Could "Equality of Opportunity" among Commoners Suffice?

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Working Paper No. 2019-01

July 17 2019

DALHOUSIE UNIVERSITY
Inspiring Minds

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Version: July 17th, 2019

[1] Revised version of keynote address presented at Conference on Inequality of Opportunity, University of Queensland and Griffith University, Brisbane, Australia, June 26-27, 2019. The comments of Insa Bechert, 'Chico' Ferreira, Marc Fleurbaey, Sripad Motiram, Shelley Phipps, Daniel Rosenblum, John Roemer, Ed Wolff, Dongjie Wu and participants in the Brisbane conference have been enormously valuable and are very much appreciated. The support of the Australian Research Council under ARC DP 1701 00438 is gratefully acknowledged. I alone am responsible for remaining errors. Additional comments and corrections are very much welcomed – please check for the current version available before any quotation.

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Abstract

The Equality of Opportunity (EOP) approach to the analysis of economic inequality, based on Roemer (1998), attempts to estimate the fraction of existing income inequality which can be considered “fair”. Sections 1 and 2 summarize its methodology and the reasons why it can at best estimate a lower bound to the role which inequality of opportunity plays in determining total inequality. Sections 3 and 4 discuss individual inheritance of financial wealth and of DNA. Section 3 notes that the EOP approach ignores income from capital ownership (i.e. roughly half of GDP, and rising) and argues that the fairness of the inheritance of wealth and of the shares of capital and labour in national income have historically been central issues in inequality debates. Section 4 discusses genetic and epigenetic inheritance and the psychometric literature on their importance for personality. Sections 5 and 6 question whether analysis of inequalities of opportunity can be separated from discussion of inequalities of outcome. Section 5 notes that when wages are attached to the jobs which individuals are able to get and workers have to compete with each other for good jobs, greater equality of opportunity may just mean more people running harder after the same distribution of prizes, with ambiguous welfare impacts, unless the distribution of income also changes. Section 6 discusses intergenerational mobility, concluding that since the life chances of children depend on the bequest choices and wealth constraints of their parents, the inequality of opportunities within one generation depends on the inequality of outcomes within preceding generations.

For all these reasons, this paper concludes that there is much more complexity in the concept and measurement of “fair inequality” than the EOP approach now sometimes seems to suggest.

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In the early 21st century, there is widespread public discontent in many countries with the distribution of income. However, although surveys show overwhelmingly agreement that income differences are "too large", very few people are absolute egalitarians[2]. In academia, the recent economics literature has produced a body of research which argues that "fair" income inequality can be calculated by comparing existing inequality with the hypothetical inequality prevailing in an ideal state of equality of opportunity. This paper asks whether greater "fairness", in the sense of greater equality of opportunity, as measured in this literature, could be expected to produce greater economic well-being and lessened discontent with current trends in income and wealth inequality. More precisely, since this literature (henceforth to be called generically the EOP approach[3]) emphasizes the unfairness of the impact on individual earnings of unchosen "circumstances" (like gender, race or parents' education), this paper asks whether, and under what conditions, a reduction in the impact on earnings of unfair "circumstances" would plausibly reduce public discontents.

The paper's title starts from two observations. (1) In the 18th century, before the French Revolution, the most politically important dimension of economic inequality in Europe was the social divide between aristocratic families, who lived off the income from their large inherited estates, and commoners, who depended on their labour earnings. (2) The vast majority of people in contemporary societies can also be described as "commoners", in the sense that they do not own, control or inherit large fortunes and therefore depend primarily on their labour earnings for their lifetime consumption. It follows that greater equality of opportunity in earnings determination among commoners is clearly an important issue, as it always has been, for the vast majority of people.

However, in analysis of trends in the income distribution over the last 40 years it has often been observed that "most of the action has been at the very top"[4]. Because the top 1%,

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[2] Averaging across the 11 countries participating in the International Social Survey Programme from 1987 to 2009, Osberg and Bechert (2019) find that 72.4% agree or agree strongly that income differences are "too large", but only about 1% think that a factory worker should make the same income as the Chair of a large national company.

[3] see Fleurbaey, Peragine and Ramos (2017). [Brunori, Peragine and Serienga (2018) prefer the label IOp].

[4] Alvaredo et al (2013: 13). Gordon (2008) and Burkhauser et al. (2009) also found that, as Morelli et al (2014: 79) put it, "the rise in the top end has driven much of the distribution in the United States". Murphy et al (2007, 2008), Osberg (2008, 2014, 2018) and Veall (2012) reinforced that finding for Canada.

and even more the top 0.1%, of the income distribution have experienced much more rapid rates of income growth than the middle class, the income share of the very top percentiles of the income distribution has grown rapidly in many countries. And for the plutocrats of the 21st century the ownership, control and inheritance of capital matters hugely, as it did for the aristocrats of the 18th century. Thus although non-discrimination in the wages of the 99.9% is clearly an important issue, it is also one which may miss much of the concern and rising discontent with income distribution within many advanced capitalist nations[5].

Section 1 of this paper starts by defining and outlining very briefly the main features of the EOP approach while Section 2 summarizes several already available critiques. Section 3 then considers the disappearance from the EOP literature of any mention of non-human wealth, the inheritance of property or income from capital ownership – issues which historically were central to discussions of the fairness of the income distribution. Section 4 discusses genetic inheritance, noting that the epigenetics literature on the importance of environmental influences on, and the psychometric literature on the genetic inheritance of personality traits, raise new questions for the cross-national comparability, and the interpretation, of the "effort" / "circumstances" dichotomy underlying the EOP literature. "Tweaks" to the EOP approach to deal with these issues are suggested.

The EOP literature typically discusses inequality of opportunity without any explicit consideration of inequality of outcome, but is this a defensible methodology? Section 5 notes that in general, the welfare implications of decreasing the importance of "circumstances" for individual earnings depend crucially on any changes in the inequality of outcomes which that might imply. A crucial issue in whether and how the distribution of outcomes might change is why effort or circumstances characteristics matter for earnings – i.e. whether an individual's earnings are determined by the job they have or by the set of skills which they have acquired. When advantages are attached to positions and individuals have to compete with each other for good jobs, positional externalities are inescapable because the relative ranking of characteristics is what matters. If more equal opportunities just mean that more people run harder after the same prizes, the aggregate well-being effects of greater equality of opportunity are very unclear. Section 6 widens the focus to consider intergenerational mobility and the cumulative implications across generations of the bequest choices and income constraints of the current generation of adults, concluding that inequality of opportunity is inextricably linked to inequality of outcome. Section 7 concludes.

[5] In Canadian polling data, 85% either 'agree strongly' (38%) or 'agree' (47%) with the statement that "*Income inequality is no longer about the gap between the rich and the poor, but rather the very rich and everyone else*" Pollara (2014) – a similarly worded EKOS question got 77% agreement, see Graves (2017).

1. The EOP literature of the early 21st century.

This paper thinks of the EOP literature as the body of research now summarized in articles such as Andreoli and Fusco (2019), Brunori (2016), Fleurbaey, Peragine and Ramos (2017), Hufe, Kanbur and Peichl (2018), Motiram (2018) and Ramos (2016), among others. Although this literature builds on Roemer (1998), it has (like all dynamic research agendas) evolved somewhat from the original and now starts from an ambitious and explicitly ethical perspective – "the idea of distinguishing fair inequalities, i.e., outcome inequalities due to effort and responsibility, from the unfair inequalities that are instead due to exogenous circumstances (such as race, gender, parental background)[6]." An ideal of equal opportunity is the point of reference, which (Brunori, 2016:1) defined as: "non-discrimination, prescribing that all individuals should be treated equally. To this formal definition others oppose a substantive version of the same principle: equality of opportunity requires that all individuals have the same chances to obtain valuable outcomes.[7]"

The crucial starting assumption is that each individual can be fully described by two sets of traits – "circumstances" beyond individual control, c_i, and responsibility characteristics, e_i, which individuals control, called "efforts". Individuals are held to be morally responsible for the consequences of their efforts[8]. The outcome of interest y_i is then written as a function of efforts and circumstances[9].

[1] $y_i = g(c_i, e_i)$

In economics, a common perspective is to see outcomes as determined by choices made subject to constraints – i.e. as jointly determined – and to think of social reality in terms of continuous variables. The EOP perspective hypothesizes that choices (efforts) and constraints (circumstances) can be cleanly distinguished. If efforts and circumstances can be grouped into discrete categories, the joint distributions of circumstances, efforts and outcomes can be represented as a matrix, in which cells report the average outcome (y_{jk}) associated with a given combination of effort and circumstance, as in [2].

[6] Fleurbaey, Peragine, and Ramos (2017:578). Roemer (1998) contented himself with discussion of the meaning of equality of opportunity,

[7] When individuals have unequal genetic inheritances these definitions are <u>not</u> different statements "of the same principle". As Roemer (1998:6) explicitly recognized, genetically inherited disadvantage implies that equal chances require <u>unequal</u> treatment – i.e. compensatory programs for the genetically disadvantaged (see also Section 3).

[8] This perspective has been questioned, Fleurbaey (2007:246), for example, "rejects the popular thesis that individuals should be held responsible for what lies in their control".

[9] Section 5 discusses whether traits are directly productive or serve to rank individuals.

$$
\begin{array}{lcccc}
 & & \leftarrow & \textit{Efforts} & \rightarrow \\
 & & y_{11} & y_{1k} & y_{1m} \\
 & \uparrow & & & \\
[2] & \textit{circumstances} & y_{j1} & y_{jk} & y_{jm} \\
 & \downarrow & & & \\
 & & y_{n1} & y_{nk} & y_{nm}
\end{array}
$$

Each of the n rows in the matrix is the outcome vector of a 'type', defined as the set of individuals sharing the same circumstances. Each of the m columns is termed a 'tranche', and includes all individuals that exerted the same effort. Efforts thus vary within types and circumstances vary within tranches. The n rows of the matrix consisting of the types comprise the combinations of circumstances considered – e.g. white and male, white and female, non-white and male, non-white and female.

