all types. A second, less demanding definition of equal opportunity has been drawn from Roemer's theory. The "weak equality of opportunity" criterion allows some inequality within tranches but requires that the mean advantage levels should be the same across types (Ferreira and Gignoux, 2011).

The *ex ante* measure of inequality of opportunity proposed by Checchi and Peragine (2010) is a measure based on this weaker definition. The approach interprets the type-specific outcome distribution as the opportunity set of individual belonging to each type. The (utilitarian) value of the opportunity set of each type is the mean outcome of the type. Therefore, inequality of opportunity in this case is simply between-type inequality:

$$IOp_{EA} = I(\mu_k), \tag{3}$$

where μ_k is the average outcome of type k.

Adopting the *ex ante* approach greatly simplifies the measurement of inequality of opportunity and it is by far the most popular measure in the literature: for a meta-analysis of *ex ante* inequality of opportunity measures in 41 countries, see Brunori *et al*. (2013).

Unfortunately, the two measures differ except in the very unlikely case of constant effect of circumstances on outcome for different effort levels, that is, inequality is identical within all tranches. This difference stems from the tension between the principle of *ex post* 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 Schokkaert, 2009; Fleurbaey and Peragine, 2013). Because of this tension, any measure of *ex post* inequality of opportunity can be fully consistent with one of the two principles, but can only partially satisfy the other. This explains why often empirical contributions propose both decompositions of total inequality.

Moreover, it should be underlined that, because not all circumstances are observable, IOp_{EA} and IOp_{EP} can only be interpreted as lower-bound estimates of inequality due to opportunity in the distribution of y (Ferreira and Gignoux, 2011; Luongo, 2011).

For our purposes, these measures of inequality of opportunity have two important features: first, they are widely adopted in the relevant literature and, second, they have an intuitive meaning. The second property is crucial in this context because we aim to precisely compare measures and perceptions of the phenomenon.

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. 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, which asks about the role of race, gender, or socioeconomic background, captures a particular dimension in which the compensation principle is perceived to be violated. Therefore, the more relevant the circumstances beyond individual control in determining outcomes, the higher the inequality of opportunity that 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. What is not obvious is how to 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 a degree of complementarity between dimensions and weights to each component. Alternatively, we can rely on multivariate statistical methods, such as principal component analysis, in order to aggregate information contained in a set of answers. The latter approach is particularly advisable when we suspect that the 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 on 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 (Doming-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 r answers measuring perceived violations of the equality of opportunity principle. All answers can assume the same set of ordinal values ($\lambda = A < B < \ldots < Z$). For each individual, we construct the vector $\mathbf{v} = (v_1, \ldots, v_r)$ which contains the values of all answers ranked in ascending order, so that $(v_1 \leq v_2 \leq \ldots \leq v_k r$. $\mathbf{v}$ contains perceived violations of the equal opportunity principle measured over r 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 using the median-based operator *IOpP*, which has different definitions in the following cases:

Case (1) r is odd: $IOpP(v_1, \ldots, v_r) = v_{\frac{r+1}{2}}$.

Case (2) r is even and $v_{\frac{r}{2}} = v_{\frac{k+1}{2}}$: $IOpP = v_{\frac{r}{2}} = v_{\frac{r+1}{2}}$.

Case (3) r is even and $v_{\frac{r}{2}} \neq v_{\frac{r+1}{2}}$: $v_{\frac{r}{2}} < IOpP < v_{\frac{r+1}{2}}$.

Case (4) r is even, $v_{\frac{r}{2}} \neq v_{\frac{r+1}{2}}$, and $\exists$ a non-empty set of values U s.t. $v_{\frac{r}{2}} < u_i, \ldots u_j < v_{\frac{r+1}{2}}$: $IOp\bar{P} = median(U)$.

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 $v_{\frac{r}{2}}$ and $v_{\frac{r+1}{2}}$," and in the fourth case we pick the median of the set of values equal to or higher than $v_{\frac{r}{2}}$ and equal to or less than $v_{\frac{r+1}{2}}$.[1]

Consider a simple example: a questionnaire contains four questions, of which two concern the perceived violation of the principle of reward and two concern the violation of the principle of compensation. The possible answers are A, B, C, D, E, where A indicates that the principle is not at all violated, and where E expresses the maximum possible level of perceived violation. All values are assumed to be equally spaced.

Individuals i, j, and l report the following answers:

	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:

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

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

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 one in which we must calculate the mean of two non-contiguous answers (individual l) in order to calculate the median. 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 the 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 23 European Countries

The data requirements for studying the relationship between inequality of opportunity and its perception are rather demanding. They require 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 Research Group, 2012) (hereinafter, "ISSP 2009") and the European Union Statistics on Income and Living Conditions (hereinafter, "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 the ISSP was conducted in the aftermath of the Great Financial Crisis (2007–8) represents a potential threat to 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. Giuliano and Spilimbergo (2014), for example, have shown that individuals experiencing recessions tend to believe that economic success is more influenced by luck than effort and choices.

Given the large overlap of the two samples, we are able to study a subsample of 23 European countries included both in EU-SILC 2011 and ISSP 2009: Austria

(AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), the Czech Republic (CZ), Denmark (DK), Estonia (EE), Finland (FI), France (FR), Germany (DE), Hungary (HU), Iceland (IS), Italy (IT), Latvia (LT), Norway (NO), Poland (PL), Portugal (PT), the Slovak Republic (SK), Slovenia (SI), Spain (ES), Sweden (SE), Switzerland (CH), and the United Kingdom (U.K.).

