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How uneven is the playing field? Inequality of socio-economic opportunity in the UK, 2009-2017

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David Flatscher

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Department of Social Policy
London School of Economics and
Political Science Houghton Street
London WC2A 2AE

Email: socialpolicy.workingpaper@lse.ac.uk
Telephone: +44 (0)20 7955 6001

lse.ac.uk/social-policy

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Abstract

Social policy can serve an important role in bringing about equal opportunities. In order for it to do so, a reliable measure of equality of opportunity is in order to assess progress. To date, few direct estimates of inequality of opportunity exist for the UK. In this dissertation, I seek to fill this gap in the research by measuring inequality of opportunity with recent methodological advancements. Following Niehues and Peichl (2014), I directly measure lower and upper bounds of inequality of opportunity. Unfortunately, opportunities are far from equal in the UK. Inequality of opportunity, in 2017, ranges from about 10 to 65 percent of total inequality of gross income. Furthermore, I quantify the relative contribution circumstances beyond individual control play in shaping unequal socio-economic advantages. Finally, I estimate the evolution of inequality of opportunity between the years 2009-2017.

Keywords: Inequality of opportunity, income inequality, social disadvantage

Author

David recently received his MSc in International Social and Public Policy from the Department of Social Policy at LSE. Prior to graduate school, David received his BA in Economics from New York University. His research interests include socio-economic inequalities and public economics.
Email: david.flatscher@gmail.com

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1 Introduction

Equality of opportunity (EOp) is a complex idea and can have multiple interpretations. A widely utilized definition is the one from Roemer (1993, 1998), who defines EOp as the condition in which advantageous outcomes are solely determined by individuals' efforts and not by circumstances out of their control. Intuitively speaking, many would agree that circumstances should not prevent individuals from being rewarded for their contributions. This view is widely espoused by policymakers. Indeed, the notion that social policy should provide equal opportunities, or "level the playing field", commands support across the political spectrum and is an established feature of political discourse in the UK.[1] Yet, how do we know if the playing field is actually not level? And if it is not, how uneven is it?

To date, the yardstick for unequal socio-economic opportunity in the UK has primarily been intergenerational social mobility. This measure, however, only partially captures the idea of inequality of opportunity (IOp) as formulated in normative political philosophy and welfare economics. It also is of limited use to social policymakers who seek to understand the role circumstances beyond parental income play in shaping disadvantage. Direct estimates, on the other hand, broadly quantify how factors beyond individual control contribute to observed inequalities. While the direct method is promising, much of the extant literature that uses it suffers from a methodological shortfall: estimates are a lower bound of inequality of opportunity (Ferreira & Gignoux, 2011). The lower bound estimates only explain the minimum level of IOp. In the absence of an upper bound measure, the share circumstances play in shaping advantage may be misunderstood or even downplayed by policymakers (Kanbur & Wagstaff, 2016). Recent methodological advances offer a solution via an upper bound estimate, which estimates the maximum level of IOp (Niehues & Peichl, 2014). Lower and upper bound estimates together can capture the "true" extent of IOp.

At this point, few studies directly estimate IOp in the UK and only one (Carranza, in press) has estimated an upper bound. The goal of this dissertation is to fill the gap in and contribute to this research. I provide direct lower and upper bound estimates of socioeconomic inequality of opportunity in the UK for the period of 2009–2017. To the best of my knowledge, this constitutes the most up-to-date direct estimate of IOp in the UK.

The dissertation is structured as follows. In chapter 2, I highlight the theoretical advances on equality of opportunity, identify attempts to operationalize the concept, and articulate how I advance the extant literature. Chapter 3 outlines the empirical strategy I take, chapter 4 offers a description of the data and measures used, and chapter 5 puts forward the empirical results. I discuss social policy implication in chapter 6. Finally, chapter 7 concludes the study.

[1] Examples from political debate include Smith 2010; May, 2016; Exley, 2019; Stewart, 2019.

2 Literature Review

2.1 What is equality of opportunity?

Equality of opportunity is a complex idea and upon close inspection it entails numerous conceptual difficulties. For instance, equal opportunities can bring about unequal outcomes, which, in turn, means that opportunities are no longer equal (see Chambers, 2009). One might ask: when should opportunities be equalized? This issue is particularly noticeable if one takes on an intergenerational perspective (e.g., Swift, 2005; Fishkin, 2014). If inequalities are transmitted from one generation to the next, then starting points are not equal. Furthermore, equality of opportunity is an abstract concept and can therefore be misleading; it is closely linked to other concepts such as meritocracy, fairness, and efficiency (see Cavanagh, 2002). Any attempt to assess such a multifaceted idea thus needs to be grounded in a precise theoretical framework that clearly defines it. The focus of section 2.1 of this review is to outline theoretical advancements on equality of opportunity and conclude with a precise definition. I proceed to examine the state of the applied literature in section 2.2, and specifically highlight how inequality of opportunity (IOp) has been measured in the UK context in section 2.3. Finally, I identify how my study advances this literature.

The conceptual developments in distributive justice and normative political philosophy broadly recognize the importance of individual responsibility, preferences, and choices. In other words, underlying factors that generate observed outcomes are highlighted. Equality of outcome neglects these elements and is thus rejected as an ideal in favor of equality of opportunity. The seminal contribution of Rawls (1971) steered welfare analysis in this direction by rejecting utilitarianism. Society, according to Rawls, should focus on the worst-off and the distribution of primary goods (not just income but also liberties, rights, and opportunities). Sen (1979, 1988, 1992) argues for a multidimensional approach toward understanding the distribution of advantages in society that takes into account choices and capabilities to achieve desirable outcomes (“functionings”). Further contributions criticize equality of outcome because it fails to take into account individuals’ preferences (Dworkin, 1981a, 1981b), accomplishments (Nozick, 1974), and responsibilities (Cohen, 1989; Arneson, 1989). These works set the philosophical foundation for contemporary debate on the subject of equality, but they also leave much unanswered. While it appears clear that equality of outcome is a problematic ideal, the alternative is only vaguely defined. What, in a tangible sense, does the condition of equal opportunities require?

A pioneering interpretation of equality of opportunity is provided by Roemer (1993, 1998), crucially extending earlier theories in normative political philosophy and welfare economics. Roemer articulates a conceptual framework in which outcomes (“advantages”) such as education, health, or income, are the result of circumstances and efforts. Circumstances are factors beyond individual control (e.g., socioeconomic background, ethnicity, gender) while efforts are factors that can be controlled and contribute to the observed advantage. Equality of opportunity, according to Roemer, is the condition in which individuals who exert the same degree of effort achieve the same outcome. Thus, equality of opportunity dictates that outcomes depend only on factors that are within individuals’ control.

Further conceptual advancements, particularly relevant to social policy intervention, are made by Fleurbaey (1995, 2008) and Fleurbaey and Maniquet (2011a, 2011b). These works articulate a

theory of equality that takes into account individual responsibility via the principles of compensation and reward. The principle of compensation "requires that two agents who display the same responsible characteristics should end up with equal outcomes" (Fleurbaey, 1995, p. 686). The principle of reward deals with how outcomes should relate to responsibility attributes. Two variants of the latter principle are frequently called upon in the literature: utilitarian and liberal reward. Utilitarian reward suggests that once differences due to circumstances are eliminated, the social policy objective should be to maximize the sum of individuals' welfare. The liberal (or natural) reward principle requires that once differences in circumstances are compensated for, no further redistribution should take place (Fleurbaey & Maniquet, 2011a, p. 512–514).

A division in the literature is based on whether one takes an ex ante or ex post approach toward the principle of compensation. The ex ante perspective on compensation follows the view expressed by Van De Gaer (1993) that inequalities due to fixed endowments should be compensated. Equality of opportunity then necessitates that individuals who face different circumstances have the same opportunities available. This conception is analogous to the concept of equity, a state in which individuals face equal choice sets, as defined by Le Grand (1991). By contrast, the ex post perspective corresponds to Roemer's (1998) view, "[not] that outcomes be equalized for all, but only within a particular segment of the population, where such a segment consists of all those with different circumstances who have applied the same degree of effort" (p. 23). Put differently, ex post equality of opportunity requires that favorable outcomes are solely determined by individuals' efforts. The difference is subtle but the two points of view can nevertheless be incompatible (Fleurbaey & Peragine, 2013).

Now, it is worthwhile to briefly touch upon the role of luck. Some argue that luck should fall within the domain of personal responsibility because it can be partly controlled via risk-taking (Friedman, 1963), however, other strands of the literature treat luck as a factor beyond individual control on the basis of which compensation can be sought (see Le Grand, 1991; Vallentyne, 2002). The latter view is more common (Kanbur & Wagstaff, 2016).

While EOp still elicits robust debate among scholars, Roemer's (1993, 1998) insight that the observed outcome inequality could be decomposed into two distinct components—one legitimate part that is a product of individual control and another illegitimate part that arises from uncontrollable circumstances—established a definition and theoretical framework for empirical investigation. In the following section, I examine pertinent strands of the applied literature, highlight key critiques, and identify recent encouraging developments.

2.2 Operationalizing the concept

The conceptual complexities encapsulated in the aforementioned theoretical contributions are mirrored in the empirical literature. There is a growing body of work that seeks to quantify unequal opportunities in the areas of health (e.g., Fleurbaey & Schokkaert, 2009; Van de Gaer, Vandenbossche, & Figueroa, 2013) and education (e.g., Peragine & Serlenga, 2008; Ferreira & Gignoux, 2013). These contributions underscore the flexibility of the EOp framework. A related literature evaluates social policies that seek to eliminate IOp (Roemer et al., 2003; Betts & Roemer, 2005; Groot, van der Linde, & Vincent, 2018). The scope of this review, however, is limited to studies that measure inequality of socio-economic opportunity. Efforts to operationalize the

concept are varied and no consensus has emerged. The existent applied literature can broadly be categorized according to how the principles of compensation and reward are reconciled (Brunori, 2016; Ramos & Van de Gaer, 2016). Moreover, the literature can be distinguished by methodological strategy.

The most widely used measure of equality of opportunity follows the ex ante perspective. At this point, estimates have been produced for a large number of countries. The World Bank has taken this view in a recent report on Latin America (Ferreira, Molinas Vega, Paes de Barros, & Saavedra Chanduvi, 2008). A meta-analysis by Brunori, Ferreira, and Peragine (2013) presents international comparisons of ex ante measures of inequality of opportunity for 41 countries. Some studies (Cogneau & Mespl´e-Somps, 2008; Checchi & Peragine, 2010; Belhaj Hassine, 2011) estimate equality of opportunity non-parametrically.

The non-parametric methodology advanced by Checchi and Peragine (2010) defines inequality of opportunity as inequality between types who share circumstances. To illustrate this, consider the case with one circumstance variable, for example sex (male or female). IOp, in this case, is the inequality between males and females. While this method is simple, there is a notable drawback: if there are many circumstances variables, the number of types will be fairly large, which then requires a large sample to avoid imprecise estimates. Others (e.g., Bourguignon, Ferreira, & Men´endez, 2007; Ferreira, Gignoux, & Aran, 2011; Ferreira & Gignoux, 2011; Marrero & Rodr´ıguez, 2012; Singh, 2012; Checchi, Peragine, & Serlenga, 2015; Piraino, 2015; Brzezinski, 2015; Martinez Jr, Rampino, Western, Tomaszewski, & Roque, 2017; Hufe, Peichl, Roemer, & Ungerer, 2017; Su´arez ´Alvarez & Jesu´s L´opez Men´endez, 2018) use a parametric procedure. The regression based method can include relatively more circumstance variables without sample size becoming problematic. This technique estimates inequality of opportunity via a counterfactual distribution. To give a prominent example, Bourguignon et al. (2007) econometrically estimate an earnings distribution under the counterfactual of identical circumstances. This counterfactual distribution is then compared to the observed earnings distribution to measure the share of inequality of opportunity in Brazil. A downside of this approach is that a specific functional form is assumed. Finally, some others (Pistolesi, 2009) use a combination of both non- and parametric components.