In looking at a matrix, one can compare the distribution of outcomes within types (i.e. across the rows of people with similar circumstances) or within tranches (i.e. across the columns of people with similar efforts). Fleurbaey, Peragine, and Ramos call the former perspective the Ex Ante approach and term the latter the Ex Post approach to measuring opportunity inequality. In the Ex Ante approach: "There is EOP if the opportunity sets have the same value, regardless of the circumstances. Inequality of opportunity decreases if inequality between individual opportunity sets decreases." (2017:582) The Ex Post criterion is defined as: "There is EOP (equality of opportunity) if all those who exert the same efforts have the same outcome. Inequality of opportunity decreases if the outcome inequality decreases among the individuals at the same degree of effort."

In the ex ante approach, differences in the outcome prospects for classes of individuals with identical circumstances are emphasized. Accordingly, it focuses on inequality between types, and as Brunori (2016:6) notes ex ante EOP "is by far the most popular measure of inequality of opportunity". The papers discussing whether to use the Ex Ante or Ex Post approach discuss the ethical arguments for each and the relative primacy of the Compensation Principle (that unfair disadvantages due to circumstances should be compensated) and the Reward Principle (that fair advantages due to effort should be rewarded). Wagstaff and Kanbur 2015:1243) have a particularly pithy summary of the empirical methodology:

> "Take a household survey. Decide on an outcome – (such as) income. Calculate the amount of inequality in the outcome in the data – let us say it is 50/100. Then identify in the dataset the variables that capture the influences on the outcome over which the person had no control – their 'circumstances'. Form groups [or 'cells'] based

on combinations of these circumstance variables. Calculate how much inequality there is across these groups. Let us suppose it is 20. This is inequality of opportunity. The residual [30] is legitimate inequality because of differences in effort – differences within the cells of people in similar circumstances."

This matrix approach can also be further simplified. A matrix of outcomes like [2] can be easily changed to a linear format by the use of dummy variables for each cell of the matrix. For the j = 1..n circumstance type rows and the k = 1…m effort tranche columns, D_{ijk} = 1 if individual i belongs; = 0 else, as in 2A.

2A $\quad y_i = \alpha_0 + \Sigma_j\Sigma_k \alpha_{jk} D_{ijk} + u_i$

Researchers willing to ignore interactions between efforts and circumstances[10] may then assert that equal expected value of income across circumstance types can be interpreted as ex ante equality of opportunity. If so, then OLS regression estimates of equation 2B produce coefficients $\boldsymbol{\alpha_j}$ which are said to represent the influence of each circumstance type, implying that the expected value of the total influence on income of circumstances for each individual is $\boldsymbol{y_i}$, as given by equation 2C.

2B $\quad y_i = \alpha_0 + \Sigma_j \alpha_j D_{ij} + u_i$

2C $\quad \boldsymbol{y_i} = \boldsymbol{\alpha_0} + \Sigma_j \boldsymbol{\alpha_j} D_{ij}$

Inequality statistics (such as the Gini or Mean Logarithmic Deviation) calculated over the vector of counter-factual estimated incomes ($\boldsymbol{y_i}$) predicted by circumstances characteristics alone are then compared to inequality statistics calculated over actual incomes (y_i) , and their ratio[11] is labelled the "unfair" fraction of inequalities due to circumstances[12]. (These estimates are typically not very high – e.g. Niehues and Peichl [2014: 85] argue "observed circumstances can explain up to 26.3 % of the overall variation in log earnings in Germany, and up to 29.5 % in the U.S.") The lower the R^2 of the equation which is estimated in regression 2B, the lower

[10] Roemer (1998:15, 20) originally argued that in thinking about "fairness", one should recognize that cultural norms might be part of the (dis)advantages conferred by membership in a particular community, so fairness requires thinking of equivalent "effort" in terms of percentile rank among people with similar circumstances characteristics. This suggestion has not been followed up much, perhaps partly because rank differences across types can correspond to very different absolute effort differences (depending on the effort distribution's variance and skew) and the fairness implications are not obvious. If, for example, Group A has twice the variance in work hours of Group B, is it "equal additional effort" when a member of Group B increases labour supply by half the additional hours of a member of Group A? .

[11] In other contexts, (e.g. when estimating the redistributive impact of taxes and transfers in public finance) the convention is to calculate the difference between actual and counterfactual indices of inequality (e.g, the Gini (before tax) minus the Gini (after tax)). It is not clear why the EOP literature prefers the ratio to the difference – but the choice will affect country rankings. In either case, using a summary index (like the Gini or MLD) ignores the possibility and implications of Lorenz crossing – see Osberg (2017) for a discussion of the Gini, which applies also to the MLD.

[12] Hufe, Peichl, Roemer and Ungerer (2017) is an example.

inequality of opportunity is said to be (see Ibarra and Cruz, 2015). The unexplained variance of a linear regression model thereby acquires ethical meaning[13].

Although Roemer (1998) framed the discussion of advantages and disadvantages very broadly, Brunori (2016:16) has noted "the majority of empirical studies have selected income" as the variable of interest. Any definition of an "income" flow must specify the recipient unit considered, the time period of measurement and the types of receipts included. Since Roemer (1998), the issue under examination is equality of access to positions, which implies that labour earnings should be the appropriate income flow to examine. In the EOP literature, as in much of the broader literature on inequality, differences in lifetime earnings are what researchers would in principle like to examine, but they generally have to make do with data on annual earnings, because that is what is available. The EOP approach diverges, however, from the broader literature on inequality in its conceptual emphasis on individual, not household, earnings. Since, in all societies, most people live in households with other people and share, to some degree, in the standard of living enabled by household resources, empirical work on inequality which examines the distribution of economic well-being typically considers inequality in the distribution of household income[14]. Analytically, however, the EOP literature is about the roles played by effort and circumstances in determining individual earnings.

When incomes are shared within families, equality of opportunity to earn individual income may not translate directly into equality of opportunity to consume. Imagine, for example, that the inequalities of opportunity in individual earnings ascribable to gender are eliminated because a 1950s type society in which half of all top executives are the sons of top executives and half are the sons of working class parents has changed into a 2020s type society in which top executives are entirely the sons and the daughters of top executives. The working class daughters of the 1950s whose working class origin husbands became top executives at least got to share in the consumption enabled by executive compensation – but in the 2020s they are shut out of both the earning and the consumption of high salaries. In this example, gender discrimination in earnings ends but class bias increases – and inequality of opportunity

[13] The social interpretations of explained and unexplained variation in regression results have long been questioned. Jenks (1979:301), for example, found that "family background, test scores and years of schooling might explain 51 to 54 percent of the observed variation in adult occupational status", (which left nearly half unexplained), but questioned what the coefficients and R^2 estimated in a particular context can tell us about equalizing circumstances. He suggested that unexplained variation may depend on explained variation – that equalizing personal characteristics might cause changes in wage-setting institutions such that "the labor-market imperfections that now generate inequality among identical workers might diminish or even disappear" (1979:309). In economic jargon, he was pointing out that estimated regression coefficients can, at best, indicate the marginal partial association between variables, conditional on all other variables and on unchanging institutional context. Since a counter-factual of equal opportunity would certainly be well "out of sample", both general equilibrium responses and institutional changes could reasonably be expected.

[14] More exactly, the norm [e.g. OECD (2015)] is to examine the inequality across individuals of equivalent disposable household income – i.e. per capita after-tax household income adjusted for economies of scale in consumption. Some EOP empirical work (e.g. Brunori, Peragine and Serlenga (2018)) uses this concept, despite its dependence on household size, marital homogamy, family labour supply, capital income, taxes and transfers.

by gender for consumption increases because homogamy in marriage patterns produces increased inequality in household income in the 2020s. More to the point of whether greater EOP could reduce social discontent, one can ask: Would one expect working class women to celebrate the 2020s?[15]

2. Choice, Constraint or Chance?

The labelling in the EOP literature of individual characteristics as representing either an "effort" (i.e. a personal choice which produces "fair" inequalities) or a "circumstance" (i.e. a constraint which causes "unfair" inequalities) has been a major innovation. The feasibility of unambiguously categorizing individual characteristics has therefore been a major critique. Many economists have been influenced by the idea that outcomes are jointly determined by choices and constraints. Alfred Marshall's famously compared the joint impact of supply and demand to the lower and upper blades of a pair of scissors, arguing that "We might as reasonably dispute whether it is the upper or the under blade of a pair of scissors that cuts a piece of paper" (Marshall, 1913). In the regressions which labour economists have for decades been running to estimate the empirical relationship between individual earnings and personal characteristics, the size of estimated coefficients has typically been interpreted as being jointly determined – i.e. partly due to "efforts" and partly due to "circumstances". Although variables like gender, race and age are not personal choices, both efforts and circumstances play important roles in determining the influence of other variables.