The data needed to measure *IOp* are 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.

We estimate *IOp* for the sample of European countries exploiting the EU-SILC, which is a reliable source for the analysis of the income distribution. Moreover, it has already been utilized 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 Rodríguez, 2012; Checchi *et al.*, 2015). We implement a non-parametric approach to estimate *IOp*, identifying groups of individuals sharing the same circumstances and then partitioning each group into three income tranches. Note that due to the sample size of types in our partition, the number of quantiles used is smaller than is used by other authors: Checchi and Peragine (2010), for example, use five quantiles. We face a sort of bias–variance tradeoff here: on the one hand, limiting the number of quantiles can in principle bias our estimates downward (Luongo, 2011), on the other, estimating within-group variability in groups with a small sample size will increase the variance of the estimates obtained. 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 (16 types). Table 6 in the Appendix (in the Online Supporting Information) reports the distribution of circumstances across countries. IOp_{EP} and IOp_{EA} are then calculated as the mean logarithmic deviation applied to the counterfactual distribution (equations (2) and (3)), where the outcome y is the household income divided by the square root of the number of household components.[2] 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 who nevertheless benefit from a positive income. Table 4 in the online Appendix reports the sample size, mean income, total inequality, IOp_{EP}, and IOp_{EA} (both in levels and as share of total inequality). IOp_{EP} varies between 0.0008 (0.53 percent of total inequality) in Denmark and 0.0330 (16.04 percent) in Bulgaria. IOp_{EA} is slightly lower, ranging between 0.36 percent in Denmark and 12.99 percent in Bulgaria. The two measures are extremely closely correlated ($\rho = 0.9699$, $p = 0.0000$).

To measure the perception of inequality of opportunity, we use opinions recorded in ISSP 2009. The ISSP is a continuing annual program of cross-

[2]Although other inequality measures, such as the Gini, have been suggested as better measures of *IOp*, the mean logarithmic deviation has been traditionally adopted because of its perfect and path-independent decomposability between and within groups (Checchi and Peragine, 2010).

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). The 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.[3] Descriptive statistics of the average values of respondents' characteristics in the 23 samples are reported in Table 5 in the online Appendix.

In order to estimate *IOpP*, we combine the answers 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/ethnicity?
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, and 5 = not at all important.

   We also include the answer to the following question:

8. "*To what extent do you agree or disagree with the following statements: In <country> people have the same chances to enter university, regardless of their gender, ethnicity or social background?*"

   Possible answers are: 1 = strongly agree, 2 = agree, 3 = neither agree nor disagree, 4 = disagree, and 5 = strongly disagree.

The first five questions (and question 8) measure the perceived violation of the principle of compensation. Questions 6 and 7 measure the extent to which the principle of reward is perceived to be satisfied. Table 1 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 in transition economies consider family wealth to be at least very important (21 percent 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 percent of the French interviewees, but by less than 6 percent of the Polish and Slovak respondents. Race is considered to be at least very important by over 70 percent of the Estonian and 78 percent of the Latvian respondents.[4] Race is apparently perceived to be less important in Hungary (40 percent). Religion appears as an important determinant of success

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

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

TABLE 1
DIMENSIONS OF INEQUALITY OF OPPORTUNITY PERCEPTION

Country	Family Wealth	Connections	Race	Religion	Gender	University*	Ambition	Hard Work
AT	0.3008	0.0826	0.5374	0.6835	0.5321	0.5844	0.7487	0.6696
BE	0.4692	0.0842	0.5560	0.7194	0.6647	0.5429	0.5458	0.6403
BG	0.2153	0.0708	0.5360	0.6174	0.5233	0.6727	0.8454	0.8029
CH	0.6168	0.1211	0.6394	0.7884	0.6138	0.6381	0.6285	0.6690
CY	0.3480	0.2220	0.6380	0.6900	0.7280	0.6370	0.8410	0.8800
CZ	0.4613	0.1344	0.5276	0.8038	0.5462	0.5121	0.6661	0.7447
DE	0.3563	0.0674	0.5419	0.7792	0.6122	0.4280	0.7799	0.6975
DK	0.5856	0.2154	0.7088	0.7477	0.7391	0.6719	0.6377	0.4315
EE	0.3270	0.1155	0.7096	0.8797	0.7676	0.5435	0.4613	0.6822
ES	0.3773	0.1190	0.6336	0.7806	0.6393	0.5660	0.5634	0.6765
FI	0.6670	0.2424	0.6463	0.8064	0.7234	0.6502	0.5026	0.6239
FR	0.6158	0.3932	0.6466	0.8312	0.6974	0.4254	0.6066	0.5336
HU	0.2520	0.1465	0.4066	0.7568	0.5254	0.4180	0.7659	0.7077
IS	0.5861	0.1859	0.6536	0.8205	0.6800	0.7233	0.8933	0.9271
IT	0.2343	0.1081	0.6056	0.7124	0.5140	0.4593	0.5676	0.5913
LT	0.2816	0.1328	0.7848	0.8868	0.7212	0.5790	0.5575	0.7624
NO	0.5268	0.2019	0.4505	0.7370	0.6484	0.7466	0.8668	0.7960
PL	0.2109	0.0566	0.6938	0.6840	0.5617	0.4248	0.9132	0.8494
PT	0.2641	0.1344	0.6122	0.7171	0.6475	0.4076	0.7142	0.8660
SE	0.5057	0.1671	0.6157	0.7001	0.6157	0.5901	0.8197	0.7353
SI	0.3277	0.0610	0.6535	0.7099	0.5437	0.7164	0.7174	0.7099
SK	0.3046	0.0559	0.5870	0.7022	0.5604	0.5284	0.7303	0.7521
U.K.	0.5811	0.2156	0.6903	0.7857	0.7375	0.5298	0.7138	0.8415

Notes: Determinants to get ahead in life: the share of respondents answering "essential" or "very important." *Equality of opportunity in access to university: the share of respondents answering "strongly agree" or "agree."