An alternative and less popular method follows the ex post perspective. To restate, according to the ex post point of view, inequality of opportunity exists if individuals who exert the same degree of effort exhibit different outcomes. This approach is less straightforward than the simple ex ante approach and limited by the fact that effort is not easily observed (though it can be indirectly deduced from the type specific income distribution). Studies that offer an ex post estimate include e.g., Checchi and Peragine (2010); Checchi et al. (2015); Aaberge, Mogstad, and Peragine (2011); Carpantier and Sapata (2013). I will also note the stochastic dominance technique advanced by Lefranc, Pistolesi, and Trannoy (2008, 2009). This approach, which is distinct from any method discussed thus far, ranks distributions conditional on circumstances to test for EOp, yet, on its own, it does not quantify the magnitude of inequality of opportunity. Furthermore, the stochastic dominance method also is not a feasible procedure if a large number of circumstance variables is considered (Ferreira & Gignoux, 2011, p. 11).

In contrast to the direct measures outlined above, the intergenerational social mobility literature partly attempts to measure inequality of opportunity indirectly (Benabou & Ok, 2001; Roemer, 2004). Social mobility is often measured as an association between individual and parental income. If this association is low, then opportunities are posited to be more equal. But this view corresponds to a radical interpretation of equality of opportunity as it neglects, for example, "the influence of family background on the formation of preferences and aspirations among children" (Roemer, 2004, p. 55). In effect, it also reduces circumstances to one variable, parental income. Yet, other circumstance variables such as gender, ethnicity, parental education, etc., are also relevant for EOp. On top of that, measuring social mobility entails a number of conceptual difficulties on its own (for a review of this literature, see Jäntti & Jenkins, 2015).

The popularity of the regression-based ex ante method to estimate socio-economic inequality of opportunity suggests the potential for a consensus. This is to be welcomed because a unified approach facilitates international comparisons and analysis over time, which is vital for policy evaluation. However, the approach has recently been criticized because it offers a lower bound estimate of IOp (Kanbur & Wagstaff, 2016). The lower bound property arises because the full set of relevant circumstance variables is only partially observable and adding more circumstance variables either increases or does not change the IOp estimate (Ferreira & Gignoux, 2011). In the absence of an upper bound estimate, it cannot be ruled out that "true" IOp is, in fact, equivalent to total inequality. Policymakers could confuse the lower bound estimate with a point estimate and draw wrong conclusions about the state of unequal opportunities (Kanbur & Wagstaff, 2016, p. 138). Fortunately, recent developments in the literature offer a promising complement to the lower bound method. Niehues and Peichl (2014) propose estimating inequality of opportunity via an econometric fixed effects model, which captures all unobserved factors that do not change over time. Under the assumption that all circumstances (and some efforts) are time invariant, this method yields an upper bound of IOp (Niehues & Peichl, 2014, p. 75). An upper bound estimate has been produced for the USA, Germany (Niehues & Peichl, 2014), a number of emerging economies (Hufe, Peichl, & Weishaar, 2019), and European countries (Carranza, in press).

2.3 Measuring unequal opportunities in the UK

IOp in the UK has been frequently estimated indirectly using social mobility as a proxy measure (e.g., Blanden & Machin, 2007; Blanden, Haveman, Smeeding, & Wilson, 2014; Bukodi, Goldthorpe, Waller, & Kuha, 2015; McKnight, 2015; Goldthorpe, 2016). Direct estimates, on the other hand, are relatively scarce. Yet, direct measures provide valuable information about the role circumstances (beyond parental income or class) play in shaping unequal socio-economic opportunities and are closer to the philosophical framework established in the literature.

Lefranc et al. (2008) employ the stochastic dominance method to directly test for IOp in the UK (in addition to eight other developed countries) for the year 1991. Circumstances variables, based on British Panel Household Survey (BHPS) data, are rather limited and include fathers' education and occupational social status. A number of papers provide cross-country estimates for European countries based on European Union Statistics on Income and Living Conditions (EU-SILC) data (Marrero & Rodr´ıguez, 2012; Checchi et al., 2015; Brzezinski, 2015; Carranza, in press). Checchi et al. (2015) use a non-parametric ex ante and ex post method, producing results for IOp in gross earnings for the years 2005 and 2011. The majority of works based on the EU-SILC data, however,

provide regression based ex ante estimates. Marrero and Rodr´ıguez (2012) include parental education, father's occupation, country of birth, and individuals' financial situation during childhood as circumstance variables and estimate IOp for equivalized disposable household income for the year 2005. Brzezinski (2015) is a follow up study to Marrero and Rodr´ıguez (2012) based on a slightly narrower set of circumstances for the years 2004 and 2010. Carranza (in press) stands out among these studies as the only one that offers an upper bound in addition to the ex ante lower bound estimates. Moreover, Carranza (in press) presents a time trend by estimating upper bound IOp for every year in the period 2005–2011, and lower bounds for the years 2005 and 2011. In the baseline estimation, circumstance variables include parental education and economic activity, father's occupation, sex, and household composition during childhood. Hufe et al. (2017) parametrically estimate ex ante inequality of opportunity in the UK for the years 2004, 2008, and 2012, based on data from the 1970 British Cohort Study (BCS70). The rich cohort data allow the authors to test the effect of including additional childhood circumstances in their estimate. However, the data is not nationally representative of the entire UK population (as only one cohort is observed). Moreover, while including rich circumstance variables offers an upward correction to the lower bound estimate, no upper bound is estimated.

To begin to address the existing research gap, I estimate ex ante lower and upper bounds of socio-economic inequality of opportunity in the UK for the year 2017. I also include a time trend for the lower bound estimates for the period 2009–2017. Additionally, I investigate, in detail, the relative contribution of circumstances to total inequality of opportunity. To the best of my knowledge, this constitutes the most recent comprehensive investigation of inequality of socio-economic opportunity in the UK (and besides Carranza (in press), it is the only study to provide an upper bound estimate). This dissertation thus significantly contributes to the applied literature and our understanding of the role that circumstances play in shaping opportunities for income acquisition in the UK.

3 Methodology

3.1 Theoretical Framework

Based on Roemer's (1993, 1998) seminal framework and following Ferreira and Gignoux (2011), I employ an ex ante approach to parametrically measure socio-economic inequality of opportunity. Consider that the observed income of each individual in the population $i \in \{1, \ldots, N\}$ is the product of a vector of circumstances, a scalar of effort variables, and a random component that includes factors such as luck:

$$Y = f(C, E(C), \epsilon) \tag{3.1}$$

To test for ex ante IOp, the first step is to divide the population into a set of homogenous types based on shared circumstances, $\Omega = \{T_1, T_2, \ldots T_k\}$. Recall that the ex ante perspective defines equality of opportunity as the condition in which differences in advantage (in this case income) that are attributable to circumstances are eliminated. Hence, EOp according to the ex ante utilitarian reward principle, requires that the average outcome, $\mu(y)$, across types is equalized. Put formally:

$\mu_a(y) = \mu_b(y) \forall a, b | T_a, T_b \in \Omega$. Inequality of opportunity, then, exists to the degree to which $\mu_a(y) \neq \mu_b(y), a \neq b$.

IOp can be measured in a smoothed counterfactual distribution $\{\tilde{\mu}\}$, where each individual's outcome $y_i \forall i = 1, \ldots, N$ is replaced by their predicted type mean outcome, $\tilde{\mu} k \; \forall k = 1, \ldots, n$ (Foster & Shneyerov, 2000; Checchi & Peragine, 2010; Ferreira & Gignoux, 2011). I in 3.2 refers to any inequality index applied to the counterfactual distribution.

$$IOp = I\{\tilde{\mu}\} \tag{3.2}$$

3.2 Capturing the "true" extent of unfair inequality

To arrive at a bounded estimate of IOp, it is necessary to both estimate a lower and an upper bound. To this end, I mirror the empirical strategy in Niehues and Peichl (2014). The same approach has also been used by Hufe et al. (2019) and Carranza (in press). These papers proceed by first estimating a lower bound and then an upper bound. The "true" value of IOp will lie in between the two estimates.

Lower bound

For the lower bound estimation, I follow the parametric model first advanced by Bourguignon et al. (2007). In this model, circumstances explain the outcome variable, both directly and indirectly via their effect on efforts. This is expressed in the following set of equations:

$$Y_i = \lambda C_i + \phi E_i + \upsilon_i \tag{3.3}$$

$$E_i = \psi C_i + \nu_i \tag{3.4}$$

As Bourguignon et al. (2007, pp. 15–16) point out, it is not necessary to estimate both equations above to measure the full impact of circumstances on the outcome variable, in line with the Frisch-Waugh theorem (see Frisch & Waugh, 1933). Instead, I can estimate equation 3.5 by inserting 3.4 into 3.3:

$$InY_i = \underbrace{(\lambda + \phi\psi)}_{\beta} C_i + \underbrace{(\phi\nu_i + \upsilon_i)}_{\epsilon_i} \tag{3.5}$$

By convention, a log-linear functional form is used. This choice is well established in labor economics (see Heckman, Lochner, & Todd, 2003) and has been followed in the empirical literature that seeks to estimate IOp. I estimate equation 3.5 with a Poisson regression using robust standard errors instead of OLS. Thus, I avoid having to perform a Smearing correction to obtain consistent results (Blackburn, 2007). Compared to OLS, the Poisson regression estimates in a log-linear model are unbiased when errors are heteroskedastic (Silva & Tenreyro, 2006) (see also Carranza, in press).[2] Based on the results obtained in equation 3.5, I use the vector of estimated parameters $\{\tilde{\beta}\}$ to construct the smoothed counterfactual distribution:

$$\tilde{\mu}_i^{LB} = exp\{\hat{\beta} C_i\} \tag{3.6}$$

Upper bound

Following Niehues and Peichl (2014), I exploit the time-constant influence of family, social background, and the total set of fixed circumstances, to estimate inequality of opportunity (IOp) via a fixed effects model. The intuition is that immutable circumstances that are beyond individual control do not change over time. The FE model applied to the longitudinal data captures all unobserved circumstances that are time invariant as well as unobserved time invariant efforts. This estimation involves two preliminary stages. The first step is to estimate the time constant unobserved heterogeneity:

$$lnY_{it} = \alpha E_{it} + c_i + \mu_t + \epsilon_{it} \tag{3.7}$$

Equation 3.7 can be considered an upper bound estimate of IOp because the term ci captures all unobserved time invariant heterogeneity (circumstances and efforts). μ_t controls for time effects that, on average, affect all individuals equally (for example, a recession).

After estimating the FE model, I return to the cross-section and regress the outcome variable on the predicted individual fixed effect $\hat{c}_i$ (the estimate of circumstances' influence):

$$lnY_i = \delta \hat{c}_i + v_i \tag{3.8}$$

Again, I estimate the above model 3.8 via a Poisson regression with robust standard errors. I can then construct a smoothed counterfactual distribution based on the estimated parameters:

[2] I would like to thank Rafael Carranza for pointing this out to me.

$$\tilde{\mu}_i^{UB} = exp\{\hat{\delta}\hat{c}_i\} \quad (3.9)$$

Alternatively, I also estimate a pure fixed effects model, without controlling for any effort variables (upper bound 2). The effort term αE_{it} in equation 3.7 may also capture the indirect effect of time invariant circumstances on efforts. If effort variables are relatively stable over time, one could argue they should be considered circumstances and not efforts (e.g. long-term unemployment/part-time work). However, equation 3.7 does not attribute these "efforts" to circumstances and therefore, the model might underestimate the upper bound. Conversely, if we consider the effort variables included in model 3.7 to be legitimate effort, then the estimate produced by the model will be closer to the "true" value of IOp.

$$lnY_{it} = c_i + \mu_t + \epsilon_{it} \quad (3.10)$$

After estimating upper bound 2 in equation 3.10, I follow the same procedure as outlined in equations 3.8 and 3.9 to predict the income distribution under the counterfactual condition that circumstances are the sole determinant of income.

3.2 An index of inequality of opportunity

The choice of inequality index can be consequential because any inequality index incorporates a number of assumptions in its construction, such as sensitivity to changes in various parts of the distribution. While most inequality indices such as the Gini coefficient, members of the Atkinson class, and the Generalized Entropy measures satisfy a number of desirable properties, only the mean log deviation $MLD(Y) = \frac{1}{N}\sum_{i=1}^{N} In\ \frac{\mu}{y_i}$ satisfies additive subgroup decomposability and path independence (Foster & Shneyerov, 2000). Checchi and Peragine (2010) and Ferreira and Gignoux (2011) first propose an index of IOp that exploits the desirable properties of the MLD. It can be expressed as follows:

$$IOp_{(relative)} = \frac{MLD(\{\tilde{\mu}\})}{MLD\ (Y)} \quad (3.11)$$

Where $MLD(\{\tilde{\mu}\})$ is simply a measure of the predicted between-type inequality (by definition inequality due to circumstances) and $MLD(Y)$ is equal to total inequality in the observed outcome distribution. This measure (IOR) gives the share of total inequality that is due to IOp. I follow this approach to ensure comparability with previous studies. Moreover, the MLD can be decomposed to provide a measure of relative importance of each circumstance variable. Enumerating the share of inequality of opportunity in total inequality of outcome is also interesting per se.