In, for example, the classic "Mincer equation" specification[16] of the Human Capital earnings function, the crucial variable is years of schooling. Age is relabelled as "Potential Experience" and appears slightly transformed as [Age – years of schooling – 6], which enters as a quadratic in the earnings function [3]:

$$[3] \quad \ln(\text{earnings}] = \beta_0 + \beta_1(\text{years school}) + \beta_2\,(\text{Experience}) - \beta_3\,(\text{Experience})^2 + \beta_4(\text{gender}) + \beta_5\,(\text{race}) + \beta_6\,(\text{hours of work}) + \text{other control variables} + \text{error term}$$

Since the returns to education and experience often differ by race and gender, separate regressions by group are usually appropriate. A large literature interprets (e.g. by Blinder-Oaxaca decomposition) the unexplained / "discrimination" component of the association

[15] A majority of white working-class women in the U.S. voted for Trump in 2016.

[16] Lemieux (2006) suggests that equation [3] should also include a quadratics in years of schooling and a quartic in potential experience, but remains "remains an accurate benchmark for estimating wage determination equations", having been estimated on thousands of data sets in many countries and for many time periods.
Non-parametric estimates, as per 2A, are preferred by some authors and can be labelled piece-wise linear approximations – but the essential point is the ambiguities of choice/constraint classification assignments.

between earnings, race and gender[17]. The earnings differentials associated with "experience" are interpreted as the returns to human capital acquired informally through on the job training while the earnings differentials associated with education (i.e. β_1) are seen as the returns to formally acquired human capital[18].

Although the initial human capital models were written as if an individual's education was determined by their adult decisions about human capital acquisition, a large recent literature has emphasized the importance of early childhood and family background for schooling and lifetime earnings. Almond and Currie (2011), for example, discuss the importance of fetal origins, emphasizing that insults to the in-utero environment can have major impacts, including some that remain latent until later adulthood. Currie (2009) surveys the linkages between parental socio-economic status and child health and between child health and adult education or income. Finding strong evidence of such links, she argues that health is an important transmission mechanism in the intergenerational inheritance of economic status. Cunha and Heckman (2009) see the capability formation process as governed by a multistage technology, in which the individual capabilities that can be developed at one stage in life depend on the capabilities developed at earlier stages, and the development of some capabilities (e.g. language acquisition) is subject to critical and sensitive periods in early childhood. They argue that: "Preferences and skills determined early in life explain a substantial part of lifetime inequality. …. in American society about 50% of lifetime inequality in the present value of earnings is determined by factors known to agents at age 18" (2009:4). They add in a footnote "Notice that this is a lower bound estimate. Forces set in motion in the early years of childhood may play out after age 18 but their consequences may not be fully anticipated at age 18."[19]

Wagstaff and Kanbur (2015) are among those who have also pointed out that small children do not get to make decisions which will heavily influence their lives such as which school to attend or which neighborhood to reside in. Furthermore, for the choices that children do make, the legal systems of all countries recognize that because capacity for informed moral and practical choices depends on age, juveniles should not be held criminally or financially responsible in the same manner as adults – and it is hard to argue that teenagers should be

[17] Since, for example, African-Americans differ from white Americans in both average characteristics and in the estimated 'return' to characteristics, it makes a difference to discrimination estimates which group's regression is used as the base. However, the EOP literature typically uses coefficient estimates from a pooled sample regression.

[18] Section 5 will discuss alternative causal interpretations of the earnings differentials associated with education (i.e. β_1) and age.

[19] Although the economics literature on the impacts of early childhood disadvantage emerged at roughly the same time as the EOP literature and although both are arguably concerned with similar issues, they appear to have developed in isolation – the early childhood articles cited here typically cannot be found in the bibliography of EOP papers, and vice-versa. Empirically, EOP researchers have also tended to find much smaller impacts of "circumstances" than the Cunha and Heckman result cited above.

held more morally responsible for their schooling choices than for their criminal choices[20]. Although many post-secondary schooling decisions are made after legal adulthood is attained (usually at 18), the capabilities developed by then and the options then available to each person depend crucially on their earlier circumstances, so current "efforts" can only be partially responsible, even after age 18. And as Roemer (1998:21) recognized, schooling choices also depend on the norms and expectations of the communities into which children are borne.

In short, adult labour supply and human capital in education are very heavily influenced by early circumstances. And although age is not a choice variable, it is the rest of "potential experience". As a positive proposition, many thousands of earnings regressions have shown that education and "potential experience" (i.e. age minus years of schooling) are strongly correlated with individual earnings, but these variables mingle the influences of adult choices and childhood constraints. Current hours of work also depend heavily on the demand side of labour markets – i.e. unemployment and job availability. Hence it is a dubious normative proposition to classify these variables as solely "effort" characteristics, unambiguously satisfying the reward principle.

Much of the variation in earnings among individuals also cannot be "explained" by measurable characteristics and cannot reasonably be forecast, even by well-informed agents. Wagstaff and Kanbur (2015) and Kanbur and Wagstaff (2014) therefore emphasize the role and problematic categorization of risk and uncertainty. In the EOP literature, a distinction between "option luck" (in events that an individual does control) and "brute luck" (in events over which an individual has no control) is often made, with the implication that individuals should be held morally responsible for the consequences of the former but not of the latter. That case for assigning moral responsibility is stronger if one can believe that individuals have alternative choices available to them, can know future event probabilities with accuracy and are endowed with the ability to calculate the relative expected value of outcomes. Behavioral economists like Kahneman (2011) protest that this hyper-rational "homo economicus" archetype is very rare.

Cunha and Heckman (2016) have also argued that risk and uncertainty have been increasing in recent times. They ask how much of the increase in American inequality has been due to components of earnings that are predictable by agents or to greater uncertainty facing them, concluding that unforecastable components in labor income were primarily responsible for increased inequality "especially for less skilled workers" (2016:S33)[21]. Perhaps because the distinction ("control") between types of luck is extremely slippery, no attempt is in practice made to distinguish between "option luck" and "brute luck" in actual EOP empirical work. The most common practice in EOP empirical work is to use an equation like 2C to calculate the

[20] Hufe, Peichl, Roemer and Ungerer (2017) argue that all characteristics acquired before legal adulthood should be counted as circumstances – since they use a regression methodology as per equation 2B, they are able to control for a large number of childhood attributes, which considerably increases the measured role of circumstances (but ignores the restriction of options available to adult chaices).

[21] As they note, since their data predated the Great Recession of 2008, they were unable to model the increase in cyclical uncertainty which it caused.

expected value of the impact of circumstances characteristics and call that "inequality of opportunity", which in effect assumes all the unexplained variance (i.e. all luck and the influence of all unobserved variables) is not due to "circumstances" and must therefore be due to "efforts"[22].

But how well does the "option luck" / "brute luck" distinction correspond to perceptions of fairness anyway? In our real world in the early 21st century, discontent with current levels of inequality is accompanied by great uncertainty about the future. Anxieties about technological and market changes have risen over the last 30 years, as risk has been transferred from employers to workers[23], but in the EOP approach, "unfair inequalities" are conceptually limited to the earnings implications of circumstance characteristics known in early adulthood (e.g. race, gender, parent's education). This implies that an initially circumstance advantaged individual (e.g. a white male) cannot later suffer from unfair inequality – e.g. if, for example, after 20 or 25 years of faithful service they are laid off and can only find a low wage replacement job, they should not think their current low income is "unfair"[24].

Historically, economists have drawn a distinction between "risk" (known future events which may occur with known probabilities) and "uncertainty" (known future events which occur with unknowable probabilities). Some economists (e.g. King, 2016) have recently added the idea of "radical uncertainty" – i.e. that now unimagined events that may in future occur, with inherently unknowable probabilities. If all possible choices come with risks and uncertainties attached, the "fair" degree of moral responsibility that individuals should bear for the outcomes of their choices has to depend on both what alternatives actually were available to them and whether they could possibly have predicted, with even approximate accuracy, the probabilities of its consequences[25].

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[22] Niehaus and Peichl (2014) used a fixed effects estimator to try to assess the role played by constant unobserved variables, claiming that this estimated an "upper bound" to inequality of opportunity. (Why one would expect unobserved variables to have a constant impact is not discussed.) They found "significant, sizable and robust differences between lower and upper bound estimates" (2014:73). Crucial to their methodology for assessing the upper bound was their assumption that all luck is an individual responsibility and that the impact on earnings of unobserved variables does not vary over time. When they considered luck as a circumstance, almost all male inequality in the U.S. was explained. Ibarra and Cruz (2015) also note that the omission of top income groups can substantially bias upwards the lower bound estimate.

[23] See Hacker (2006)

[24] The author knows of no evidence that public perceptions of "fairness" would agree.

[25] Concretely, oil industry workers have had wage losses since the 2014 drop in oil prices and the truck drivers who will be displaced by driverless vehicles will have future job losses. Some of these workers could maybe have gotten other types of jobs at some point in the past. Workers who are now 40 may well have made such occupational decisions when they were around 20 – i.e. in about 2000. Since oil prices have fluctuated, there always was "uncertainty" about future oil industry wages, so perhaps oil industry workers "should have known". But in the year 2000, driverless vehicles were not imagined. Today's truck drivers unknowingly faced "radical uncertainty". Should their losses now count as option luck or brute luck? Do any of these distinctions actually matter much for public perceptions of "unfairness" in income inequality trends?

Although everyone will probably agree that part of current inequality Is due to differences in choices/efforts and part is due to differences in constraints/circumstances, attempts to estimate the exact percentage assigned to each thus depend crucially on many judgment calls. If more kinds of circumstances (e.g. religion, ethnicity, parental education, parental occupation, gender, region of birth, race, etc.) are identified and if finer gradations of each kind of circumstance and more interactions of circumstances are recognized, the number of "types" identified will be larger[26]. Increasing the number of identified "types" increases the statistical explanatory power of circumstances in estimates of earnings determination. And there is strong evidence for expanding the list of circumstance characteristics beyond those considered in EOP regressions. For example, although family background has in almost all EOP empirical work been proxied just by parental years of education or broad occupational category, Adermon, Lindahl, and Palme (2019:2) have shown, using matched Swedish data over four generations, that including measures of the extended family substantially increases estimates of persistence across generations – e.g. "the *Years of schooling* measure increases by 50 percent, from 0.28 for the simple parent-child model to 0.42 when we use the between-dynasty persistence measure".