The share of answers is obtained using sample weights when available.

Source: Author's calculation based on ISSP 2009.

again in Latvia (89 percent) and Estonia (88 percent).[5] Estonia has also the highest percentage of respondents considering gender essential or very important to success in life (77 percent). The lowest percentage is found in Italy with 51 percent of respondents considering sex at least very important. The third-to-last column contains the share of respondents who strongly agree or agree with the idea that individuals have the same chances to access university regardless of their gender, ethnicity, or social background: the share ranges between 41 percent in Portugal and 75 percent in Norway. As far as the questions regarding the reward principle are concerned, Estonia again signals a high degree of perceived *IOp*, with only 46 percent of the respondents considering ambition at least very important. The highest percentage is found in Poland (91 percent). Finally, "hard work" is viewed as an essential element of success in Iceland (93 percent), while at the opposite end of the scale is Denmark, with only 43 percent of respondents convinced of its importance.

To measure *IOpP*, we first make the five questions about compensation consistent with the other three, that is, we recode them so that 1 = "not at all important" and 5 = "essential." Because the number of considered dimensions is even, the resultant index of inequality of opportunity perception, *IOpP*, is the median

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

of the eight answers and in few cases between two possible answers; it ranges between 1 and 5 and assumes nine possible values. Note that it is never the case that the two answers used to calculate the median (fourth- and fifth-lowest perceptions) are not contiguous—this implies that all values have clear ordinal meaning. *IOpP* assumes value 1 when at least five of the eight factors violating the principle of equal opportunity are judged as "not at all important" and it assumes value 5 when at least five of the eight violations are perceived as essential.

However, there is an important potential threat to the reliability of our measure of perceived inequality of opportunity. In constructing *IOpP*, we are implicitly aggregating eight dimensions—assigning the same relative weight to all question. In the absence of a criterion to assign different weights, this choice may be legitimate only if the eight questions actually capture distinct dimensions of the phenomenon. If this is not the case, we 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 disproportionately 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 9 in the online Appendix reports correlations between each pair of answers. The correlations have the expected signs, are in the majority of the cases highly statistically significant, but are rather weak (never above 0.5). Therefore we can exclude the double counting problem and use all eight dimensions to calculate *IOpP*.

Figure 1 reports perceived and measured *IOp* in the 23 European countries. The top scatterplots present correlation of *IOp* and *IOpP* in absolute terms for both *ex post* (left) and *ex ante* (right) measures. The correlation coefficient calculated on this sample of countries is rather weak and not statistically significant. However, 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 the U.K. 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.[6] 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 scatterplots report the same correlations looking at the rank of countries. Again, average perception is very far from the actual ranking of countries based on the *IOp* measures, with some countries extremely far from what is expected (the 45 degree line).

Such descriptive figures suggest that individual perception of inequality of opportunity weakly correlates with scholarly measurement of it. However, a possible explanation for such a weak association could be related to the way in which we have measured inequality of opportunity. There are many methods to measure inequality of opportunity and different approaches can lead to systematically

[6]Note that Bulgaria represents a clear outlier and its removal does improve the correlation between *IOp* and *IOpP*, which becomes 0.367 ($p = 0.09$) for *ex post IOp* and 0.3902 ($p = 0.07$) for *ex ante IOp*.

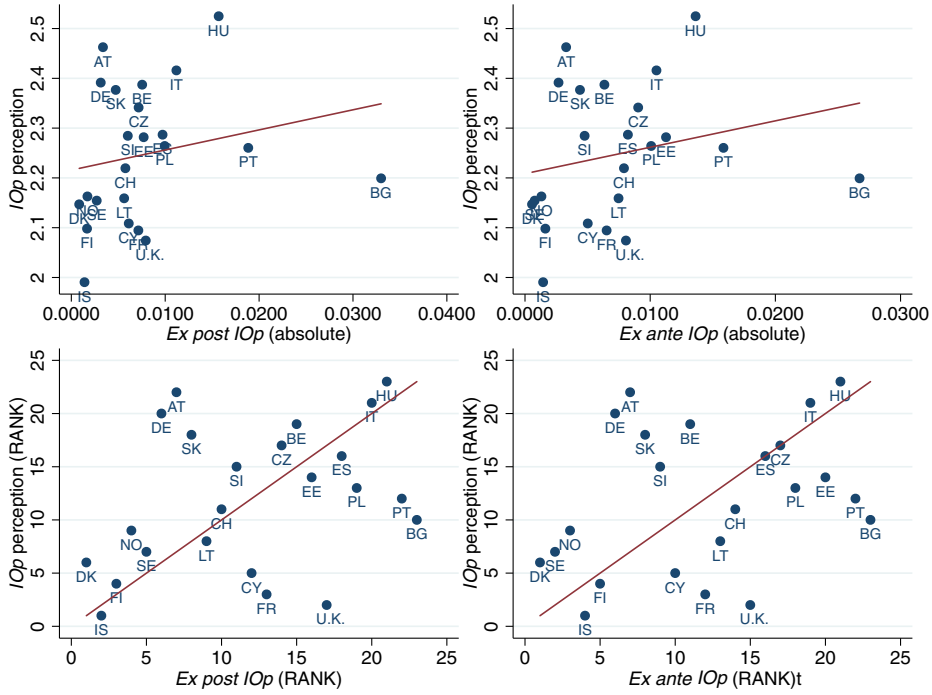

Figure 1. Inequality of Opportunity: Measure and Perception [Colour figure can be viewed at wileyonlinelibrary.com]