4 Data

The data I use are obtained from the Understanding Society: UK Household Longitudinal Study (UKHLS) waves 1-8, collected from 2009-2017 (University of Essex, 2018). It is a longitudinal study, i.e. the same individuals are repeatedly interviewed over time, with a sample representative of the entire UK population. The UKHLS is comprised of a stratified, clustered, equal probability sample of 24,800 households in England, Scotland and Wales; an unclustered systematic simple random sample of 1,200 households in Northern Ireland; and a clustered ethnic minority boost sample of 4,000 households. From wave 2 onward, it also includes 8,000 households from wave 18 of the British Household Panel Survey (BHPS). Lastly, from wave 6 onward the UKHLS includes another clustered minority boost sample, the Immigrant and Ethnic Minority Boost Sample (IEMBS) of 2,500 households (Knies, 2018).

This dissertation is, to the best of my knowledge, the first to utilize the UKHLS database to provide a quantification of inequality of opportunity for the UK. The majority of previous estimates rely on the European Union Statistics on Income and Living Conditions (EUSILC) data (Marrero & Rodr´ıguez, 2012; Checchi et al., 2015; Brzezinski, 2015; Carranza, in press). A distinct advantage of the UKHLS data compared to the EU-SILC is that the former allows for a longer time period to estimate the predicted fixed effects coefficients (7 years instead of 3).

In line with the previous literature, I restrict my sample to individuals aged 25 to 55 years, the OECD prime working age. As outcome variables I select gross personal income, net personal income, and gross labor earnings, respectively. The various income measures allow for analysis of the effects of the tax and transfer system, which is a primary social policy instrument to reduce inequalities and unequal opportunities in the UK (Groot et al., 2018). Looking at inequality of opportunity in earnings, in addition to broader income measures, allows for investigation of potential unequal opportunities directly in the labor market. I further restrict the sample to individuals who report positive incomes and earnings because of methodological constraints (namely, the log-linearized functional specification in equations 3.5, 3.7, and 3.8).

The dataset provides rich information on circumstances and efforts within individual control. In selecting circumstance variables for the lower bound estimate, I broadly follow previous studies that include information on socio-economic background, ethnicity, migrant generation, sex, and height to ensure comparability. These variables are frequently used because they clearly represent invariant circumstances that are beyond individual control. Thus, a strong normative case can be made to eliminate and compensate inequality that arises due to these circumstances.

I make a departure from some previous studies (e.g., Checchi et al., 2015) by exluding age. A priori, age is strongly correlated with work experience and skill. Hence, there is less of a clear-cut normative case to compensate for inequality due to age. On the other hand, I include whether the respondent suffers from a long-standing (at least 12 months) illness or impairment. This factor is rarely considered. I present summary statistics for the circumstance variables used in my estimation for IOp in 2017 in table 4.1.

In the baseline upper bound estimation, I control for effort variables that are (at least partially) under individual control. I include dummy variables indicating if the respondent was ever married or

in a civil partnership, weekly working hours, region of residence, whether the respondent is a full- or part-time worker, educational attainment, and data on current economic activity (such as being self employed, a student, or on maternity leave). One might object to the choice of these effort variables because clearly individuals cannot fully control them (this is particularly evident in the economic activity variables, where circumstances are most obviously at play). The skeptical reader can turn to the alternative second upper bound estimate, which does not control for any "efforts".

The final analytical sample for the lower bound estimate in wave 8 contains 5,377 individuals. In addition, I also compute lower bound estimates for each wave in the dataset. The baseline upper bound estimate is based on a sample of 7,417 individuals and includes 42,215 observations (see table 7.4). The full results and sample sizes for each estimate are presented in section 5.1. I use longitudinal weights in the sample analysis to ensure external validity.

Table 4.1: Descriptive statistics

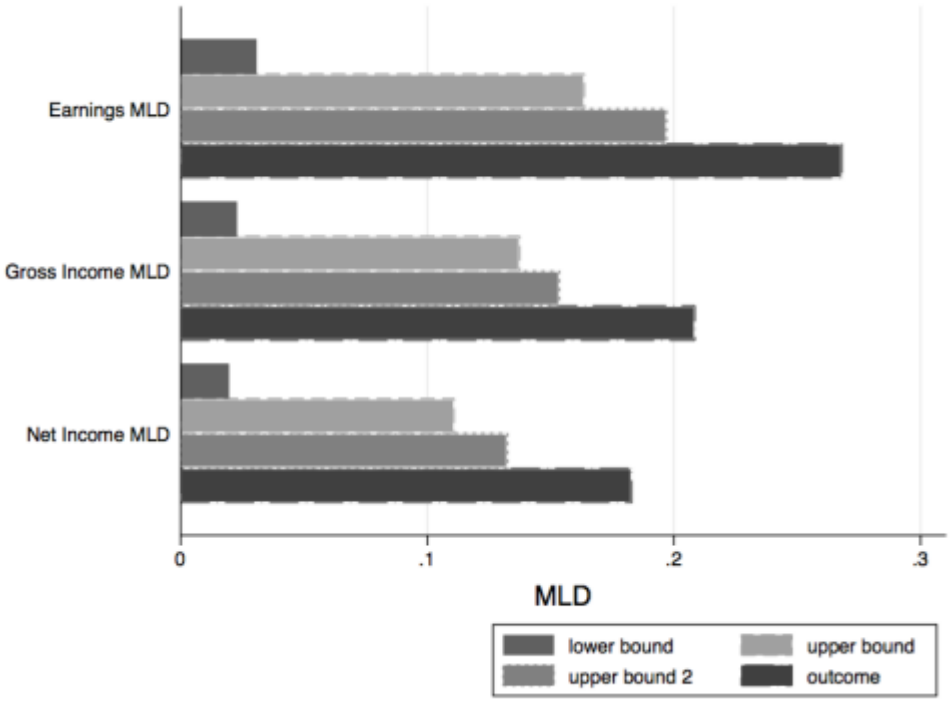
Circumstance Variables (Wave 8)	All	Female	Male
Mean Monthly Gross Personal Income (£)	2630.004	2244.932	3127.135
Mean Monthly Net Personal Income (£)	2068.468	1801.313	2413.367
Mean Monthly Gross Labor Earnings (£)	2375.313	1949.205	2925.423
Long-Standing Illness or Impairment (% Yes)	23.81	25.12	22.11
Ethnicity (%)			
White	83.97	85.02	82.62
Mixed	1.75	2.05	1.36
Asian	10.34	8.38	12.87
Black/African/Caribbean	3.51	4.19	2.64
Other	0.43	0.36	0.51
Sex (%)			
Female	56.35	100	0
Male	43.65	0	100
Father's Educational Qualifications (%)			
Did Not Go to School	1.66	1.52	1.83
Left school with no qualif/certif	26.04	26.70	25.18
Left school with some qualif/certif	27.64	26.86	28.63
Post school qualif/certif	29.42	30.33	28.25
University or higher degree	15.25	14.59	16.11
Mother's Educational Qualifications (%)			
Did Not Go to School	2.79	2.51	3.15
Left school with no qualif/certif	25.00	24.82	25.22
Left school with some qualif/certif	38.96	38.35	39.75
Post school qualif/certif	22.78	23.56	21.77
University or higher degree	10.47	10.76	10.10
Father Not Working, Resp. Aged 14 (%)	6.40	6.47	6.31
Migrant Generation (%)			
1st generation	12.11	10.99	13.55
2nd generation: born uk, at least one parent not born uk	12.94	12.81	13.12
3rd generation: born uk, both parents born uk, at least one grandparent not born uk	9.15	9.50	8.69
4+ generation: born uk, both parents and all grandparents born uk	65.80	66.70	64.64
Mean Height (Feet)	5.142	4.990	5.338
N	5377	3030	2347

5 Results

5.1 Main findings

In this section, I present the empirical results from the IOp estimates. While the primary purpose of this dissertation is to measure the importance of circumstances in the observed outcome distributions, it is nonetheless interesting to discuss the results of the underlying regressions. First, I turn to the lower bound estimation. In the Poisson reduced-form regressions presented in table 5.1, coefficients all broadly have the expected signs. Looking at the various ethnicity variables, coefficients are consistently negative compared to the reference category ("white"). Individuals in the ethnicity category "black/african/caribbean" have lower gross and net incomes as well as labor earnings, on average. These results tend to be statistically significant. For black males, incomes and earnings are significantly lower, on average, than for white males. The results also strongly reflect the well-known gender wage gap. Females' incomes and labor earnings are significantly lower than males', on average. Socio-economic background, as reflected by parental education and father's employment status when respondents were aged 14, appears to be important for income acquisition. Individuals whose father has a university degree have significantly higher incomes, on average, than individuals whose father did not attend school. Father's educational qualification tends to be more influential than mother's. Finally, as expected, having a long-standing illness or disability is associated with significantly lower incomes and earnings than not having an illness.

Figure 5.1 Inequality of opportunity, Absolute Index (2017)



As for the baseline upper bound estimation, looking at the fixed effects estimations presented in table 7.4, one can glean some insights about the importance of various effort variables that are (partially) within an individual's control. Any history of marriage or civil partnership is significantly associated with higher incomes and earnings. The coefficients for working hours are all as expected. Working more hours is associated with higher incomes. The coefficients for region of residence are mostly insignificant. Interestingly, compared to living in the North East, living in London, the East and West Midlands, and Scotland is significantly associated with higher incomes for females only. Coefficients for economic activity and employment status are broadly as expected. A surprising result is that higher educational attainment is not correlated with higher incomes or earnings in this sample. This could be due to noise introduced by an omitted variable. From the aforementioned estimations (and similar ones for waves 1-7 in the lower bound case), I derive absolute and relative indices of inequality of opportunity as discussed in section 3.3. These results are summarized in table 5.2. Overall, gross earnings inequality in 2017 is highest with an MLD value of 0.27, followed by gross income, MLD 0.21, and then net income, MLD 0.18. The same ranking is preserved in absolute IOp estimates (see figure 5.1).

In terms of relative shares, inequality of opportunity constituted at least 10.62 percent and, in the baseline specification, at most 65.93 percent of gross income inequality. Relative IOp in net income ranges from 10.33 percent to 60.65 percent. The highest lower bound relative IOp is found in gross labor earnings at 11.4 percent of total earnings inequality. Interestingly, the same does not hold true for the baseline upper bound estimate of labor earnings IOp, which makes up 61.06 percent of earnings inequality. This can be explained by the high level of overall earnings inequality.