This paper is therefore only repeating the statements of others in saying that almost all[27] empirical estimates of the percentage of total inequality "explained" by inequality of opportunity are very uncertain lower bounds to its influence on actual inequality. Furthermore, the recent literature has frequently not emphasized the distinction between an estimate of a *lower bound* to the impact of inequality of opportunity and a *point estimate* of the impact of inequality of opportunity.

[26] If interactions are allowed and if c_i is the number of categories identified within each circumstance i of n circumstances, the number of types is the product $\prod_{i=1..n} c_i$. Since this number quickly becomes large, and since small sample size in interaction cells can produce large standard error of estimates and imprecisely estimated coefficients, interaction effects (e.g. female and working-class parents and black) are usually ignored. Brunori, Peragine and Serienga (2018) show that in EU-SILC data, fully interacted models typically estimate considerably more inequality of opportunity than linear models and that the ranking of countries depends crucially on the model chosen. They advocate a model selection criterion of minimum Mean Squared Error for out of sample predictions to determine the interactions used in modeling EOP and emphasize that this will typically not produce the same model in all countries. Their model considers luck and unobserved variables a personal responsibility.

[27] Niehaus and Peichl (2014) and Brunori, Peragine and Serienga (2018) claim to be exceptions.

3. The Disappearance of Capital and of its Inheritance

Given that all these discussions of inequality of opportunity are occurring in the context of capitalist market economies, a remarkable feature of the current EOP literature is the disappearance of capital. In many[28] otherwise excellent recent papers on inequality of opportunity a word search for terms like "capital", "wealth" "dividends" or "interest" yields zero hits. Capital, property, non-human wealth and the income flows derived from their ownership have simply disappeared from the conceptual framework. Roemer (1998:1) framed his argument from the start to be about "levelling the playing field among individuals who compete for positions" – i.e. non-discrimination in the competition for positions – so opportunities to earn income have always implicitly meant labour earnings. The processes which determine labour income are very different from the processes which determine capital income – indeed, the "effort" / "circumstances" dichotomy also depends on earnings being the focus, since the idea of "effort" being involved in the receipt of income from inherited wealth makes absolutely no sense[29]. Some authors in the EOP literature do examine income, and since the market income flows of individuals are always the sum of their labour earnings plus their capital income[30] one might expect that discussion of the differing determinants of labour and capital income would be provided, but instead income from the ownership of capital just disappears.

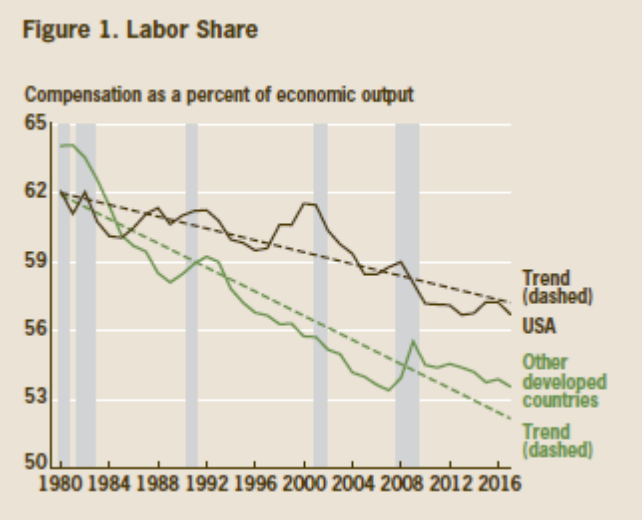
The disappearance of capital income is especially odd because in modern times labour's share of national income has been declining. Although the capital/labour division of national income was fairly stable until the 1980s, "the average adjusted labour share in G20 countries went down by about 0.3 percentage points per year between 1980 and the late 2000s …..When GDP is measured at market prices, the average labour share for the 9 countries with data from

[28] More exactly, in: Andreoli and Fusco (2019), Brunori, 2016; Brunori, Ferreira and Peragine, 2013; Fleurbaey, Peragine and Ramos (2017); Hufe, Kanbur and Peichl (2018); Van de Gaer, Martinez and Schokkaert, (2019). Motiram (2018) does mention "wealth" three times very tangentially but otherwise has zero hits. Words like "interest" do show up with other meanings – as in "interesting" or "object of interest" and "human capital" is a commonly found term in discussions of labour earnings. The word "wealth" can also be often found in the journal title "Review of Income and Wealth". But the productive capital stock or financial wealth and the income in capital gains or interest or dividend payments that derive from their ownership are just not mentioned.

[29] In the 1970s, the one generation life-cycle consumption/savings model with no intended bequest was popular in academia. In it, the capital stock consists entirely of the retirement savings of younger cohorts (which they deplete in their old age) and although each individual's annual income may (depending on their age) include some interest on their savings to date, the expected present value of lifetime consumption and lifetime earnings are identical. It has long been known – see Osberg (1981:151; 1984:195) – that this model cannot explain: [1] the existence of billionaires and the top tail of the wealth distribution, [2] why so many households have nil wealth at all ages, [3] the size of the aggregate capital stock, [4] why so few annuities are sold and [5] why inequality between age cohorts is such a small fraction of total wealth inequality (using the Theil index, roughly 5%). As well, inherited wealth remains an issue because life cycle savers who are inaccurately optimistic about their date of death leave unintended bequests.

[30] Household disposable income is equal to the market income of all household members plus transfer payments from government minus taxes paid. Large literatures discuss the equity implications of [1] transfers, taxes and public services; [2] assortative mating and the gendered nature of family labour supply and [3] household size and formation, which all raise important issues for "Fair Inequality" of equivalent disposable household income. However, this paper will, like the EOP literature, ignore all this, pleading "space constraints".

the 1960s declines from a peak of more than 65 per cent to about 56 per cent" (ILO, 2015:3). Figure 1 summarizes the general trend in the OECD while Figure 2 presents the Australian data.



Economic Commentary 2018:08, Federal Reserve Bank of Cleveland, August 2018

Figure 2[31]

Furthermore, when national income accountants measure capital's share of national income, they only count the income (i.e. rent, interest and dividends) received from the

[31] See Stanford (2019) https://assets.nationbuilder.com/theausinstitute/pages/2961/attachments/original/1551913121/Weak_Economic_Data_as_Election_Looms.pdf?1551913121

ownership of capital. At the very top of the income distribution, the salaries, stock options and bonusses of corporate CEOs and hedge fund managers are therefore counted as part of labour's share of national income, even though executive compensation is highly correlated with firm size and arguably derives from control over the firm's capital stock, if not from its formal ownership. In the Canadian context, Lemieux and Riddell (2016:113) calculated that if the incomes of the top 1% are excluded from labour's share of GDP, the annual rate of decline in labour's share from 1982 to 2008 in Canada nearly doubled (increasing from 0.17 to 0.30 percentage points annually). The reasons for the downward trend in labour's share, and the prospect for future trends, are debated[32]. Greenwald, Lettau, and Ludvigson (2019:3) have, for example, argued that most of the exceptionally good returns of U.S. stock markets since 1989 have been due to favorable factor share shocks that "persistently reallocated rents to shareholders and away from labor compensation[33]." But whatever the reason, when capital income is roughly half of national income, analyses of unequal opportunities which only consider equal opportunities to earn the labour half of national income will leave the other half unexamined.

Eventually, of course, the 'earnings' of hedge fund managers and CEOs show up in capital income, because their labour compensation[34] generates savings, which accumulate to stocks of wealth and pass by inheritance to the next generation. Since the acceleration of the growth of top end incomes dates from the 1980s and that cohort of CEOs has begun to die off, the increasing top end earnings of the last thirty years will imply increasing top end inheritance of wealth over the next thirty years. Between 2010 and 2016, the top 1% share of U.S. net worth increased by 4.5 percentage points – i.e. by well over twice the total net worth share of the bottom 60% of American households (1.9% of net worth in 2016)[35].

Historically, much of the discussion of inequality concerned inherited wealth and factor shares. Ricardo (1831) famously remarked: "the produce of the earth – all that is derived from its surface by the united application of labour, machinery and capital is divided among three classes of the community, namely, the proprietor of the land, the owner of the stock of capital necessary for its cultivation and the labourers by whose industry it is cultivated. To determine the laws that regulate this distribution is the principle problem of political economy." In Ricardo's time, the great landed estates of the English aristocracy, which passed by inheritance from one generation to the next, dominated the distribution of wealth. Thompson, (1985: 272n) notes that: "the established large landowners, whose family estates dated back to well before the 18th century, were an extremely stable group, well insulated from financial hardship or bankruptcy and self protected from demographic failure by the primogenitive customs of

[32] See Schwellnus, Pak, Pionnier and Crivellaro (2018)
[33] By contrast, during the 1952-1988 period economic growth accounted for 92% of equity value increases.
[34] In Canada in 2015, the CEO of Valeant Pharmaceuticals received $182,902,189. For other examples, see Osberg (2018:74).
[35] From 35.1% to 39.6%: Wolff (2017:44, Table 2) Table 4, page 46 also notes that 97.4% of the increase in net worth of U.S. households 1983-2016 has accrued to the top 20%.

strict settlement". Although in the later 1800s, the primacy of the English aristocracy in economic, social and political power was somewhat challenged by the new fortunes generated by industrial capitalism, the central issue in inequality of opportunity was for many decades clearly seen as being the distinct classes of affluence created by vast inequality in inheritances of wealth. And since the EOP approach starts from an explicitly ethical perspective, it is worth remembering that the ethical rationale for income from simple ownership has long been contested. As Heilbroner (1986:189) summarizes it: "Why, asks Henry George, should rent exist? Why should a man benefit merely from the fact of ownership, when he may render no services to the community in exchange? … where is the foresight of a man whose grandfather owned a pasture on which, two generations later, society saw fit to erect a skyscraper?"[36].