Notes: Inequality of opportunity *ex post* is IOp_{EP} in equation (2); inequality of opportunity *ex ante* is IOp_{EA} in equation (3). Attitude toward inequality is the average *IOpP* index in each country. The correlation coefficient with IOp_{EP} is $\rho=0.1834$ ($p=0.0.4023$) and with IOp_{EA} is $\rho=0.2013$ ($p=0.3571$).

Sources: Author's calculation based on ISSP 2009 and EU-SILC 2011.

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 Brzeziński (2015). The two studies are based on the same data but follow different measurement approaches. Both opt for an *ex ante* measure of inequality of opportunity and consider different sets 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 (equation (3)). Brzeziński (2015) follows a parametric approach. Figure 2 shows the correlation between *IOpP* and these alternative estimates. Although the two figures are not perfectly comparable with ours (because the set of countries is not exactly the same), we nevertheless find a similar positive correlation, 0.1815 and 0.3326 respectively—but again, not one that is statistically significant.[7] We may therefore exclude that the finding of a weak correlation between a measure of inequality of opportunity and its perception is exclusively driven by the method chosen to measure *IOp*.

[7]The list of countries and *IOp* estimates for the three studies are reported in Table 8 in the online Appendix.

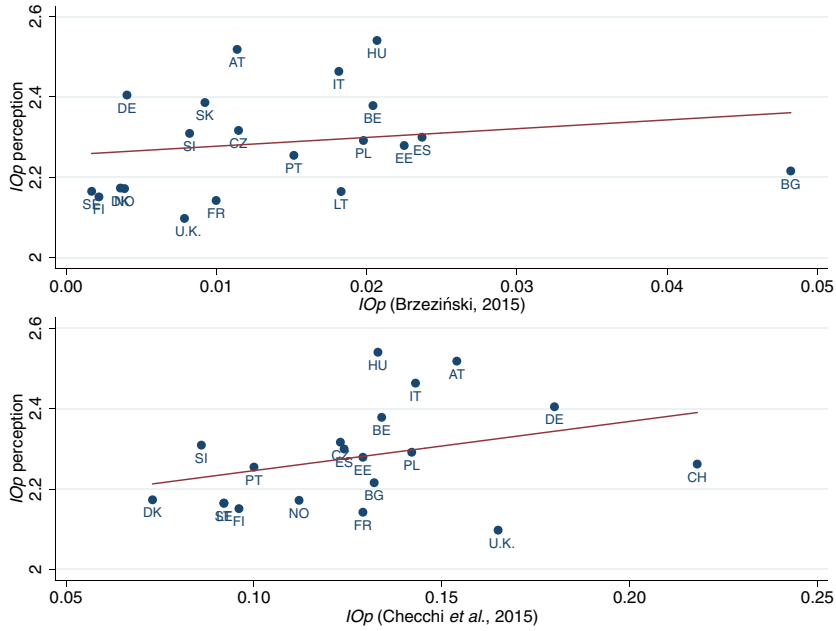

Figure 2. Inequality of Opportunity and its Perception: Alternative *IOp* Measures [Colour figure can be viewed at wileyonlinelibrary.com]

Sources: Brzeziński (2015) and Checchi *et al.* (2015).

Finally, because a correlation in a scatterplot of 23 observations may be difficult to judge, we have repeated the same exercise dividing larger countries into macro-regions. Table 7 in the online Appendix contains the details of the subdivision of the sample into 68 regions. However, due to the limited sample size of many regions, it has been impossible to estimate *ex post IOp* in this case. Therefore, Figure 3 shows the correlation perceived and only the *ex ante* inequality of opportunity measure. The correlation is very close to zero (0.0288) and not statistically significant.

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 eight questions ($\zeta^*_{i,j}$). We also assume that the latent variable is

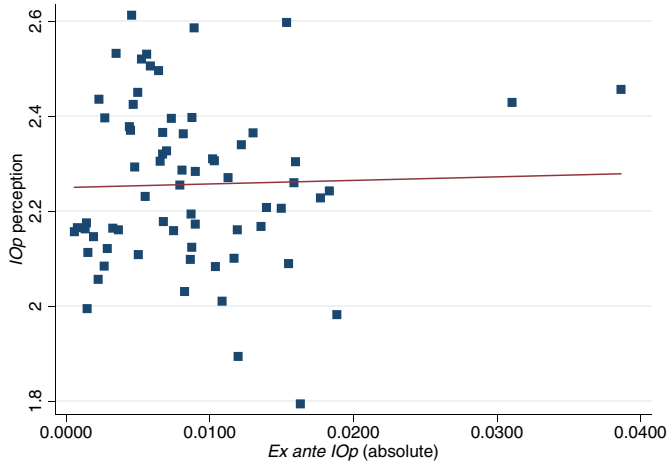

Figure 3. The Measured and Perceived *IOp* in 68 European Regions [Colour figure can be viewed at wileyonlinelibrary.com]