Table 5.1 Regression results to estimate lower bound (wave 8)

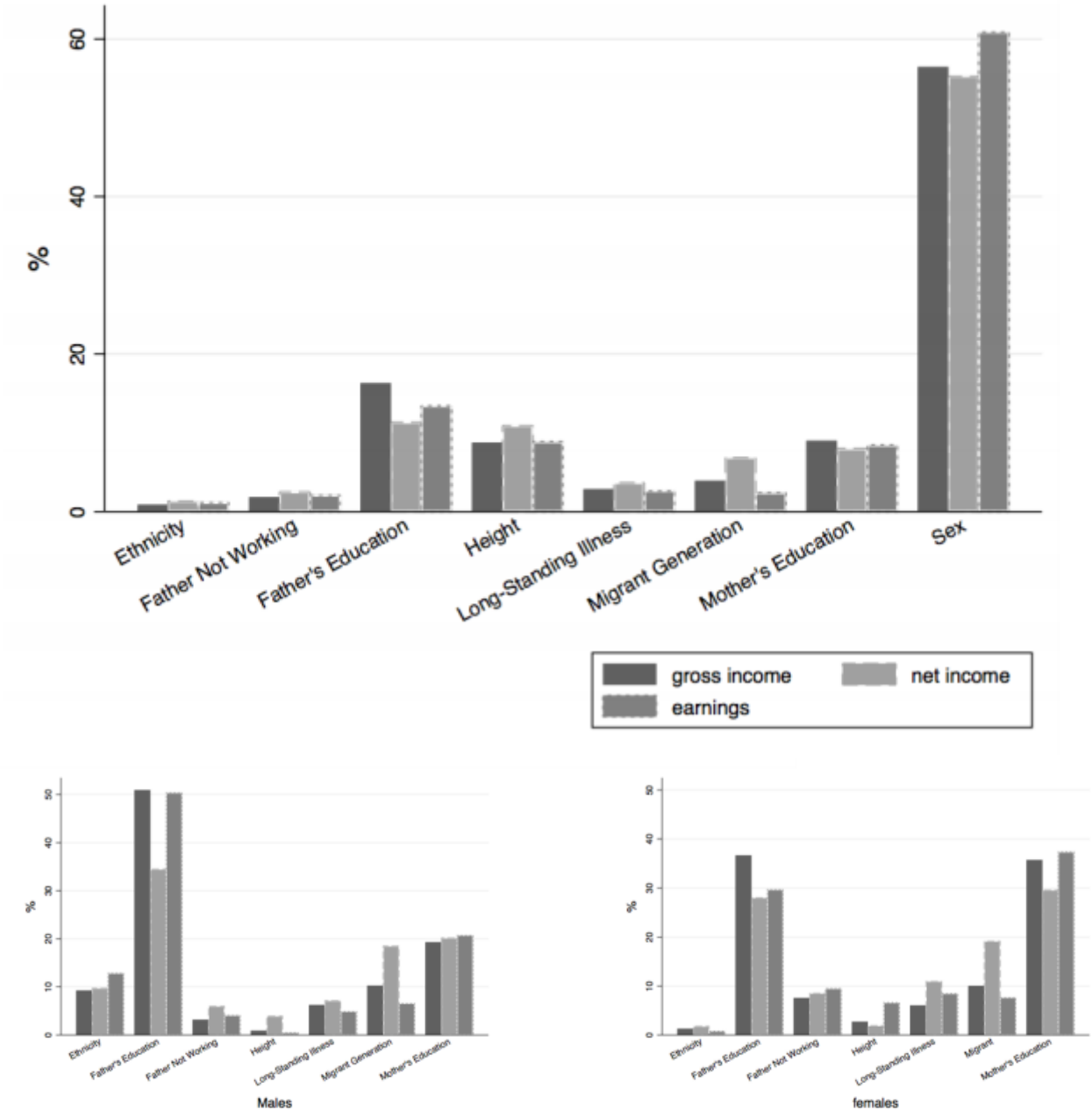
Poisson Reduced-Form Regressions Lower Bound of IOp	Gross Income			Net Income			Earnings		
	All	Female	Male	All	Female	Male	All	Female	Male
Long-Standing Illness or Impairment (Reference = No)	-0.072**	-0.068*	-0.071*	-0.076**	-0.076*	-0.076	-0.080**	-0.091**	-0.069
	(0.024)	(0.030)	(0.035)	(0.026)	(0.030)	(0.042)	(0.025)	(0.035)	(0.036)
Ethnicity (Reference = White)									
Mixed	-0.128	-0.192	-0.035	-0.197*	-0.212	-0.157	-0.136	-0.189	-0.057
	(0.075)	(0.105)	(0.105)	(0.080)	(0.114)	(0.111)	(0.083)	(0.111)	(0.118)
Asian	-0.083	0.026	-0.142*	-0.114	-0.040	-0.157	-0.104*	0.031	-0.171*
	(0.051)	(0.069)	(0.070)	(0.062)	(0.083)	(0.087)	(0.052)	(0.077)	(0.068)
Black/African/Caribbean	-0.149*	0.000	-0.343**	-0.177**	-0.030	-0.375**	-0.164*	-0.021	-0.336**
	(0.062)	(0.072)	(0.116)	(0.064)	(0.079)	(0.115)	(0.070)	(0.084)	(0.125)
Other	-0.129	-0.188	-0.114	-0.122	-0.217	-0.070	-0.252	-0.172	-0.337*
	(0.129)	(0.239)	(0.139)	(0.132)	(0.238)	(0.145)	(0.135)	(0.198)	(0.169)
Sex (Reference = Male)	-0.320***			-0.277***			-0.393***		
	(0.022)			(0.025)			(0.023)		
Father's Educational Qualifications (Reference = Did Not Go to School)									
Left school with no qualif/certif	0.192	0.048	0.345*	0.199*	0.064	0.353*	0.214	0.020	0.414**
	(0.104)	(0.119)	(0.157)	(0.102)	(0.114)	(0.164)	(0.114)	(0.139)	(0.152)
Left school with some qualif/certif	0.153	0.018	0.302	0.132	-0.008	0.290	0.171	0.001	0.356*
	(0.104)	(0.117)	(0.157)	(0.100)	(0.099)	(0.166)	(0.113)	(0.137)	(0.152)
Post school qualif/certif	0.244*	0.089	0.411**	0.207*	0.055	0.378*	0.262*	0.063	0.473**
	(0.104)	(0.117)	(0.157)	(0.099)	(0.100)	(0.164)	(0.114)	(0.138)	(0.152)
University or higher degree	0.410***	0.249*	0.584***	0.363***	0.209*	0.536**	0.437***	0.208	0.670***
	(0.106)	(0.122)	(0.160)	(0.102)	(0.107)	(0.168)	(0.116)	(0.142)	(0.155)
Mother's Educational Qualifications (Reference = Did Not Go to School)									
Left school with no qualif/certif	-0.036	-0.158	0.055	-0.074	-0.151	-0.030	0.031	-0.041	0.072
	(0.091)	(0.124)	(0.121)	(0.106)	(0.109)	(0.173)	(0.099)	(0.141)	(0.130)
Left school with some qualif/certif	0.072	-0.061	0.169	0.023	-0.035	0.051	0.140	0.046	0.194
	(0.091)	(0.122)	(0.122)	(0.106)	(0.103)	(0.173)	(0.099)	(0.140)	(0.131)
Post school qualif/certif	0.073	-0.017	0.138	-0.004	-0.033	-0.001	0.150	0.108	0.164
	(0.092)	(0.124)	(0.124)	(0.106)	(0.106)	(0.174)	(0.101)	(0.143)	(0.133)
University or higher degree	0.089	0.042	0.118	0.064	0.006	0.089	0.175	0.187	0.148
	(0.095)	(0.127)	(0.128)	(0.111)	(0.109)	(0.180)	(0.103)	(0.145)	(0.137)
Father Not Working, Resp. Aged 14 (Reference = Father Working)	-0.093*	-0.133*	-0.059	-0.111**	-0.115*	-0.106	-0.118**	-0.165*	-0.080
	(0.042)	(0.054)	(0.062)	(0.043)	(0.055)	(0.063)	(0.044)	(0.068)	(0.059)
Migrant Generation (Reference = 1st Generation)									
2nd generation: born uk, at least one parent not born uk	0.078	0.077	0.075	0.125	0.138	0.112	0.065	0.034	0.078
	(0.046)	(0.063)	(0.065)	(0.064)	(0.079)	(0.094)	(0.048)	(0.069)	(0.065)
3rd generation: born uk, both parents born uk, at least one grandparent not born uk	-0.026	0.042	-0.080	-0.068	-0.002	-0.119	-0.027	0.008	-0.055
	(0.054)	(0.070)	(0.078)	(0.058)	(0.068)	(0.088)	(0.056)	(0.079)	(0.076)
4+ generation: born uk, both parents and all grandparents born uk	-0.088	-0.057	-0.109	-0.101	-0.065	-0.125	-0.087	-0.078	-0.092
	(0.046)	(0.062)	(0.064)	(0.052)	(0.061)	(0.076)	(0.047)	(0.070)	(0.063)
Height	0.029	0.124	0.019	0.050	0.081	0.045	0.028	0.222*	0.011
	(0.028)	(0.099)	(0.029)	(0.041)	(0.094)	(0.044)	(0.028)	(0.099)	(0.029)
Constant	7.683***	7.108***	7.523***	7.401***	7.125***	7.266***	7.538***	6.422***	7.401***
	(0.183)	(0.499)	(0.223)	(0.238)	(0.481)	(0.274)	(0.191)	(0.509)	(0.216)
N	5377	3030	2347	5377	3030	2347	5377	3030	2347

Robust standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001

Table 5.2 Summary of results

Year	LB(1) MLD	Gross Income MLD	Relative LB(1) %	LB(2) MLD	Net Income MLD	Relative LB(2) %	LB(3) MLD	Earnings MLD	Relative LB(3) %	N
2009	0.02411	0.22764	10.59128448	0.01911	0.20315	9.406842235	0.03292	0.28916	11.38470051	10698
2011	0.02244	0.22151	10.13046815	0.02098	0.20211	10.38048587	0.03166	0.28537	11.09436871	10032
2012	0.02118	0.21702	9.759469173	0.01546	0.18558	8.330639077	0.03053	0.28511	10.70814773	8532
2013	0.01994	0.21469	9.287810331	0.01392	0.18364	7.58004792	0.02904	0.27889	10.41270752	7848
2014	0.02169	0.22237	9.754013581	0.01725	0.1986	8.685800604	0.03088	0.28967	10.66040667	7231
2015	0.02331	0.21981	10.60461307	0.02241	0.22014	10.17988553	0.03252	0.27348	11.89118034	6363
2016	0.02224	0.21686	10.25546435	0.01662	0.192	8.65625	0.03038	0.27219	11.16132114	5892
2017	0.02279	0.21457	10.62124248	0.01956	0.18929	10.33335094	0.0308	0.27005	11.40529532	5377
Upper Bound Estimates (2017)	UB(1) MLD	Gross Income MLD	Relative UB(1) %	UB(2) MLD	Net Income MLD	Relative UB(2) %	UB (3)	Earnings MLD	Relative UB(3) %	
	0.13749	0.20853	65.93295929	0.11095	0.18292	60.65493112	0.16372	0.26812	61.06221095	7417
	UB2(1) MLD	Gross Income MLD	Relative UB2(1) %	UB2(2) MLD	Net Income MLD	Relative UB2(2) %	UB2(3)	Earnings MLD	Relative UB2(3) %	
	0.1536	0.20781	73.91367114	0.13254	0.18219	72.74822987	0.19708	0.26732	73.72437528	7551
Sub-Sample LB&UB (2017)	LB(1) MLD	Gross Income MLD	Relative LB(1) %	LB(2) MLD	Net Income MLD	Relative LB(2) %	LB(3) MLD	Earnings MLD	Relative LB(3) %	
Females	0.00973	0.20604	4.722384003	0.0074	0.17084	4.331538281	0.011	0.28254	3.893254053	3030
Males	0.00952	0.19429	4.899891914	0.00963	0.18486	5.209347614	0.01128	0.21422	5.265614789	2347
	UB(1) MLD	Gross Income MLD	Relative UB(1) %	UB(2) MLD	Net Income MLD	Relative UB(2) %	UB (3)	Earnings MLD	Relative UB(3) %	
Females	0.12633	0.19701	64.12364855	0.10248	0.16163	63.40407103	0.16141	0.27797	58.06741735	4093
Males	0.11791	0.18982	62.11674218	0.10422	0.18037	57.78122748	0.12187	0.21319	57.16497021	3324
	UB2(1) MLD	Gross Income MLD	Relative UB2(1) %	UB2(2) MLD	Net Income MLD	Relative UB2(2) %	UB2(3)	Earnings MLD	Relative UB2(3) %	
Females	0.14458	0.19689	73.43186551	0.11439	0.16148	70.83849393	0.20749	0.27898	74.37450713	4126
Males	0.13379	0.18929	70.67990913	0.12644	0.17943	70.46759182	0.14397	0.21224	67.83358462	3425

Figure 5.2 Contribution of individual circumstances % (Shapley Decomposition)