In their analysis of historical inequality trends, Milanovic, Lindert and Williamson (2010) have estimated that the Gini index of inequality of income in France in 1788, just before the French Revolution, was 0.559. At the time, France was an overwhelmingly agricultural nation whose land was mostly owned by a small aristocracy, passing from generation to generation by inheritance[37]. Pre-Revolutionary 18th century France thus illustrates how the ownership and inheritance of the capital stock created very large inequalities of living standards, social status and political power whose inheritance from one generation to the next produced substantial discontent – indeed, eventually, a revolution.

But would modern methods for the analysis of inequality of opportunity have been able to detect the social reality of pre-revolutionary France? The empirical EOP literature uses micro data drawn from sample surveys of the population, but outliers are routinely discarded (due to the possibility of measurement error). If aristocrats comprised only one tenth of 1% of the population, their data (if they responded at all to a sample survey) would often be discarded as atypical outlying observations. In one sense that would be appropriate, since if commoners were 99.9% of the population, it is their outcomes which were "typical" of the population as a whole and the processes which determined their incomes were fundamentally different from the determinants of aristocratic incomes. The information on personal characteristics like gender, ethnicity, parental education, etc, which modern studies now use to characterize "circumstances" might well explain part of inequality in earnings among commoners. But that information would be completely uninformative about the most important circumstance of late 18th century France – whether one was borne a commoner, inheriting little or no property, or a noble, inheriting vast landed estates.

The plutocrats of today and the aristocrats of the 18th century have different "court rituals", but they do share the reality, like earlier elites, that they sit at the top of the income

[36] In North America and Australia, one might today add that the original indigenous owners of the pasture were probably fairly recently displaced by force. In Europe, the forcible seizure of land usually has a longer history.

[37] If there were zero inequality in earnings among commoners, and aristocrats owned all the capital stock, a Cobb-Douglas production function with labour share parameter equal to 0.44 would fit these data. A Gini index of 0.559 would then imply, if aristocrats were 0.1% of the population, that the incomes of aristocrats were on average 1,271 times greater than the incomes of commoners.

distribution and they derive most of their income from the ownership or control of capital[38]. For both the billionaires of today and the nobility of the Middle Ages, private ownership of capital implies that the inheritance of great wealth will be a crucially important "circumstance" determining the incomes of their descendants, who are a very small, but very politically influential, percentage of the population[39]. Concern about inequality of opportunity was part of the reason why the inheritance of property and the taxation of large inheritances were central to debates on inequality of opportunity for many years. But discussion of large inheritances and the possibility of estate taxation cannot be found in the EOP literature of the last twenty years. Inheritance of wealth is a concept that is simply not discussed analytically and a variable that is not measured empirically – it has disappeared from this section of the academic literature.

Piketty (2014: Chapter 11) has however argued that when the rate of interest exceeds the growth rate of GDP, the value of the capital stock will grow faster than the rate of growth of national income, implying that inheritances received will inevitably comprise an ever-growing fraction of national income. The higher rates of return available on large portfolios work together with the increasing importance of inheritance of large fortunes to imply increasing concentration of wealth. Historically, estate taxation was central to the equality of opportunity debate, reflecting attempts to limit increases in the hereditary concentration of wealth and power. Because reducing the intergenerational transmission of large fortunes and limiting the concentration of political, economic and social power was always the main agenda, the exemption levels embodied in estate tax legislation enabled middle class inheritances (for most decedents, primarily the family home) to escape taxation[40].

Although commoners do not inherit large fortunes and although they have to work for their living, that does not imply that the inheritance of property is unimportant for them. As Wolff (2015: 91) puts it: "while the dollar value of wealth transfers is greater for wealthier groups, small gifts and bequests mean more to poorer families"[41]. Balestra and Tonkin (2018:50) note that across OECD nations "members of one-in-three households have received some form of gift or bequest by the time they were interviewed" – which, of course, leaves two thirds who have not. Housing is a concrete example of the importance of unequal inheritance

[38] For the factor origins of the income of the top 0.1% and 0.01% of the income distribution See Statistics Canada. Table 11-10-0055-01 High income tax filers in Canada

[39] Page, Seawright and Lacombe (2019) argue that billionaires are highly active politically, but typically prefer indirect influence, avoiding the visibility of direct political participation. Exceptions are the Murdoch dynasty, whose Fox News and global media empire generates both huge profits and immense political power, (see https://www.nytimes.com/interactive/2019/04/03/magazine/rupert-murdoch-fox-news-trump.html?action=click&module=Top%20Stories&pgtype=Homepage) and the Koch brothers (see https://en.wikipedia.org/wiki/Political_activities_of_the_Koch_brothers).

[40] In the U.S., for example, Tax Cuts and Jobs Act of 2017 doubled the estate tax exemption to $11.18 million per taxpayer. In 2018, only approximately 2,000 people (0.0006% of the U.S. population) were liable for any estate tax.

[41] Comparing lower wealth quintiles to upper quintiles, the marginal utility of a given dollar transfer is greater and intergenerational wealth transfers are a larger percentage of total lifetime wealth. Small inheritances can be a larger *percentage* of household wealth when other wealth is small – as it is for many Americans: 34.7% of U.S. households had less than $10,000 in net worth in 2016. Wolff, (2017: Table 1). For OECD comparisons, see Balestra and Tonkin (2018:52)

for inequality of wellbeing among the 99%. In OECD countries, owner-occupied housing is the major asset of middle-class families and increasing equity through mortgage paydown and capital gains is the primary basis by which wealth is acquired. Escalating house prices and stagnating youth wages have increased the importance of inequalities of opportunity to enter the housing market through inheritance and inter-vivos transfers (a.k.a. borrowing from "The Bank of Mom and Dad" for down payments)[42].

As Kindermann, Mayr and Sachs (2018:1) have noted, the expectation of a future inheritance can be expected to alter current effort (i.e. labour supply) since heirs work harder when they cannot expect quite as large an inheritance. As they put it: ``The taxation of bequests can have a positive impact on the labour supply of heirs through wealth effects. This leads to an increase in future income tax revenue on top of direct bequest tax revenue`[43]. Inheritance taxation can thus alter the impacts of both ``effort`` and ``circumstances`` on the distribution of income.

But support for inheritance taxation appears to depend partly on how aware voters are of the importance of inherited wealth. In an experimental study of Swedish attitudes to inheritance taxation, Bastani and Waldenström (2019) compared the attitudes of respondents who were, and were not, made aware of three research-based facts about inherited wealth in Sweden – specifically: "Inherited wealth represents about half of all wealth in the population.", "Those with the highest incomes inherit the most." and "A majority of Swedish billionaires have inherited their fortunes." (2019:8). By comparing the attitudes towards inheritance taxation of the respondents who were, and those who were not, exposed to this information they looked for the causal role of information in attitude formation. Their conclusion was that: "exposing individuals to research-based facts about inherited wealth increases the support for inheritance taxation significantly. The effect appears to be driven by individuals' changing perceptions about inherited wealth and altered views on whether luck and circumstance is considered to matter most for economic success. Overall, we find strong evidence that the common equality of opportunity justification for inheritance taxation plays a key role in understanding the determinants of the support for inheritance taxation". (2019:37) Their emphasis on the political role played by the salience of perceptions suggests that analyses of inequality of opportunity

[42] In the EOP literature, as in the broader literature on economic inequality, the value of in-kind housing services received by homeowners is typically not considered in calculations of income inequality – but an aggregate imputation is part of the calculation of GDP and capital's share therein.

[43] Their overlapping generations life cycle model is calibrated to German data and yields the estimate that ``a one percentage point bequest tax increase leads to an increase in gross earnings of 21.7 cents for each Euro of additional bequest tax payments (and) a labour tax revenue increase of 8.9 cents``(2018:26). In the language of this paper, their model is one of "commoner" behaviour. The top ``billionaire/millionaire`` tail of the wealth distribution is not their focus and they do not address the impact of estate taxes on large inheritances or the intergenerational concentration of wealth and power.

which, like the EOP literature, omit entirely any mention of the inheritance of property may be having, by that omission, an impact on policy attitudes.

In a caveman society the capital stock is not very large and it would be reasonable to ignore the inheritance of capital when discussing equality of opportunity. However, in modern societies, when roughly half of national income accrues to the owners of capital, the fact that the capital stock inevitably outlives its current owners and passes by inheritance to the next generation should not be ignored in analysis of equality of opportunity. To the extent that the capital stock is publicly owned, the benefits of its inheritance are equally received by all citizens – which has always been a key argument for socialism. However, private ownership of the capital stock necessarily implies the inheritance of unequal advantages – which is why inheritance taxation was a central issue in discussions of inequality of opportunity, at least until the recent ascendancy of the EOP approach.

Fortunately, there is an easy fix to these difficulties – relabeling and the avoidance of grandiose language about "fair inequality". It would be straightforward to simply refer to the EOP approach as the EEOP (Equal Earnings Opportunity) approach. Relabelling EOP as EEOP would make it clear that capital income is not being discussed. Avoiding grand claims that "fair inequality" is being measured would leave space for separate discussions about the fairness of labour and capital factor shares and the fairness of the inheritance of property, thereby enabling a clearer discussion of the overall "fairness" of the income distribution.