Notes: $\rho=0.0288$, p-value = 0.8159
Sources: ISSP 2009 and EU-SILC 2011.

a linear combination of a number of independent determinants at individual levels (x), a set of cutpoints (μ), and an unobserved individual effect ϵ:

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

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, $\epsilon_{i,j}$ is the sum of an individual and a country unobservable effect:

$$\zeta^*_{i,j}=x'_{i,j}\beta+v_j+\epsilon_{i,j}. \tag{5}$$

v_j can be a fixed effect or can it 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):

$$\zeta^*_{i,j}=x'_{i,j}\beta+z'_j\gamma+u_j+\epsilon_{i,j}. \tag{6}$$

ζ^* is not observable. What we observe is as follows:

$$\begin{aligned}
&\zeta_{i,j}=\text{lowest value of } IOpP \text{ if } \zeta^*_{i,j}<\psi_1,\\
&\zeta_{i,j}=\text{second lowest value of } IOpP \text{ if } \psi_1<\zeta^*\leq\psi_2,\\
&\ldots\\
&\zeta_{i,j}=\text{highest value of } IOpP \text{ if } \psi_8\leq\zeta^*_{i,j}.
\end{aligned} \tag{7}$$

If the mean and variance for ϵ are normalized to be zero and $\pi^2/3$ respectively, and assumed independent of u_j, we obtain the following:

$$
\begin{aligned}
&\text{Prob}(\zeta_{i,j}=\text{lowest value of } IOpP|x,z)=H(\psi_1-\zeta_{i,j})\\
&\text{Prob}(\zeta_{i,j}=\text{second lowest value of } IOpP|x,z)=H(\psi_2-\zeta_{i,j})-H(\psi_1-\zeta_{i,j})\\
&\dots\\
&\text{Prob}(\zeta_{i,j}=\text{highest value of } IOpP|x,z)=1-H(\psi_8-\zeta_{i,j})
\end{aligned} \tag{8}
$$

where $\zeta_{i,j}$ 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 (Greene, 2003; Rabe-Hesketh and Skrondal, 2012). We specify three versions of the ordered logistic model: (equation (3)) a pooled model with corrections of the standard error to account for data clustered in 23 countries, (equation (4)) a pooled model with country fixed effects, and (equation (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 residence (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 1 if the respondent considers the job qualification she has today to be 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 to be 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 Jenkins, 2016), 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 decade from 1999 to 2009. Table 2 contains the coefficients for the three specifications of the model.

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 eight answers are distinguishable categories for the respondents looking at the cutpoint ($\mu_1, \dots, \mu_8$) confidence intervals. Categories with overlapping confidence intervals in an ordinal model are interpreted as signaling that ordinal categories are indistinguishable and would suggest collapsing 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 percent level

[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 2
Individual IOp Perception: Ordered Logit Estimates

	(3)	(4)	(5)	(5)
Variable	Pooled	Country Fixed Effect	Mixed (*ex post*)	Mixed (*ex ante*)
Number of observations	18,929	18,929	18,929	18,929
Education	−0.0976***	−0.0116	−0.0145	−0.0064
Male	0.0805***	0.0876***	0.0852***	0.0900***
Age	0.0031**	0.0053***	0.0052***	0.0052***
Married	−0.0647*	−0.066*	−0.0691*	−0.0617*
Upward mover	−0.1090***	−0.0967***	−0.0930***	−0.1021***
Downward mover	0.1389***	0.1776***	0.1793***	0.1754***
Unemployed	0.2212***	0.2097***	0.2203***	0.2060***
Retired	−0.0708	−0.1027*	−0.0948*	−0.1071
Worker	−0.0652	−0.0567	−0.0555	−0.0576
Urban	0.0408	0.0978***	0.0923***	0.0994***
Country fixed effect	No	Yes	No	No
IOp			−19.6392***	−6.9305***
GDP per capita			−0.0003	−0.0071***
Growth			−0.1650***	−0.2147
Cutpoints				
μ_1	−2.255***	−1.613***	−2.1188***	−2.6383***
μ_2	−1.549***	−0.9006***	−1.4061***	−1.9255***
μ_3	0.3529***	1.042***	0.5341***	0.01683***
μ_4	1.0628***	1.7685***	1.259***	0.7428***
μ_5	2.7376***	3.4653***	2.9554***	2.4388***
μ_6	3.4421***	4.1743***	3.6642***	3.1476***
μ_7	5.0772***	5.8131***	5.3029***	4.7864***
μ_8	5.4684***	6.2048***	5.6946***	5.1781***

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Sources: Author's calculation based on ISSP 2009, EU-SILC 2011, and Eurostat (2015).

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 $[\mu_8, \infty]$. Therefore, to be male and older reduces the probability of having the lowest possible perception of inequality of opportunity. Moreover, urban residence, a variable often included as a proxy for reference group in models of relative deprivation, significantly increases the degree of inequality of opportunity perceived. In interpreting this coefficient, one should take into account the possibility that urban residents have a different reference group than other citizens when assessing inequalities. Moreover, what is shown in Figure 3 and Table 7 in the online Appendix should be underlined: regions in which the largest European cities are located seem to have a higher level of inequality of opportunity.