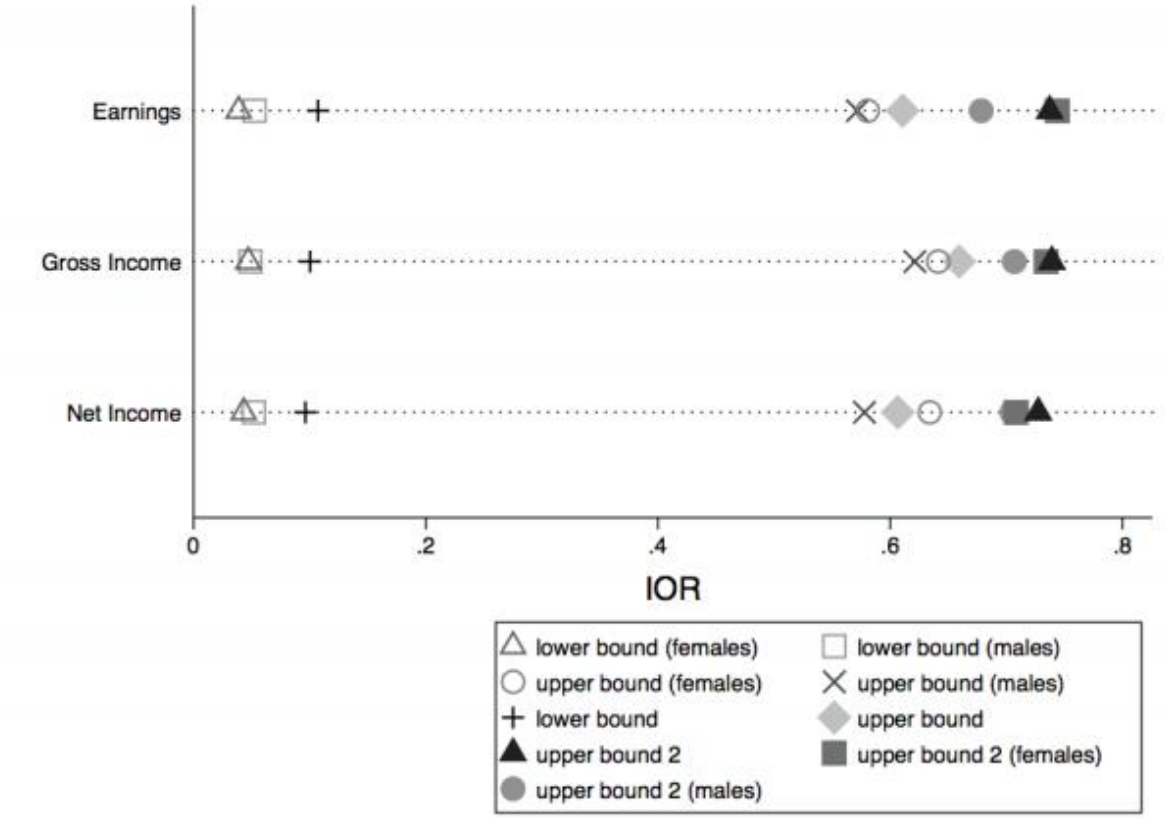


5.2 Relative importance of circumstances

In figure 5.2, I present results from a Shapley inequality decomposition, which gives an estimation of the relative importance of each group of circumstance variables in the lower bound estimation (see Ferreira et al., 2011; Deutsch, Alperin, & Silber, 2018; Chantreuil & Trannoy, 2013; Bj¨orklund, J¨antti, & Roemer, 2012; Shorrocks, 2013). The results from the Shapley decomposition suggest that socio-economic IOp in the UK is largely driven by gender divisions. The relative contribution of sex, compared to other circumstance variables in the model, amounts to more than half of IOp for net and gross income and more than 60 percent for earnings. Looking at what drives IOp within sex reveals another interesting result: father's education tends to be relatively more important for

males than females. For females, father's and mother's education contribute about equally to IOp. The importance of mother's education for females is actually more important in net income and earnings than father's education. Overall, the relative contribution of father's educational qualifications appears to be less important in net income acquisition, as migrant generation has a relatively larger role there. In sum, the decomposition indicates that sex and parental education are the important drivers of the estimated inequality of opportunity.

Figure 5.3: Relative index (2017)



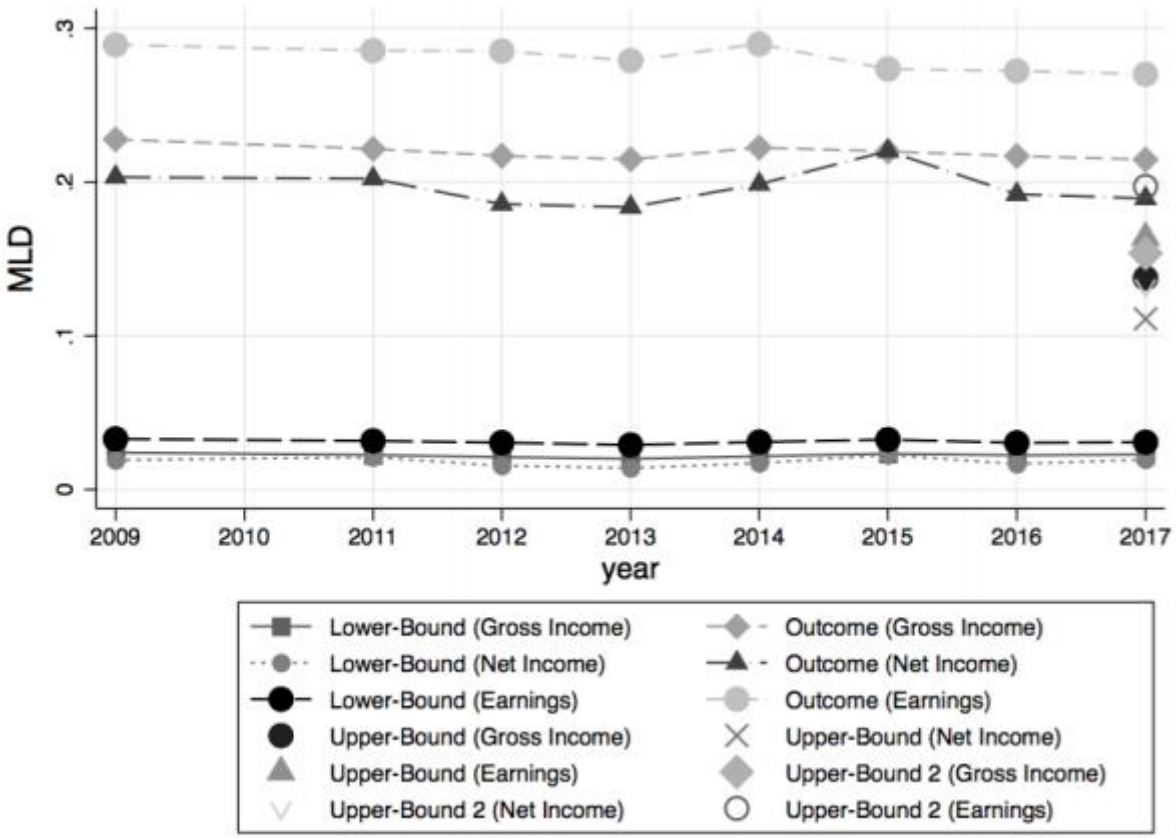
I also estimate inequality of opportunity separately for men and women. Generally, results are fairly similar between the two groups. However, the relative share of upper bound IOp to total inequality for females tends to be higher than for males. Outcome inequality tends to be higher for females than males, except for net income. The importance of the gender variable is also underscored when comparing the sub-sample with the baseline results. Including the circumstance sex roughly doubles relative lower bound IOp. These findings are in line with those by Niehues and Peichl (2014) for Germany and the USA. Figure 5.3 shows how relative IOp levels vary by sex.

5.3 Trends and comparisons

Figures 5.4 and 5.5 show trends in the absolute levels of inequality of opportunity. IOp levels appear roughly similar in 2009 and 2017. However, during the period from 2011 to 2015, there is a

noticeable u-shaped pattern, as inequality and inequality of opportunity both decrease until hitting a low point in 2013 and then sharply increase again until 2015.

Figure 5.4 Inequality of opportunity, absolute index over time



Inequality and IOp in labor earnings are highest at all points during the period under study when compared to gross and net incomes. Inequality and IOp in net income tend to be lower than gross income (except in 2015). The relative share of lower bound IOp to total inequality over time is represented in figure 5.6. Here we see a similar pattern as in the absolute levels. Notably, the relative share of IOp to total net income inequality is higher than the IOp share for gross income in 2011.

To place the results in context, it is useful to compare these findings with other estimations. Even so, it should be kept in mind that the measures are not precisely the same across studies. Looking at the UK, the lower bound and outcome net income inequality estimates are broadly similar to those found by Marrero and Rodr´ıguez (2012) in 2005 (MLD 0.0199; 0.1952). Generally speaking, results are also in line with findings by Carranza (in press), though the estimates I obtain tend to be a bit higher. Carranza's (in press) upper bound estimate for 2011, which does not explicitly control for effort variables, is MLD 0.11 (IOR 64.71 percent). By comparison, the upper bound 2 estimate I find is MLD 0.13 for 2017 (IOR 72.75 percent). The aforementioned studies use equivalized

disposable household income as the outcome variable. Niehues and Peichl (2014) estimate inequality in gross earnings and find a MLD 0.26 (LB 0.07; UB 0.12) for Germany and MLD 0.35 (LB 0.06; UB 0.12) for the USA. I estimate the most recent earnings inequality in the UK as MLD 0.27 (LB 0.03; UB 0.16). Accordingly, earnings inequality in the UK falls between Germany and the USA, while the maximum share in inequality due to circumstances is highest in the UK.