Relabelling EOP as EEOP is necessary because the aggregate size, and the distributional importance, of capital income mean that it has to be part of any plausible discussion of "fair inequality". But it is not possible, in empirical work, to incorporate the very different circumstances created by the unequal inheritance of property into the current EOP methodology. Reliable data on intergenerational financial transfers is rarely available in surveys of the general population and nonexistent for top wealth holders. Furthermore, the criterion of "fairness" in intergenerational asset transmission is not entirely obvious. Although it is clear that a 100% inheritance tax on all asset transfers would equalize inheritance circumstances, it is not so clear that this would be generally thought to be "fair"[44]. Public attitudes to the transmission between generations of some types of assets, like the family home or family heirlooms and consumer durables, are (quite reasonably) not the same as public attitudes to

[44] It is also not clear that complete elimination of the role of parental background would be thought to be "fair". Hufe, Peichl, Roemer and Ungerer (2017) include among their circumstances characteristics for U.S. children "play with parents" and "schoolwork support from parents". But who would like to live in a society that prohibited <u>any</u> parental influence on the earnings potential of their children (e.g. by reading bedtime stories and thereby encouraging literacy and better school performance)? Although whether or not one's parents did such things is clearly a "circumstance" for each child, which affects children unevenly, is it an "unfair advantage"? If it is legitimate for parents to care about the outcomes of their children and if parents differ in ways that are correlated with measurable characteristics, absolute equality of family background circumstance is a problematic goal.

the inheritance of multi-billion dollar fortunes[45]. The objective of "fairness" probably requires an inheritance tax system that both restricts the emergence of inherited privilege and allows exemptions for small bequests.

"Fairness" in the acquisition of wealth and in capital income also raises complex issues. If hard work and shrewd judgement were all that is necessary to acquire a very large fortune, lots of people would be rich – how does one assess the "fair" return to the good luck of being in the right place at the right time? And how much of wealth acquired is really due to offloading the costs of externalities like pollution onto others or to insider co-operation in financial markets or to the legal regime establishing property rights (e.g. in software) or to restricting the competition that might erode market power? Wealth has also increased because real interest rates have declined significantly over the last twenty years, which has produced an upward revaluation of asset values. What aspects of these changes in wealth holdings are "fair"? Because the "efforts" versus "circumstances" framing of the EOP approach cannot adequately inform the ambiguity and complexity of "fairness" in capital income or the acquisition or intergenerational inheritance of property, relabelling EOP as EEOP would be highly desirable.

4. Genetics and Epigenetics

Some people inherit property from their parents, and some do not, but everyone inherits all their DNA – which is clearly a "circumstance" influencing every individual's life. The crucial questions are: [1] how much does genetic inheritance matter as an influence on life outcomes in contemporary societies? and [2] what are the pathways by which genetic inheritances influence life outcomes? Specifically, if environmental differences can influence genetic endowments, as the epigenetics literature now suggests, then how much of each generation's genetic "circumstances" arises from the prior public policy choices of the society in which they live? As well, if genetic and epigenetic inheritance plays a significant role in the determination of personality, as an emerging literature in psycho-metrics argues, what is left of the concept of "choice" determining the effort part of the "effort" / "circumstances" dichotomy which now underpins the measurement and analysis of inequality of opportunity?

Bio-ethicists have begun to address these issues (see Loi, Del Savio, and Stupka:2013; Huang and King:2017) but recent EOP papers often totally ignore genetic factors – word search for "genetics" often yields zero hits[46]. Estimates of the role played by unequal circumstances in the determination of earnings will clearly be downwardly biased when genetics is ignored as a possible circumstance. Nevertheless, the argument that genetics helps to determine income

[45] Page, Seawright and Lacombe (2019:11) note that the two Koch brothers ($36 Billion each in 2013) and the four Walton children ($33.3 Billion to $35.4 Billion in 2013) are at the top of current U.S. inherited wealth.

[46] Specifically, Brunori, 2016; Brunori, Ferreira and Peragine, 2013; Fleurbaey, Peragine and Ramos (2017) Van de Gaer, Martinez and Schokkaert, 2019;)

distribution has in the past been a part of the larger literature on economic inequality. Taubman (1976:867), for example, analyzed the earnings at age 50 of a sample of 2000 fraternal and identical twins. Partitioning the variance of earnings into genetic, environmental, and family influences, he estimated that 18 to 41% of the variance of earnings was due to genetics.

However, in economics the genetics research agenda fell into disuse. Since twin studies involve a large number of potential variables but only a few observed correlations, the analysis of genetic influences on earnings produces an inherently under-identified system of equations and requires some strong simplifying assumptions. Goldberger's devastating critique [1979:341] substituted a different set of plausible assumptions[47]. Using the same data, he showed that one could get the result that 0% of the variance in incomes was attributable to genetic differences.

Goldberger was not arguing that in fact 0% was the correct number. His point was that the precise size of genetic influences on earnings could not be known with any certainty. His more important point, in many ways, was to question why the influence of genetic factors (an unequal circumstance) on the inequality of earnings might matter. From a policy perspective, as he pointed out, "some genetically based handicaps can be remedied at very low cost while some environmentally based handicaps can only remedied at great cost, if it all." [1979:345]. Genetic inheritance may, for example, produce poor eyesight or hearing which can impede learning and productive work, so unremedied genetic factors may imply lower earnings, but eyeglasses and hearing aids are relatively cheap solutions, which public policy can easily deliver. By contrast, a deprived or abusive early childhood environment may leave physical and/or mental and emotional damage that can only be undone later at great expense, if at all. Goldberger saw no reason to accept that genetic or epigenetic influences on the income distribution are, for public policy purposes, inherently more irremediable or inescapable than other influences. And from a moral perspective, the argument that differences between people ascribable to genetic influences can establish a hierarchy of human worth has long been discredited – the basic starting point for liberal political philosophy is the equal moral worth of all human individuals.

But when Goldberger and Taubman were writing in the 1970s there was general acceptance of a nature/nurture distinction that could at least potentially establish a clean dichotomy of genetic and environmental influences. That hypothesis has been revised over the last 40 years by a new epigenetics research agenda which has established that environmental influences can affect the expression of genes, in ways that can be inherited over several

[47] Goldberger argued, for example, that any variance decomposition of earnings differences between fraternal and identical twins has to make some assumption about the percentage of shared environmental influences, in both instances. Such data are unobservable, and arbitrary assumptions matter significantly.

generations. Debates on the size of genetic influences on the income distribution therefore now have to start from very different premises. Loi, Del Savio and Stupka (2013:142) suggest that three characteristics make epigenetics particularly relevant for study of the inequality of opportunity: "1.Sensitivity to social structures: Some epigenetic phenomena are highly responsive to environmental changes, which are affected by social institutions; 2.Early programing: Several epigenetic traits are established early-on in development, and their effects on health unfold throughout the life course; 3. Trans-generational transmission: … epigenetic traits can be trans-generationally inherited. In addition to genetic inheritance that provides adaptive flexibility in the long (evolutionary) time span, epigenetics constitutes other, semi-stable, biological mechanisms through which features are inherited through generations." In short, as they say (2013:149): "epigenetics forces us to reconsider what counts as the natural/social boundary of equality of opportunity."[48]

Hertzman and Boyce (2010) emphasize that epigenetic influences are only part of the biological embedding of the influence of early childhood environment on the life course. The intergenerational socio-economic gradient in adult health, educational and income attainment trajectories develops from childhood experiences during the critical and sensitive periods when stressors strongly influence early childhood brain development. Social causation is nonlinear, multi-causal and iterative and recursive*,* in the sense of involving repeated, self-amplifying exposures over time[49]. Since early childhood influences develop capacities that are protective in some contexts and risk-augmenting in other contexts, "it is not genes or environment, nor is it genes and environment, but rather it is gene-by-environment interactions that influence developmental trajectories". (2010:341)

When there was a general belief that a clean dichotomy of genetic and environmental influences on inequality was possible, it could be imagined that each generation, or each society, could make their own choices about ``nurture``, given the unchanging influences of ``nature`` from generation to generation. If each generation, or each society, can choose the set of social and economic arrangements it prefers but the next generation, or a different society, always inherits an unchanging distribution of genetic factors, then the appropriate distinction between individual efforts and genetic circumstances is the same over generations and across

[48] "Epigenetics complicates the picture…..: (i) it expands the list of developmentally privileged material that can be passed on at conception from parents to their offspring (e.g. patterns of DNA-methylation); (ii) it suggests that biological inheritance does not happen only at conception by parental donation of developmental material: also environmental clues might program adult traits (i.e. early in development or in utero) and their intergenerational similarities, i.e. if parents and their offspring share the developmental environment; (iii) it suggests that biological inheritance is reversible through environmental clues and thus influenced by social structure." (2013:)

[49] An implication is that the linear regression specification of separable circumstance and effort characteristics embodied in Equation 2B is a massive mis-specification of earnings determinants.

societies. But epigenetics now forces the realization that in choosing social arrangements for this generation, each society affects genetically the choices available for future generations.