The self-esteem hypothesis is confirmed for the lowest and highest categories 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. The coefficients are very similar using both the *ex post* and the *ex ante* measures of inequality of opportunity. As expected, what is affected by the choice of the measure are country-level controls: GDP per capita and its growth increase the probability of having 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. However, this coefficient is statistically significant from zero only when *IOp* is estimated *ex post* (the opposite happens for GDP per capita). Interestingly enough, the objective measure of *IOp* seems to have a negative impact on the perception of inequality of opportunity itself. The sign is the same for both *ex ante* and *ex post* measures but the magnitudes of the coefficients significantly differ. However, these interpretations cannot be extended to the seven middle categories, because the shift of the distribution implies that some mass will move into each of the middle categories while 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 3.

As expected, the marginal effects for the first category have the opposite sign of the coefficients. For both specifications (*ex ante* and *ex post*), 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 residence, being male, and having experienced downward mobility reduce the probability of having a low perception of inequality of opportunity. Conversely, respondents who are in a stable relationship and 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 third category, where we find the majority of respondents, all have the same signs but are lower in terms of magnitude. The country-level controls show that, after controlling for all the other observable covariates, GDP growth in the past decade affects *IOpP*: the perception of inequality of opportunity decreases in more dynamic countries. However, as already shown in Table 2, another interesting result is that the measure of inequality of opportunity included among controls has the opposite effect on its perception (it increases the probability of being in the first categories) and this effect is statistically significant when IOp_{EP} is used as a control.

Although we are reluctant to conclude that the way in which economists measure inequality of opportunity has nothing to do with how it is perceived by people, these estimates suggest that other country characteristics and individual variables play a clearer role in determining *IOp* perception. The low number of countries observed may be an explanation for this counterintuitive result: when the number of groups is small, country-level effects are likely to be estimated imprecisely.

Finally, in Figure 4 we report for each category the 95 percent confidence interval for predicted odd ratios of the two types of respondents: upward movers and downward movers. The precision of the estimates is very different for the two groups (there are twice as many upward movers as there are downward movers). Moreover, the very low probability of observing individuals with extreme *IOpP* makes the two categories less distinguishable for the last two levels of inequality of opportunity perception. However, the distribution of the odd ratios across

TABLE 3

Individual IOp Perception: Ordered Logit Marginal Effects Calculated for Model (5)

Ex post	Lowest *IOpP*								Highest *IOpP*
Education	0.001566	0.000945	0.000720	−0.000940	−0.001690	−0.000280	−0.000245	−0.000019	−0.000040
Male	−0.009170***	−0.005540***	−0.004200***	0.005550***	0.009949***	0.001690***	0.001437***	0.000110***	0.000200***
Age	−0.000562***	−0.000300***	−0.000259***	0.000330***	0.000600***	0.000100***	0.000080***	−0.00000***	0.000010***
Married	0.007408**	0.004480**	0.003510**	−0.004400*	−0.008074*	−0.001380*	−0.001160*	−0.000094*	−0.000100*
Upward mover	0.010010***	0.006046***	0.004600***	−0.006050***	−0.010840***	−0.001800***	−0.001560***	−0.000120***	−0.000200***
Downward mover	−0.018230***	−0.011429***	−0.011190***	0.011310***	0.021670***	0.003809***	0.003240***	0.000260***	0.000555***
Unemployed	−0.022000***	−0.013950***	−0.014500**	0.013700***	0.026900***	0.004770***	0.004070***	0.000331***	0.000690**
Retired	0.010390	0.006190	0.004370*	−0.006220	−0.010900	−0.001800	−0.001560	−0.000120	−0.000260
Worker	0.005960	0.003610	0.002820	−0.003616	−0.006490	−0.001110	−0.000939	−0.000076	−0.000160
Urban	−0.009800***	−0.005900***	−0.004840***	0.005970***	0.010800***	0.001860***	0.001570***	0.000100***	0.000269***
IOp	2.116200***	1.277500***	0.979067***	−1.280000***	−2.289000***	−0.390442***	−0.330258***	−0.026700***	−0.056360***
GDP p.c.	0.000041	0.000020	0.000010	−0.000020	−0.000045	−0.000000	−0.000000	−0.000000	−0.000000
Growth	0.017700***	0.010735***	0.008220***	−0.010750***	−0.019200***	−0.003280***	−0.002775***	−0.000225***	−0.000473***
Ex ante	Lowest *IOpP*								Highest *IOpP*
Education	0.000514	0.001295	0.000680	−0.001281	−0.000868	−0.000439	−0.000152	−0.000030	−0.000064
Male	−0.007220***	−0.005590***	−0.009500***	0.005530***	0.012210***	0.001890***	0.002143***	0.000131***	0.000277***
Age	−0.000420***	−0.000314***	−0.000560***	0.000312***	0.000710***	0.000107***	0.000125***	0.000000***	0.000016***
Married	0.004940*	0.004190*	0.006606*	−0.004140*	−0.008380*	−0.001429*	−0.001470*	−0.000090*	−0.000209*
Upward mover	0.008190***	0.006240***	0.010800***	−0.006176***	−0.013800***	−0.002120***	−0.002430***	−0.000147***	−0.000300***
Downward mover	−0.013200***	−0.011240***	−0.020250***	0.010930***	0.024280***	0.004174***	0.004460***	0.000293***	0.000617***
Unemployed	−0.015390***	−0.012580***	−0.024280**	0.012173**	0.028740**	0.004750**	0.005350**	0.000330**	0.000700**
Retired	0.008000*	0.006750*	0.011020*	−0.006710*	−0.014400*	−0.002220*	−0.002480*	−0.000154*	−0.000320*
Worker	0.004610	0.003645	0.006100	−0.003604	−0.007830	−0.001242	−0.001370	−0.000086	−0.000180
Urban	−0.007800***	−0.006380***	−0.010780***	0.006290***	0.013550***	0.002200***	0.002400***	0.000150***	0.000323***
IOp	0.556700***	0.535905***	0.736000***	−0.530430***	−0.939840***	−0.181449***	−0.164600***	−0.012591***	−0.026500***
GDP p.c.	0.000570	0.000059	0.000750	−0.000058	−0.000960	0.000020	−0.000160	−0.000000	−0.000090
Growth	0.017200***	0.010875***	0.022820***	−0.010764***	−0.029120***	−0.003682***	−0.005100***	−0.000250***	−0.000538***