Figure 5.5: Lower bound index over time

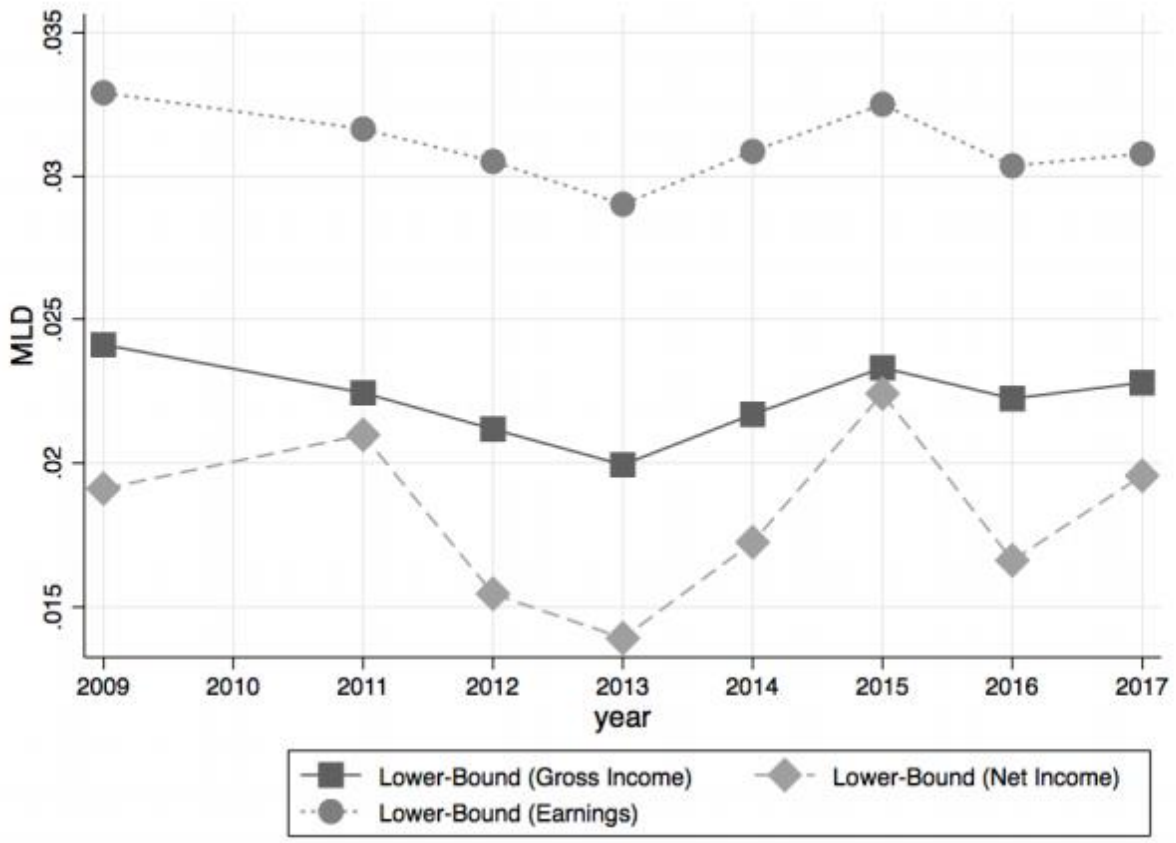
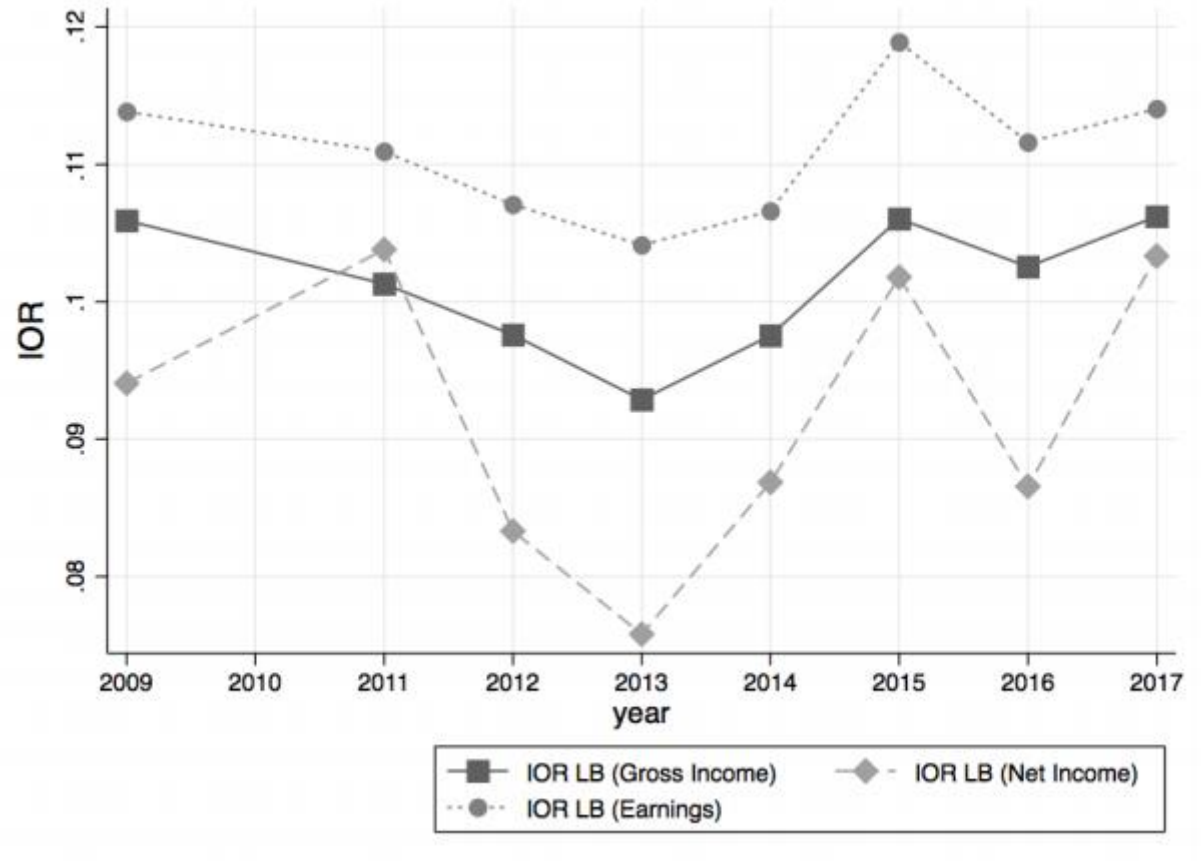


Figure 5.6: Relative lower bound index over time



6 Discussion

The findings outlined in section 5.1 suggest that the playing field is indeed uneven. To recapitulate, the share of inequality due to circumstances in the overall outcome inequality in 2017 ranges from 10.62 (10.33) to 65.93 (60.65) percent of gross (net) income. Looking at the difference between IOp in gross and net income a general theme emerges: government tax and transfer policies can work to reduce both inequality in outcomes and opportunities (on an absolute and relative level). It is the identified difference between IOp in gross and net income that leads me to make this inference as the net income variable includes taxes and social benefits. IOp levels in net income are considerably lower than in gross income and labor earnings for most periods studied. Be that as it may, inequality of opportunity still exists even after observed government intervention via the tax and benefit system. This observation is in line with estimates by Groot et al. (2018, p. 1270), which indicate that observed tax rates in the UK may be too low to compensate for gender divisions and the influence of parental background on individuals' opportunities for income acquisition.

The time trends in section 5.3 show that outcome inequality and IOp broadly move in tandem. In particular, the trend in IOp for net income seems to mirror the trend in income inequality, and a u-shaped pattern is noticeable in both measures. The trend could be better understood by looking at the effect of social policy on outcome inequality in the UK after the financial crisis of 2008-2009.

Income inequality in the UK fell in the early years of the Coalition government from 2009-2010 to a low point in 2013-2014 mainly due to decisions made by the previous Labour government (Lupton, Burchardt, Hills, Stewart, & Vizard, 2016, pp. 251–253). Regressive tax and benefit cuts enacted by the Coalition government came into effect around this low point in 2013 (Lupton et al., 2016, pp. 25–31). I estimate that IOp in net income sharply increases after 2013, which is compatible with regressive social policy changes.

Estimates from the Shapley inequality decomposition in section 5.2 indicate that sex and parental education are main drivers of inequality of opportunity in the UK. To compensate for disadvantage, social policy interventions should concentrate on the prevailing gender divisions in income acquisition and on disparities in childhood education. The large role parental education plays in shaping unequal advantages for individuals later in life could, for instance, be compensated for with investment in high quality universal childcare (Esping-Andersen, 2005).

Finally, job polarization and de-unionization may have given rise to wider wage gaps in the UK labor market in recent years (Card, Lemieux, & Riddell, 2003; Goos & Manning, 2007). The high levels of IOp (both absolute and relative) in labor earnings also indicate that circumstances beyond individual control in the labor market play an especially important role in shaping advantageous outcomes. Looking at international comparisons, estimated earnings inequality that is due to all unobserved circumstances (as expressed by the upper bound) is higher in the UK than Germany and even the USA (based on my comparison with Niehues and Peichl (2014) in section 5.3). Since inequality of opportunity is highest in labor market earnings, addressing inequalities directly in the labor market may offer a promising avenue to bring about a more level playing field in general.

While the estimates I provide quantify inequality of opportunity, which is paramount for assessing progress over time and social policy intervention, the reader should keep in mind that understanding the full picture necessitates a much broader view. The distribution of advantages and disadvantages in society is a multifaceted issue and entails numerous complexities such as the sociological or political mechanisms that perpetuate them in the first place. The scope of this dissertation is to merely measure IOp.

7 Conclusion

Social policy can serve an important role in leveling the playing field of opportunity, but in order for it to do so, it is key that we know how uneven it is to begin with. Few direct estimates of inequality of opportunity exist for the UK to date. In line with recent methodological advances, I provide lower and upper bounds, which together capture the “true” share circumstances play in creating socio-economic advantages. Unfortunately, opportunities are far from equal in the UK. IOp in 2017 ranges from about 10 to 65 percent of total inequality of gross income, a considerable share. My estimates also suggest that inequality of opportunity is highest in earnings and that social policy via taxation and benefits lowers but does not eliminate it. I present time trends from 2009 to 2017 that aid our understanding of the evolution of inequality and IOp over that period. Furthermore, I identify the relative importance of circumstances in the estimated lower bound IOp. Sex and parental education appear to be the main drivers of unfair inequality.

Importantly, I provide lower and upper bounds, which estimate how observed and unobserved circumstances shape overall outcome inequality, respectively. Including the circumstance of sex drastically raises the lower bound IOp, while including effort variables reduces the upper bound. Future research should add to the emerging consensus that measures IOp parametrically from an ex-ante perspective and provide upper bound in addition to the lower bound estimates. This should facilitate better comparisons across countries and over time, in addition to strengthening our confidence in the produced estimates. Moreover, in the extant literature, the range between the two bounds tends to still be quite large. Much of the estimated IOp is still left unexplained. What drives this unequal socio-economic opportunity? An additional role for future research will be to narrow the gap between estimated lower and upper bounds to more precisely estimate the “true” level of IOp. Producing a multitude of lower and upper bound estimates, that include, in one case more circumstances variables, and in the other, more efforts, will lead to more precise estimates and will aid our understanding of the elements that shape IOp. This dissertation has been an attempt to move in this direction.

References

Aaberge, R., Mogstad, M., & Peragine, V. (2011). Measuring long-term inequality of opportunity. *Journal of Public Economics*, 95(3-4), 193–204.

Arneson, R. J. (1989). Equality and equal opportunity for welfare. *Philosophical studies*, 56(1), 77–93.

Belhaj Hassine, N. (2011). Inequality of opportunity in Egypt. *The World Bank Economic Review*, 26(2), 265–295.

Benabou, R., & Ok, E. A. (2001). *Mobility as progressivity: ranking income processes according to equality of opportunity* (Tech. Rep.). National Bureau of Economic Research.

Betts, J., & Roemer, J. (2005). *Equalizing opportunity for racial and socioeconomic groups in the United States through educational finance reform* (Tech. Rep.). Department of Economics, UC San Diego.

Björklund, A., Jäntti, M., & Roemer, J. E. (2012). Equality of opportunity and the distribution of long-run income in Sweden. *Social choice and welfare*, 39(2-3), 675– 696.

Blackburn, M. L. (2007). Estimating wage differentials without logarithms. *Labour Economics*, 14(1), 73–98.

Blanden, J., Haveman, R., Smeeding, T., & Wilson, K. (2014). Intergenerational mobility in the United States and Great Britain: A comparative study of parent–child pathways. *Review of Income and Wealth*, 60(3), 425–449.

Blanden, J., & Machin, S. (2007). *Recent changes in intergenerational mobility in Britain*. Sutton Trust London.

Bourguignon, F., Ferreira, F., & Menéndez, M. (2007). Inequality of opportunity in brazil. *Review of Income and Wealth*, 53(4), 585–618.

Brunori, P. (2016). How to measure inequality of opportunity: A hands-on guide.

Brunori, P., Ferreira, F., & Peragine, V. (2013). Inequality of opportunity, income inequality, and economic mobility: Some international comparisons. In *Getting development right* (pp. 85–115). Springer.

Brzezinski, M. (2015, January). *Inequality of opportunity in Europe before and after the Great Recession* (Working Papers No. 353). ECINEQ, Society for the Study of Economic Inequality. Retrieved from https://ideas.repec.org/p/inq/inqwps/ ecineq2015-353.html.

Bukodi, E., Goldthorpe, J. H., Waller, L., & Kuha, J. (2015). The mobility problem in Britain: new findings from the analysis of birth cohort data. *The British Journal of Sociology*, 66(1), 93–117.

Card, D., Lemieux, T., & Riddell, W. C. (2003). *Unionization and wage inequality: a comparative study of the US, the UK, and Canada* (Tech. Rep.). National Bureau of Economic Research.

Carpantier, J.-F., & Sapata, C. (2013, Sep 01). An ex-post view of inequality of opportunity in France and its regions. *Journal of Labor Research*, 34(3), 281–311. Retrieved from https://doi.org/10.1007/s12122-013-9161-5 doi: 10.1007/s12122-013-9161-5

Carranza, R. (in press). *Upper and lower bound estimates of inequality of opportunity: A cross-national comparison for Europe* (Unpublished doctoral dissertation). The London School of Economics and Political Science.

Cavanagh, M. (2002). *Against equality of opportunity.* Clarendon Press.

Chambers, C. (2009). Each outcome is another opportunity: Problems with the moment of equal opportunity. *Politics, Philosophy & Economics*, 8(4), 374–400.

Chantreuil, F., & Trannoy, A. (2013). Inequality decomposition values: the trade-off between marginality and efficiency. *The Journal of Economic Inequality*, 11(1), 83– 98.

Checchi, D., & Peragine, V. (2010). Inequality of opportunity in Italy. *The Journal of Economic Inequality*, 8(4), 429–450.

Checchi, D., Peragine, V., & Serlenga, L. (2015). Income inequality and opportunity inequality in Europe: Recent trends and explaining factors. In *5th ecineq meeting, University of Luxembourg*.

Cogneau, D., & Mespl´e-Somps, S. (2008). Inequality of opportunity for income in five countries of Africa. *In Inequality and opportunity: Papers from the second ecineq society meeting* (pp. 99–128).