An example of current public policy choices which affect the stress levels of young families, and thereby affect epigenetic inheritance, is the set of public policy choices determining whether a society has inadequate and expensive daycare systems, minimal social assistance benefits and labour markets which offer precarious, low wage work with minimal unemployment benefits to young parents. In this context, some young families may luck out in their daycare and in their jobs, but others do not. Creating an unequally high-stress environment implies unequal child development[50], life course and epigenetic effects. Historically, slavery in the U.S. and the residential school systems for indigenous people in Canada and Australia were public policy choices that exposed black people and indigenous people in those societies to extreme stress, repeated over generations. Because these unequal stress levels condition the epigenetic influences passed on through the generations, both currently and historically, public policy choices have shaped, and continue to shape, the distribution of genetic circumstances available to future generations. Since, in the early 21st century, rich societies differ dramatically in their current public policy choices affecting young families and in their past public policy choices affecting racialized minorities, the influence of unequal genetic circumstances on the inequality of earnings also differs across countries.

Discussion of such epigenetic processes and "environmental" influences on the multi-generational inheritance of genotype would not be very important if genetics were unimportant as an influence on individual choices/efforts and outcomes. However, a large literature in psychology now emphasizes the importance of genetic determination of personality, physical traits, disease susceptibility, I.Q. and much else. The literature on personality formation is particularly relevant for the concept of "effort" and the assignment of moral responsibility for outcomes[51]. In the psychology literature, confidence in the importance of genetic influences runs high. In a *Nature* article, Polderman et al (2015) reported on "a meta-analysis of twin correlations and reported variance components for 17,804 traits from 2,748 publications including 14,558,903 partly dependent twin pairs, virtually all published

[50] Aizer, Stroud, and Buka (2016) document the impact of short-term maternal stress on cortisol levels in utero and their later implications for child development.

[51] In this literature, surveys ask respondents a series of questions intended to elicit attitudes or behaviors (e.g. whether respondents agree/disagree, strongly or not, that they "like to plan ahead before going on a trip", "like showy styles", "enjoy taking roller coaster rides", "enjoy sporting events" or "enjoy trying different foods"). Factor analysis is typically the statistical methodology which is then used to collapse a large number of response items to scores on a few key personality traits – the "Five Factor Model (Openness to experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism, often represented by the acronym OCEAN, appears now to be the dominant perspective. "Traits" further differentiate into "Facets" and "Nuances" (Mottus et al:2016). See also Cunha and Heckman (2009)

twin studies of complex traits. Estimates of heritability cluster strongly within functional domains, and across all traits the reported heritability is 49%."[52].

Whether or not one agrees with the empirical and statistical methods used by psychometricians and the specific estimates of the quantitative importance of genetic influences that these methods produce, their basic point is that genetic inheritance plays a non-trivial role in the determination of personality. Even if one disagrees that the role of genetic inheritance can be known with any exactitude or disagrees with the specific finding that genetic influences can explain 49% of trait variation, one can still agree that genetic influences on personality are unlikely to be zero and may even be "significant" empirically. And while economists may prefer to say that individuals differ in "preferences" while psychologists discuss differences in "personality", these are disciplinary differences in terminology, not substance. Whatever their label, these traits – at least partly due to genetic circumstance – drive the decisions and behaviours which indicate "effort"[53]. The EOP approach relies on the hypothesis that "efforts" and "circumstances" can be cleanly distinguished, so that moral responsibility can be assigned to the former, while compensation is due for the latter. However, when genetic "circumstance" traits partially determine the personality traits which determine "effort", the dichotomy becomes very murky. And the since epigenetic influence on genetic inheritance varies is affected by public policy choices, it varies across countries and over time.

One implication for the EEOP literature is that the fairness case for Ex Post Opportunity Equality[54] - that people who "exert the same efforts have the same outcome" – collapses if effort is measured directly[55]. A second implication is that cross-country comparisons of

[52] Assessment of the importance of genetic influences is commonly done by computing the variance and correlation of attribute scores, comparing identical (monozygotic), fraternal (dizygotic) twins and siblings using an additive model of genetic and environmental influences. Evidently, Goldberger's 1979 critique of the unverifiable assumptions involved in twin studies has had little influence in psychology. Goldberger was also considering the decomposition of genetic and environmental influences on annual earnings, a dependent variable which is at least a cardinal number, unlike the ordinal scales involved in measurement of personality traits. Since any monotonic transformation of an ordinal scale will be equally consistent with the underlying item responses, calculated correlations and variances of personality trait scores depend crucially on the scaling chosen – which is entirely arbitrary. Osberg (2000) has discussed the limited inferences possible with ordinal data (in the context of literacy measurement) but the psychologists are unimpeded by any such niceties.

[53] Preferences for risk, time preference (a.k.a. gratification deferral) or leisure preference are particularly important.

[54] Fleurbaey, Peragine, and Ramos distinguish between the Ex Ante and Ex Post approaches to measuring opportunity inequality and define the Ex Post criterion as: "There is EOP (equality of opportunity) if all those who exert the same efforts have the same outcome. Inequality of opportunity decreases if the outcome inequality decreases among the individuals at the same degree of effort." (2017:582)

[55] Alternatively, as Roemer (1998:15) originally suggested, "equal effort" can be interpreted as being at equal centiles of the distribution of effort within circumstances types or the EOP (or the EEOP) approach can focus on Ex Ante Opportunity Equality. Fleurbaey, Peragrine and Ramos (2017:582)

inequality of opportunity become dubious, if it is accepted that the influence of an omitted circumstances variable (genetic and epigenetic inheritance) is empirically important and varies across countries.

5. Relative or Absolute Traits?

In the EOP literature, when measures of inequality of opportunity are compared across countries, the presumption is that one can compare inequalities of opportunity without reference to inequalities of outcome and that reducing inequality of opportunity would produce a "better" social outcome. In that literature, the outcome of interest y_i Is written as a function of the effort and circumstances characteristics of individuals as in equation [1]:

[1] $y_i = g(c_i, e_i)$.

Reducing the inequality of opportunity is thus interpreted to mean reducing the importance of unfair circumstances characteristics in the determination of individual earnings. But what, if anything, might this imply for the distribution of income and of well-being? The answer depends on <u>why</u> earnings are determined by characteristics. Specifically, the impacts on the distribution of income and well-being of a declining importance of circumstances characteristics depend on whether (c_i, e_i) are the productive characteristics or the ranking characteristics of individuals.

"Productive characteristics" can be defined as the traits of each individual which should be measured as absolute magnitudes, independent of the traits of any other individual, because they directly produce advantages, such as more market income. When the returns to characteristics do not depend on the traits of other individuals, competition among individuals for relative advantage is not an issue. Although non-human wealth and bequests of property are ignored in the EOP approach, the dollar value of wealth owned is a clear example of a characteristic that is "productive" for income. The buying and selling of non-human wealth in financial markets establishes a market rate of return to each asset type and when each person's ownership of property is determined independently of every other person's, the capital income from each person's portfolio is independent of that of other portfolios.

"Ranking characteristics" can be defined as those characteristics which establish an individual's rank in the distribution of each specific trait. Rank is important when rewards, such

as income or power or status, are attached to positions (i.e. jobs)[56] and relative rank determines access to more advantaged positions. Roemer (1998:1) begins by discussing "pools of candidates competing for positions". Arguably, when the EOP literature refers to "the unfair inequalities that are … due to exogenous circumstances (such as race, gender, parental background)[57]", this is intended to mean that these are ranking characteristics – that individuals with differing race, gender and parental background characteristics have similar productivity potential but receive differing ranks in the queue for desirable positions, and have to accept less desirable jobs, with the result that female, non-white or lower socio-economic background people get lower wages. Presumably the intended meaning is **not** that people who are female, non-white or disadvantaged are of inherently inferior productivity – i.e. that white, upper class males make more money because they are more productive.

The human capital school of labour economics, however, starts from the assumption that wages are the labour market returns to the productive characteristics of individuals[58]. Each individual is seen as possessing a portfolio of skills and their earnings capacity is determined by their bundle of skills and the market rates of return on each of those skills. No mention of "jobs" or "positions" is necessary, since the crucial issue is the bundle of productive skills of each individual. Education, in this view, is "human capital"[59]. In Chapter 9, Roemer (1998) shifts to this perspective, in which markets for human capital and physical capital operate in essentially similar ways. One can call this the MPL world, in which traits should be measured in an absolute sense because each individual's wage is determined causally by the marginal product of their labour, which is determined by their individual portfolio of characteristics, independent of the characteristics of other individuals. Since in the MPL world earnings are entirely determined by the supply side characteristics of individuals, there can be no scarcity of "good jobs" or desirable positions and thus there is no competition among individuals for them and no positional externalities. No discussion of the hierarchy of "jobs" or "positions" is necessary, or even possible.

[56] Rawls (1982:162) also had this perspective when he argued: "Social and economic inequalities are to satisfy two conditions: they must be (a) to the greatest benefit of the least advantaged members of society and (b) attached to offices and opportunities open to all under conditions of fair equality of opportunity" (he went on to say that "part (b) has priority over part (a)").

[57] Fleurbaey, Peragine, and Ramos (2017:578)

[58] A necessary technological assumption is that firms can know the marginal product of labour of individual workers. Labour markets are assumed to be sufficiently competitive that individuals' wages are in equilibrium equal to their marginal product.

[59] Roemer (1998:56) calls this the "wage production function".

However, do labour markets actually function in this manner? Within labour economics, the "institutionalist" perspective has long argued[60] that wages and other advantages are attached to jobs, as Roemer (1998: Chapter 1) started by assuming. One can call this perspective the JOB world, in which labour markets are all about the competition among individuals for more desirable jobs, with higher ranked individuals getting the better jobs. When advantages are attached to positions and a job hierarchy exists, positional externalities are inescapable, since any increase in one individual's probability of getting a particular job necessarily implies a decrease in the probabilities of everyone else. In the JOB world, education functions, for example, primarily as a relative credential which is needed to compete in the job market and get better jobs. Because individuals are competing with each other for better jobs, *relative* effort also matters – i.e. it is harder-working people who get the promotions and make more money.