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Sources: Author's calculation based on ISSP 2009, EU-SILC 2011, and Eurostat (2015).

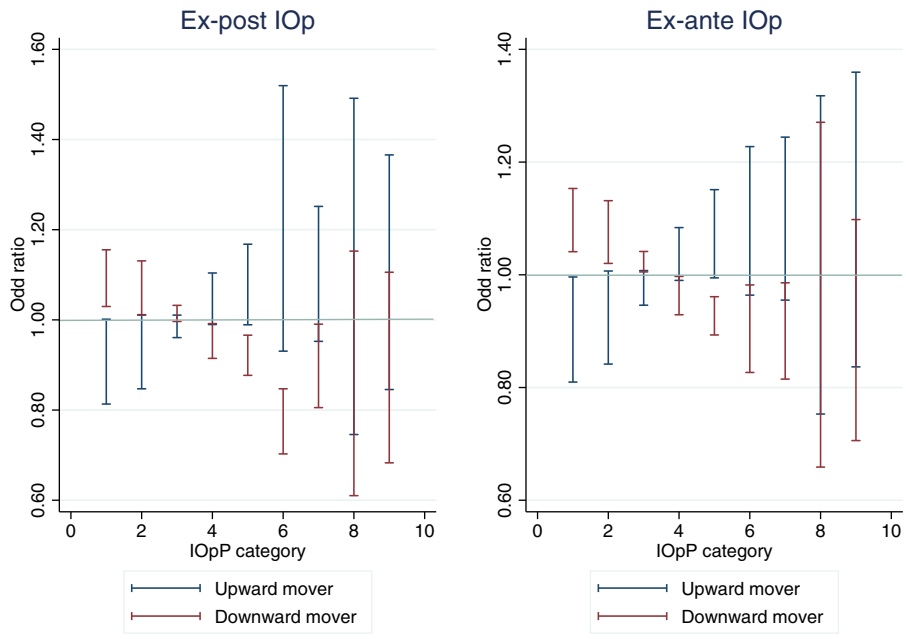

Figure 4. Perception of *IOp* for Upward and Downward Movers [Colour figure can be viewed at wileyonlinelibrary.com]

Notes: Intervals correspond to 95 percent confidence intervals
Sources: ISSP 2009 and EU-SILC 2011.

categories shows that, other things held constant, the experience of intergenerational mobility significantly modifies the perception of inequality of opportunity[9]. Note that *IOpP* is constructed by aggregating information about eight 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 effects, we interpret our results as evidence of the role of individual experience in biasing inequality of opportunity perception.

4.1. *Robustness Checks*

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

[9]For upward movers, *IOpP* is more likely to take the three lowest values; the opposite is true for the other six values. This is consistent with the inversion of the sign of the marginal effect which takes place for all variables between categories three and four. That is when the median answer is between "not very important" and "fairly important" for questions about circumstances, between "very important" and "fairly important" for questions about effort dimensions, and between "agree" and "neither agree nor disagree" for the question about whether there is equality of opportunity in access to university.

We know that our measure of *IOpP* has been obtained by aggregating eight components, following only one of the possible procedures. In order to check the robustness of our results, we run our analysis using three 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 eight components with the same controls; estimates are reported in Table 10 in the online Appendix. As far as individual controls are concerned, the coefficient obtained regressing the sum of components on our controls is very similar to those in Table 2 (coefficients for higher education, marital status, and retirement improve their statistical significance). The coefficient for IOp_{EP} and IOp_{EA} are again negative, but not significant. The other two coefficients for country-control variables have a negative and significant sign.

The second alternative represents the opposite approach: instead of reducing eight 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 11 in the online Appendix reports the coefficients estimated for the eight models when IOp_{EP} is used to control for measured inequality of opportunity.[10] 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 eight specifications. Only the coefficient for the upward movers dummy is negative (or not significantly different from zero) in all specifications and significant in the majority of cases. Being a downward mover is associated with positive coefficients or insignificant coefficients in all dimensions but ambition. Being resident in a urban area is associated with a positive coefficient, significant in six dimensions.[11] Again, country-level coefficients are unstable. Measured inequality of opportunity has both positive (family wealth, connections, race) and negative signs (religion, access to university, ambition, and hard work). More stable are the coefficients for GDP growth and GDP in levels, which are negative and significant in the majority of the dimensions. 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.