Cohen, G. A. (1989). On the currency of egalitarian justice. *Ethics*, 99(4), 906–944.

Deutsch, J., Alperin, M. N. P., & Silber, J. (2018). Using the shapley decomposition to disentangle the impact of circumstances and efforts on health inequality. *Social Indicators Research*, 138(2), 523–543.

Dworkin, R. (1981a). What is equality? part 1: Equality of welfare. *Philosophy Public Affairs*, 10(3), 185–246. Retrieved from http://www.jstor.org/stable/2264894/.

Dworkin, R. (1981b). What is equality? part 2: Equality of resources. *Philosophy Public Affairs*, 10(4), 283–345. Retrieved from http://www.jstor.org/stable/2265047.

Esping-Andersen, G. (2005). Social inheritance and equal opportunity policies. *Maintaining Momentum*, 14–30.

Exley, D. (2019, Jul). Boris Johnson barely understands what 'middle income earners' are – how can he possibly close the UK's opportunity gap? *The Independent*. Retrieved from https://www.independent.co.uk/voices/boris-johnson -tory-leadership-middle-earners-income-gap-a9014231.html.

Ferreira, F., & Gignoux, J. (2011). The measurement of inequality of opportunity: Theory and an application to Latin America. *Review of Income and Wealth*, 57(4), 622–657.

Ferreira, F., & Gignoux, J. (2013). The measurement of educational inequality: Achievement and opportunity. *The World Bank Economic Review*, 28(2), 210–246.

Ferreira, F., Gignoux, J., & Aran, M. (2011). Measuring inequality of opportunity with imperfect data: the case of Turkey. *The Journal of Economic Inequality*, 9(4), 651– 680.

Ferreira, F., Molinas Vega, J. R., Paes de Barros, R., & Saavedra Chanduvi, J. (2008). *Measuring inequality of opportunities in Latin America and the Caribbean*. The World Bank.

Fishkin, J. (2014). *Bottlenecks: A new theory of equal opportunity*. Oxford University Press, USA.

Fleurbaey, M. (1995). Equality and responsibility. *European Economic Review*, 39(3-4), 683–689.

Fleurbaey, M. (2008). *Fairness, responsibility, and welfare*. Oxford University Press.

Fleurbaey, M., & Maniquet, F. (2011a). Compensation and responsibility. In *Handbook of social choice and welfare* (pp. 507–604). Elsevier BV.

Fleurbaey, M., & Maniquet, F. (2011b). *A theory of fairness and social welfare* (Vol. 48). Cambridge University Press.

Fleurbaey, M., & Peragine, V. (2013). Ex ante versus ex post equality of opportunity. *Economica*, 80(317), 118–130.
Fleurbaey, M., & Schokkaert, E. (2009). Unfair inequalities in health and health care. *Journal of Health Economics*, 28(1), 73–90.

Foster, J. E., & Shneyerov, A. A. (2000). Path independent inequality measures. *Journal of Economic Theory*, 91(2), 199 - 222. Retrieved from http://www.sciencedirect.com/science/article/pii/S0022053199925656 doi: https://doi.org/10.1006/jeth.1999.2565.

Friedman, M. (1963). *Capitalism and freedom*. University of Chicago Press.

Frisch, R., & Waugh, F. V. (1933). Partial time regressions as compared with individual trends. *Econometrica: Journal of the Econometric* Society, 387–401.

Goldthorpe, J. H. (2016). Social class mobility in modern Britain: changing structure, constant process. *Journal of the British Academy*, 4(89-111).

Goos, M., & Manning, A. (2007). Lousy and lovely jobs: The rising polarization of work in Britain. *The Review of Economics and Statistics*, 89(1), 118–133.

Groot, L., van der Linde, D., & Vincent, C. (2018). Inequality of opportunity in the United Kingdom, 1991–2008. *Journal of Policy Modeling*, 40(6), 1255 - 1271. Retrieved from http://www.sciencedirect.com/science/article/pii/S0161893818301030 doi: https://doi.org/10.1016/j.jpolmod.2018.06.003.

Heckman, J. J., Lochner, L. J., & Todd, P. E. (2003*). Fifty years of mincer earnings regressions* (Tech. Rep.). National Bureau of Economic Research.

Hufe, P., Peichl, A., Roemer, J., & Ungerer, M. (2017). Inequality of income acquisition: the role of childhood circumstances. *Social Choice and Welfare*, 49(3-4), 499–544.

Hufe, P., Peichl, A., & Weishaar, D. (2019). *Lower and Upper Bounds of Inequality of Opportunity in Emerging Economies* (Tech. Rep.).

Jäntti, M., & Jenkins, S. P. (2015). Income mobility. In *Handbook of income distribution* (Vol. 2, pp. 807–935). Elsevier.

Kanbur, R., & Wagstaff, A. (2016). How useful is inequality of opportunity as a policy construct*? In Inequality and growth: Patterns and policy* (pp. 131–150). Springer.

Knies, G. (2018). Understanding society: Waves 1-8, 2009-2017 and harmonised bhps: Waves 1-18, 1991-2009, user guide. *Colchester: University of Essex.*

Lefranc, A., Pistolesi, N., & Trannoy, A. (2008). Inequality of opportunities vs. inequality of outcomes: Are western societies all alike? *Review of Income and Wealth*, 54(4), 513–546.

Lefranc, A., Pistolesi, N., & Trannoy, A. (2009). Equality of opportunity and luck: Definitions and testable conditions, with an application to income in France. *Journal of Public Economics*, 93(11-12), 1189–1207.

Le Grand, J. (1991*). Equity and choice: an essay in economics and applied philosophy*. Routledge.

Lupton, R., Burchardt, T., Hills, J., Stewart, K., & Vizard, P. (2016). *Social policy in a cold climate: policies and their consequences since the crisis*. Policy Press.

Marrero, G. A., & Rodr´ıguez, J. G. (2012). Inequality of opportunity in Europe. *Review of Income and Wealth*, 58(4), 597–621.

Martinez Jr, A., Rampino, T., Western, M., Tomaszewski, W., & Roque, J. D. (2017). Estimating the contribution of circumstances that reflect inequality of opportunities. *Economic*

Papers: A Journal of Applied Economics and Policy, 36(4), 380–400.

May, T. (2016, 9). *Britain, the great meritocracy*. Retrieved from https://www.gov.uk/government/speeches/britain-the-great-meritocracy-prime-ministers -speech (Prime Minister's speech)

McKnight, A. (2015). Downward mobility, opportunity hoarding and the 'glass floor'. London: *Social Mobility and Child Poverty Commission*.

Niehues, J., & Peichl, A. (2014). Upper bounds of inequality of opportunity: theory and evidence for Germany and the US. *Social Choice and Welfare*, 43(1), 73–99.

Nozick, R. (1974*). Anarchy, state, and utopia* (Vol. 5038). New York: Basic Books.

Peragine, V., & Serlenga, L. (2008). Higher education and equality of opportunity in Italy. In *Inequality and opportunity: Papers from the second ecineq society meeting* (p. 67-97). Retrieved from https://www.emeraldinsight.com/doi/abs/10.1016/S1049-2585%2808%2916004-5 doi: 10.1016/S1049-2585(08)16004-5

Piraino, P. (2015). Intergenerational earnings mobility and equality of opportunity in South Africa. *World Development*, 67, 396–405.

Pistolesi, N. (2009). Inequality of opportunity in the land of opportunities, 1968–2001. *The Journal of Economic Inequality*, 7(4), 411.

Ramos, X., & Van de Gaer, D. (2016). Approaches to inequality of opportunity: Principles, measures and evidence. *Journal of Economic Surveys*, 30(5), 855–883.

Rawls, J. (1971). *A theory of justice*. Harvard University Press.

Roemer, J. E. (1993). A pragmatic theory of responsibility for the egalitarian planner. *Philosophy & Public Affairs*, 22(2), 146–166.

Roemer, J. E. (1998). *Equality of opportunity*. Cambridge, MA and London: Harvard University Press.

Roemer, J. E. (2004). Equal opportunity and intergenerational mobility: going beyond intergenerational income transition matrices. In *Generational income mobility in North America and Europe* (pp. 48–57). Cambridge University Press, Cambridge, England.

Roemer, J. E., Aaberge, R., Colombino, U., Fritzell, J., Jenkins, S. P., Lefranc, A., ... others (2003). To what extent do fiscal regimes equalize opportunities for income acquisition among citizens? *Journal of Public Economics*, 87(3-4), 539–565.

Sen, A. (1979). Equality of what? The Tanner lecture on human values, 1. Sen, A. (1988). Freedom of choice: concept and content. *European Economic Review*, 32(2-3), 269–294.

Sen, A. (1992). Inequality reexamined. Clarendon Press.

Shorrocks, A. F. (2013). Decomposition procedures for distributional analysis: a unified framework based on the shapley value*. Journal of Economic Inequalit*y, 1–28.

Silva, J. M. C. S., & Tenreyro, S. (2006). The log of gravity. *The Review of Economics and Statistics*, 88(4), 641-658. Retrieved from https://doi.org/10.1162/rest.88 .4.641 doi: 10.1162/rest.88.4.641.

Singh, A. (2012). Inequality of opportunity in earnings and consumption expenditure: The case of Indian men. *Review of Income and Wealth*, 58(1), 79–106.

Smith, I. D. (2010, 5*). Welfare for the 21st century*. Retrieved from https://www.gov.uk/government/speeches/welfare-for-the-21st-

century (Speech by the Rt Hon Iain Duncan Smith MP)

Stewart, H. (2019, Jun). Corbyn to drop social mobility as labour goal in favour of opportunity for all. *The Guardian*. Retrieved from https://www.theguardian.com/politics/2019/jun/08/jeremy-corbyn-to-drop-social-mobility-as-labour -goal

Suárez Álvarez, A., & Jesús López Menéndez, A. (2018). Income inequality and inequality of opportunity in Europe: Are they on the rise? In *Inequality, taxation and intergenerational transmission* (pp. 149–196). Emerald Publishing Limited.

Swift, A. (2005). Justice, luck and the family: normative aspects of the intergenerational transmission of economic status. *Unequal Chances: Family Background and Economic Success*. Princeton University Press. Princeton, 256–76.

University of Essex. (2018). *Understanding society: Waves 1-8, 2009-2017 and harmonised bhps: Waves 1-18, 1991-2009*. [data collection]. 11th edition. uk data service. sn: 6614. Retrieved from http://dx.doi.org/10.5255/UKDA-SN6614-12

Vallentyne, P. (2002). Brute luck, option luck, and equality of initial opportunities. *Ethics*, 112(3), 529–557.

Van De Gaer, D. (1993). Equality of opportunity and investment in human capital. *Ph.D. Dissertation, Katholieke Universiteit.*

Leuven. Van de Gaer, D., Vandenbossche, J., & Figueroa, J. L. (2013). *Children's health opportunities and project evaluation: Mexico's oportunidades program.* The World Bank.