The third alternative measure of inequality of opportunity is based on the idea that the principle of reward might in fact be secondary to the principle of compensation in determining individual perception of the phenomenon. Therefore we specify a measure of perception ($IOpP^{\star}$) based on the same median-based algorithm but we exclude the two questions about ambition and hard work. Comparing the results in Table 10 (in the online Appendix) with estimates in Table 2,

[10]Similar coefficients are obtained using IOp_{EA} and are available upon request.

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

we notice that the coefficients for individual-level controls tend to be similar. On the other hand, country-level controls are highly statistically significant, but again show unstable coefficients in different specifications: the coefficient for *IOp* is positive when the *ex ante* measure is used and is negative when the *ex post* measure is used.

Moreover, because some of the variables used to explain $IOpP^{\star}$ are also used to partition the EU-SILC dataset into types and to calculate *IOp*, it may be safe to verify whether the inclusion and exclusion of this set of variables affect the estimated coefficients. This is verified by identifying two sets of regressors: (A) variables used to define the partition to calculate *IOp* which are observable individual characteristics in the ISSP; and (B) individual characteristics observable in the ISSP but not used to measure *IOp*. The set of regressors A includes sex and two variables not included in the model: father's occupation (four categories) and number of books at home when the respondent was 15 years old (nine categories). The latter variable is used as proxy for parental education, which is not observed in the ISSP. The set of regressors B includes all the covariates used to explain *IOpP* except for sex: age, marital status, education, employment status, experience of intergenerational mobility, and urban/rural residence. Table 12 in the online Appendix reports the coefficients estimated for three specifications of the multilevel ordered model: controlling for country-level regressors and the set A, controlling for country-level regressors and the set B, and controlling for all regressors. Estimated coefficients are in line with those in Table 2: as far as country-level controls are concerned, GDP per capita and its growth seem to be robustly associated with a lower perception of *IOp* (the only exception is the last column of Table 12, in the online Appendix). Conversely, the statistical association of the objective measure of *IOp* and its perception is again sensitive to the model specification. As far as the individual-level coefficients are concerned, additional regressors (not initially included among controls) are significant in explaining $IOpP^{\star}$, only for their lowest category (the lowest category in terms of books at home and in terms of father's occupation). Most importantly, when both sets of regressors are used to explain $IOpP^{\star}$, the sign of individual-level coefficients is unchanged and their significance only slightly modified.

To verify the consistency of our results with regard to different measures of inequality of opportunity, we estimate model (5) replacing *IOp* with the inequality of opportunity, a measure proposed by Checchi *et al*. (2015) and Brzeziński (2015). Table 10 in the online Appendix reports 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 Brzeziński (2015) *IOp* are very similar to those in Table 2. The only difference concerns the statistical significance of the control for the country-level variable *IOp*, which is no longer significant. 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 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 residence (urban/rural). To check whether their exclusion affects our results, we estimate the mixed ordered

logit model, not controlling for the area of residence but including Iceland and Portugal; estimates are reported in the last two columns of Table 10 in the online Appendix. All the coefficients for individual-level variables maintain their sign and changes in significance are marginal. The association with *IOp* is negative but significant only for *ex post IOp*.

All the robustness checks we have performed show a rather consistent picture. A number of controls have the same sign and a similar level of significance across all specifications. Among the individual controls, experience of social mobility, unemployment, and urban residence 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 who 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 observable dimensions of the phenomenon. Among country-level controls, the picture is less clear: economic growth is negatively correlated with inequality of opportunity perception in the large majority of the model specifications; on the contrary, the association with measures of inequality of opportunity does not have a clear sign.

5. Conclusion

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 behavior, and reproductive decisions may be based on perceived phenomena rather than on their objective measurement. 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 and the German IFO Business Climate Index, among policymakers 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 the 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 had been growing and may be among the causes of one of the most important revolutionary waves of recent decades.

Beliefs and perceptions are often included among explanatory variables in the analysis of individual or collective behaviors. 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 estimated two widely used measures of inequality of opportunity in a sample of 23 European countries. For the same countries, we constructed an individual ordinal measure of perceived unequal opportunities, and in merging the two measures, we showed 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 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 variability in perception. 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 clear 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 higher degree of inequality of 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 who have good reasons to perceive their experience in the labor market as a failure systematically overemphasize the role of external causes in determining socioeconomic success.

Our results suggest that the popular perception of inequality of opportunity may be weakly linked to objective measures of the same phenomenon produced by scholars. Conversely, other country characteristics—such as 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 the low association between reality and perception be explained by the endogeneity of institutions? Can public perceptions about inequality of opportunity teach economists something about how to measure inequality of opportunity? Is it possible to construct an index of relative *IOp* obtained by aggregating individual perceptions?

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

APPENDIX

Table 4: EU-SILC descriptive statistics

Table 5: ISSP descriptive statistics The partition in types to obtain the counterfactual distribution

Table 6: EU-SILC descriptive statistics Inequality of opportunity and its perception in 68 European regions

Table 7: Inequality of opportunity in 68 European regions Other inequality of opportunity measures

Table 8: Existing *IOpP* estimates based on EU-SILC 2011 Perception components

Table 9: Answers correlation across *IOpP* components Robustness check

Table 10: Alternative model specifications

Table 11: Coefficients for *IOpP* components

Table 12: Determinants of *IOpP**: including and excluding variables used to measure *IOp*