Appendix

Table 7.1

Decomposition	(Shapley method)					
	Gross Income		Net Income		Earnings	
Variable	Value	percentage	Value	percentage	Value	percentage
Long-Standing Illness	0.000632	2.85%	0.000653	3.69%	0.000821	2.67%
Ethnicity	0.000194	0.88%	0.00024	1.36%	0.000355	1.16%
Sex	0.012505	56.46%	0.009771	55.29%	0.018714	60.89%
Father's Educational Qualifications	0.003617	16.33%	0.002006	11.35%	0.004135	13.45%
Mother's Educational Qualifications	0.001994	9.00%	0.001415	8.01%	0.002597	8.45%
Father Not Working	0.000406	1.83%	0.000443	2.51%	0.000643	2.09%
Migrant Generation	0.000865	3.91%	0.001215	6.88%	0.00074	2.41%
Height	0.001938	8.75%	0.00193	10.92%	0.002732	8.89%
TOTAL	0.022149	100.00%	0.017675	100.00%	0.030737	100.00%

Table 7.2

Decomposition	(Shapley method) Females					
	Gross Income		Net Income		Earnings	
Variable	Value	percentage	Value	percentage	Value	percentage
Long-Standing Illness	0.000488	6.03%	0.000549	10.94%	0.000854	8.45%
Ethnicity	0.000103	1.27%	0.00009	1.79%	0.000077	0.77%
Father's Educational Qualifications	0.00297	36.68%	0.001407	28.03%	0.002998	29.68%
Mother's Educational Qualifications	0.002895	35.74%	0.001486	29.60%	0.003774	37.37%
Father Not Working	0.000611	7.55%	0.000429	8.54%	0.000957	9.48%
Migrant Generation	0.000811	10.02%	0.000963	19.18%	0.00077	7.62%
Height	0.00022	2.72%	0.000097	1.93%	0.00067	6.63%
TOTAL	0.008098	100.00%	0.005021	100.00%	0.0101	100.00%

Table 7.3

Decomposition	(Shapley method) Males					
	Gross Income		Net Income		Earnings	
Variable	Value	percentage	Value	percentage	Value	percentage
Long-Standing Illness	0.000459	6.22%	0.000477	7.14%	0.000432	4.89%
Ethnicity	0.000681	9.23%	0.000648	9.72%	0.001133	12.85%
Father's Educational Qualifications	0.003759	50.94%	0.002303	34.52%	0.004442	50.37%
Mother's Educational Qualifications	0.001423	19.28%	0.001347	20.19%	0.001828	20.73%
Father Not Working	0.000233	3.15%	0.0004	5.99%	0.000359	4.08%
Migrant Generation	0.000758	10.28%	0.001234	18.50%	0.00058	6.58%
Height	0.000066	0.89%	0.000262	3.93%	0.000043	0.49%
TOTAL	0.007379	100.00%	0.006671	100.00%	0.008818	100.00%

Table 7.4: Fixed effects estimation, upper bound (first stage)

Fixed Effects Regressions on Waves 1 to 7, Controlling for Efforts	Log Gross Income						Log Net Income						Log Earnings					
	All		Female		Male		All		Female		Male		All		Female		Male	
If Ever Married or in Civil Partnership (Reference = No)	0.033**	(0.011)	0.031*	(0.014)	0.028	(0.017)	0.024*	(0.011)	0.031*	(0.014)	0.017	(0.017)	-0.001	(0.013)	0.031*	(0.014)	0.018	(0.021)
Working Hours per Week (Reference = No hours)																		
1 to 21 hrs.	0.008	(0.021)	0.048	(0.025)	-0.043	(0.040)	-0.038	(0.020)	0.048	(0.025)	-0.115**	(0.039)	0.072**	(0.025)	0.048	(0.025)	0.008	(0.048)
22 to 39 hrs.	0.209***	(0.019)	0.250***	(0.025)	0.182***	(0.029)	0.121***	(0.018)	0.250***	(0.025)	0.075**	(0.028)	0.357***	(0.022)	0.250***	(0.025)	0.232***	(0.034)
40 hours	0.227***	(0.020)	0.294***	(0.027)	0.187***	(0.029)	0.134***	(0.019)	0.294***	(0.027)	0.077**	(0.028)	0.379***	(0.023)	0.294***	(0.027)	0.245***	(0.035)
More than 40 hrs.	0.248***	(0.020)	0.284***	(0.029)	0.219***	(0.030)	0.154***	(0.020)	0.284***	(0.029)	0.109***	(0.029)	0.398***	(0.024)	0.284***	(0.029)	0.275***	(0.035)
Region (Reference = North East)																		
North West	-0.102	(0.107)	0.144	(0.147)	-0.247	(0.161)	-0.101	(0.104)	0.144	(0.147)	-0.235	(0.155)	-0.244	(0.128)	0.144	(0.147)	-0.422*	(0.191)
Yorkshire and The Humber	0.016	(0.103)	0.271	(0.146)	-0.120	(0.149)	0.024	(0.100)	0.271	(0.146)	-0.084	(0.144)	-0.076	(0.123)	0.271	(0.146)	-0.228	(0.177)
East Midlands	0.142	(0.110)	0.357*	(0.151)	0.028	(0.166)	0.095	(0.107)	0.357*	(0.151)	-0.009	(0.160)	0.057	(0.131)	0.357*	(0.151)	-0.084	(0.196)
West Midlands	0.147	(0.110)	0.315*	(0.152)	0.036	(0.163)	0.126	(0.106)	0.315*	(0.152)	0.027	(0.158)	0.032	(0.131)	0.315*	(0.152)	-0.104	(0.194)
East of England	0.012	(0.109)	0.218	(0.152)	-0.109	(0.161)	-0.027	(0.105)	0.218	(0.152)	-0.163	(0.155)	-0.096	(0.130)	0.218	(0.152)	-0.220	(0.191)
London	0.090	(0.107)	0.381**	(0.147)	-0.108	(0.161)	0.038	(0.104)	0.381**	(0.147)	-0.150	(0.155)	0.030	(0.127)	0.381**	(0.147)	-0.191	(0.191)
South East	0.016	(0.107)	0.237	(0.148)	-0.107	(0.159)	-0.022	(0.103)	0.237	(0.148)	-0.147	(0.154)	-0.056	(0.127)	0.237	(0.148)	-0.191	(0.189)
South West	-0.035	(0.109)	0.174	(0.148)	-0.147	(0.165)	-0.053	(0.106)	0.174	(0.148)	-0.191	(0.159)	-0.172	(0.130)	0.174	(0.148)	-0.239	(0.196)
Wales	-0.003	(0.136)	0.205	(0.175)	-0.141	(0.216)	-0.021	(0.132)	0.205	(0.175)	-0.115	(0.209)	-0.039	(0.162)	0.205	(0.175)	-0.302	(0.257)
Scotland	0.177	(0.122)	0.450**	(0.160)	-0.019	(0.195)	0.047	(0.118)	0.450**	(0.160)	-0.083	(0.188)	0.029	(0.145)	0.450**	(0.160)	-0.182	(0.231)
Northern Ireland	-0.203	(0.303)	0.218	(0.346)	-0.681	(0.542)	-0.317	(0.294)	0.218	(0.346)	-0.738	(0.524)	-0.317	(0.361)	0.218	(0.346)	-0.810	(0.643)
Full Time or Part Time Worker (Reference = Full Time)	-0.168***	(0.010)	-0.156***	(0.009)	-0.195***	(0.023)	-0.133***	(0.009)	-0.156***	(0.009)	-0.159***	(0.022)	-0.253***	(0.012)	-0.156***	(0.009)	-0.292***	(0.027)
Current Economic Activity (Reference = Self employed)																		
In paid employment	0.105***	(0.015)	0.104***	(0.021)	0.105***	(0.023)	0.101***	(0.015)	0.104***	(0.021)	0.110***	(0.022)	0.106***	(0.018)	0.104***	(0.021)	0.138***	(0.027)
Unemployed	0.015	(0.050)	0.036	(0.066)	0.008	(0.077)	0.064	(0.049)	0.036	(0.066)	0.024	(0.074)	-0.039	(0.060)	0.036	(0.066)	0.037	(0.091)
Retired	-0.017	(0.434)	0.007	(0.370)			0.038	(0.421)	0.007	(0.370)			-0.140	(0.517)	0.007	(0.370)		
On maternity leave	0.087***	(0.024)	0.085***	(0.026)	-0.157	(0.450)	0.104***	(0.024)	0.085***	(0.026)	-0.087	(0.435)	0.025	(0.029)	0.085***	(0.026)	-0.127	(0.534)
Looking after family or home	-0.203***	(0.060)	-0.210***	(0.054)	-0.017	(0.451)	-0.181**	(0.058)	-0.210***	(0.054)	0.004	(0.435)	-0.500***	(0.071)	-0.210***	(0.054)	0.024	(0.535)
Full-time student	-0.048	(0.046)	-0.050	(0.054)	-0.026	(0.078)	0.038	(0.044)	-0.050	(0.054)	0.099	(0.076)	-0.211***	(0.055)	-0.050	(0.054)	-0.026	(0.093)
Long term sick or disabled	0.184*	(0.072)	0.153	(0.082)	0.221	(0.124)	0.225**	(0.069)	0.153	(0.082)	0.283*	(0.120)	-0.024	(0.085)	0.153	(0.082)	0.054	(0.148)
On gov training scheme	0.371	(0.296)			0.424	(0.342)	0.373	(0.287)			0.441	(0.331)	-1.308***	(0.353)			-1.302**	(0.406)
Unpaid worker in family business	-0.685**	(0.257)	0.306	(0.395)	-1.089**	(0.356)	-0.698**	(0.249)	0.306	(0.395)	-1.040**	(0.345)	-2.067***	(0.306)	0.306	(0.395)	-3.495***	(0.423)
Working in apprenticeship	0.814**	(0.311)	1.017**	(0.346)	0.582	(0.560)	0.833**	(0.301)	1.017**	(0.346)	0.630	(0.541)	0.692	(0.371)	1.017**	(0.346)	0.856	(0.665)
Doing sthg else	0.007	(0.083)	-0.081	(0.089)	0.183	(0.161)	-0.006	(0.081)	-0.081	(0.089)	0.152	(0.156)	-0.138	(0.099)	-0.081	(0.089)	0.051	(0.191)
Educational Attainment (Reference = No qualification)																		
Degree	0.018	(0.063)	0.001	(0.073)	0.037	(0.108)	0.019	(0.061)	0.001	(0.073)	0.034	(0.105)	0.114	(0.075)	0.001	(0.073)	0.067	(0.128)
Other higher degree	-0.022	(0.062)	-0.022	(0.070)	-0.032	(0.110)	-0.000	(0.060)	-0.022	(0.070)	-0.005	(0.106)	0.008	(0.074)	-0.022	(0.070)	-0.076	(0.131)
A-level	-0.014	(0.059)	-0.067	(0.067)	0.032	(0.103)	0.001	(0.057)	-0.067	(0.067)	0.048	(0.099)	0.038	(0.070)	-0.067	(0.067)	0.022	(0.122)
GCSE	0.028	(0.057)	-0.018	(0.066)	0.062	(0.098)	0.031	(0.055)	-0.018	(0.066)	0.078	(0.095)	0.086	(0.068)	-0.018	(0.066)	0.120	(0.117)
Other	-0.049	(0.052)	-0.124*	(0.063)	0.015	(0.083)	-0.054	(0.050)	-0.124*	(0.063)	0.008	(0.080)	0.018	(0.061)	-0.124*	(0.063)	0.064	(0.098)
Time-Specific Effects=2	0.030***	(0.007)	0.030***	(0.009)	0.031**	(0.012)	0.028***	(0.007)	0.030***	(0.009)	0.027*	(0.011)	0.027**	(0.008)	0.030***	(0.009)	0.024	(0.014)
Time-Specific Effects=3	0.057***	(0.007)	0.050***	(0.009)	0.063***	(0.012)	0.058***	(0.007)	0.050***	(0.009)	0.061***	(0.011)	0.050***	(0.008)	0.050***	(0.009)	0.049***	(0.014)
Time-Specific Effects=4	0.074***	(0.007)	0.057***	(0.009)	0.091***	(0.012)	0.078***	(0.007)	0.057***	(0.009)	0.089***	(0.011)	0.070***	(0.008)	0.057***	(0.009)	0.071***	(0.014)
Time-Specific Effects=5	0.088***	(0.007)	0.082***	(0.009)	0.095***	(0.012)	0.100***	(0.007)	0.082***	(0.009)	0.108***	(0.011)	0.094***	(0.008)	0.082***	(0.009)	0.078***	(0.014)
Time-Specific Effects=6	0.153***	(0.007)	0.119***	(0.009)	0.188***	(0.012)	0.161***	(0.007)	0.119***	(0.009)	0.192***	(0.011)	0.159***	(0.009)	0.119***	(0.009)	0.166***	(0.014)
Time-Specific Effects=7	0.173***	(0.007)	0.144***	(0.009)	0.203***	(0.012)	0.181***	(0.007)	0.144***	(0.009)	0.209***	(0.011)	0.190***	(0.009)	0.144***	(0.009)	0.188***	(0.014)
Constant	7.231***	(0.113)	6.861***	(0.150)	7.511***	(0.174)	7.108***	(0.109)	6.861***	(0.150)	7.360***	(0.169)	7.030***	(0.134)	6.861***	(0.150)	7.483***	(0.207)
r2	0.078		0.102		0.065		0.065		0.102		0.058		0.099		0.102		0.063	
N	42215		23338		18877		42215		23338		18877		42215		23338		18877	
No of individuals	7417		4093		3324		7417		4093		3324		7417		4093		3324	

Robust standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001