This "demand side" perspective argues that technology and social institutions together define, at each point in time, a hierarchy of socially desirable positions (i.e. jobs) and the relative wages associated with each, which determine the distribution of earnings $f(y_L)$[61]. Technological change (e.g. robotics or artificial intelligence) and institutional change (e.g. in unionization or minimum wages) and product market changes (e.g. globalization) imply that the distribution of available jobs and of earnings changes over time. Firms, especially large ones, have to decide whether to exploit any available monopsony power in their wage setting policies and individuals have to choose their optimal job search strategy and reservation wage. However, the bottom line is that at any point in time, individuals who want to get a good job have to compete for their place in the job queue – e.g. by acquiring more education, or working harder, than their peers. In the JOB world, getting a good job is always a competitive process, which depends on an individual's ranks in the distributions of traits. When wages are attached to jobs, relative ranking determines income because an individual's overall rank in the queue for desirable jobs is a weighted average of their ranks in the distributions of specific traits - which implies that individual traits should be measured in relative terms.

Although both Chapter 1 of Roemer (1998) and the introductory verbal framing of much of the current EOP literature on circumstances like race or gender are most consistent with these being ranking characteristics, the mathematics of the EOP approach and Chapters 9 to 11

[60] For an early statement, see Doeringer and Piore (1971). In this perspective, team production is the norm so firms cannot know the marginal product of labour of individual workers. Social norms and workplace institutions set relative individual wages within teams while the available technology defines job requirements and product market competition constrains the aggregate wage bill.

[61] The institutionalist perspective on labour markets has not usually directly discussed trends in the average real wage and the relative shares of capital and labour in GDP, but it is consistent with both being determined by trends in aggregate demand and supply in capital and labour markets.

of Roemer (1998) live firmly in the MPL world, in which each individual's characteristics are measured independently and this is appropriate because these are productive characteristics (i.e. "earnings capacity"). Equation 1 defined the relationship between outcomes, circumstances and efforts very generally, but equation 1A is a illustrative linear simplification of an MPL world in which earnings are determined by circumstance traits [c_1 c_2] and effort traits [e_1 e_2].

[1] $y_i = g(c_i, e_i)$.

[1A] $y_i = a_0 + a_1c_{1i} + a_2c_{2i} + b_1e_{1i} + b_2e_{2i}$

In the MPL world, as Equation 1B illustrates, the earnings of an individual establish their rank (R_i) in the earnings distribution conditional on the earnings of all other individuals ($Y_{Lj\neq i}$) remaining unchanged. However, rank is not an important concept for the MPL approach.

[1B] $y_{Li} | Y_{Lj\neq i} \Rightarrow R_i$

In the MPL world, traits should be measured in an absolute sense and earnings are determined causally by the absolute levels of traits of individuals. Hence, at the margin the individual's returns to changes in efforts e_1 and e_2 are thought to be, respectively, b_1 and b_2 – as would be the case in a labour market with infinitely elastic demand for labour hours or education. In the MPL world, if circumstance c_1 were a characteristic that negatively affects earnings (e.g. $a_1 < 0$ and c_1 = female gender), then removing the impact of gender ($a_1 \rightarrow 0$) would be thought to increase the wages of people with that negative characteristic (i.e. all women) without affecting the wages of anyone else. Eliminating an unfair gender disadvantage would thus imply that both equality of outcome and of opportunity would be improved – i.e. reducing discrimination and improving gender equality of opportunity produces unambiguous gains in fairness, in average earnings and in earnings equality.

However, in a MPL world, the implications of ending an unfairness (like gender discrimination) depend crucially on whether it is framed as an unfair disadvantage to women or an unfair advantage to men. Framing gender discrimination as a circumstance trait c_1 that negatively affects female earnings is logically almost equivalent to defining circumstance trait c_1 as positively affecting male earnings (i.e. an unfair advantage: $a_1 > 0$ and $c_1 = 1$ if male, $= 0$ otherwise – in a binary gender world, both framings would be exactly equivalent logically). Econometrically, the only difference is whether a_1 is estimated to have a positive or negative sign. But if the ending of an unfair advantage ($a_1 \rightarrow 0$) implies levelling down of male earnings, greater equality of opportunity would imply lower average earnings, as well as greater equality of earnings. Perhaps because the focus of the EOP literature is solely on distinguishing between

fair and unfair *inequality*, it never[62] discusses whether the impact of hypothetical equalization of income across circumstance types is to level down or up, so the impact on average incomes is never specified – which necessarily leaves the impact on well-being unclear.

In a JOB world, by contrast, earnings inequality and average earnings are unchanged when $a_1 \rightarrow 0$ (since $f(Y_L)$ is unchanged and the ending of discrimination just means a reshuffling of the job queue). In a JOB world, it is the relative rank of an individual in the overall distributions of circumstances and efforts which matters[63]. Equations [1C] and [1D] illustrate the idea that R_i is an individual's overall rank or place in the queue for desirable positions, which is a weighted average of their ranks in the distributions of particular circumstance and effort traits as given by $[cr_1, cr_2, er_1, er_2]$ where the weighting on each trait rank is given by $[a_1, a_2, b_1, b_2]$.

[1C] $R_i = a_1 cr_{1i} + a_2 cr_{2i} + b_1 er_{1i} + b_2 er_{2i}$

[1D] $R_i \Rightarrow y_i$ where $y_i \in f(Y_L)$.

In the real world, the joint event of individuals with specific characteristics working in specific jobs is observed. At any point in time, because the absolute level of an individual's trait also determines their relative level of that trait, a linear earnings regression summarizing an empirical relationship such as that of equation 1A is equally compatible with both the MPL and the JOB worlds. However, the interpretation of an empirical relationship like the linear earnings regression [1A] differs profoundly.

In the JOB world, if a circumstance trait (such as cr_1) loses significance because discrimination ends ($a_1 \rightarrow 0$), it does not matter whether gender discrimination is framed as male advantage or female disadvantage, since the distribution of earnings is given by $f(y_L)$. However, to achieve a given overall rank R^*_i, when an individuals' rank in trait cr_1 no longer matters, other trait ranks $[cr_2, er_1, er_2]$ now have to matter more.

[1E] if $R_i = R^*_i$, $\quad \Delta a_1 = - \Delta [a_2 + b_1 + b_2]$

One possibility is that other circumstance traits simply expand in impact to fill the void left by the demise of cr_1. Section 1 suggested an example in which the top executives of the

[62] At least in the papers listed in the bibliography to this paper.

[63] For example, when it is the harder-working people who get the top job, one gets promoted by working 42 hours a week when coworkers are only doing 40 hours, but that effort does not produce a promotion if coworkers are putting in 45 hours.

1950s were half the sons of top executives and half the sons of workers, but in the 2020s top executives are the sons and the daughters of top executives (i.e. classism + sexism → classism). In the 2020s JOB world, gender discrimination has ended but the overall inequality of individual earnings does not change. However, even if the issue is individual, and not family, earnings, it is not obvious whether equality of opportunity increases or decreases when one type of circumstance replaces another type of circumstance in importance.

More generally, as equation 1E illustrates, the declining importance of a circumstance trait in establishing each particular ranking means that the importance of other traits must change – i.e. if $a_1 \rightarrow 0$, effort traits partially or wholly replace trait cr_1 in importance and the returns to effort (b_1 and b_2) increase in size. When effort becomes more important to life outcomes, the incentives facing individuals to supply effort increase. In a MPL world, the well-being implications of increased effort by any individual are unproblematic, because there is no competition between individuals for scarce positions and there are no positional externalities. If so, an effort increase by any person i does not affect the return to effort of any other individual j. But in a JOB world, desirable positions are scarce, and individuals compete for the better jobs by trying to supply more effort *than their coworkers*.

In the labour economics literature on promotion, Bell and Freeman (2001) argued that the greater annual labour supply of American workers (compared to Europeans) can be explained by the greater inequality of U.S. wages. They pointed out that the return to work hours is not just an individual's current wage, but also any change in their future probability of promotion or future higher wage - i.e. the marginal hourly "wage" is the derivative of their expected lifetime earnings stream with respect to greater current hours/effort. The payoff to promotion is greater when wage differentials are greater, so they argue that Americans have more incentives than Europeans to work harder to gain promotion. However, when many workers compete for one promotion, any one individual's increased probability of promotion due to their greater individual labour supply in response to individual market incentives imposes negative positional externalities on their co-workers, whose probability of promotion declines. In a "rat race" labour market, the labour supply which is individually ex ante rational for each worker will over-supply aggregate work effort (from workers' point of view), in the sense that unsuccessful co-worker competitors are disappointed, and ex post regret the extra effort they supplied[64].

[64] Cain Miller (2019) argues that when getting the highest paying jobs requires working long hours, but couples also have childcare responsibilities, it is usually the woman who reduces their paid workhours in order to cope. Particularly in law, medicine, accounting, IT and finance – the time greedy professions that dominate the labour income component of top 1% incomes – this gender dimension to hours competitions thereby reproducing male preponderance of top pay percentiles and offsetting the gender equalization of educational credentials. Overall, "the rise (and later, partial retreat) in the share of Americans who work long hours had the net effect of increasing the gender wage gap (especially among parents) the motherhood wage penalty, and the fatherhood wage

An equilibrium in which labour is "over-supplied" is preferred by capitalists because factor returns shift towards capital. Market output (GDP) increases, but because GDP accounting includes no allowance for the value of foregone leisure time[65] and, ex post, unsuccessful competitors regret their added effort, aggregate worker well-being declines. From the point of view of workers, the new equilibrium is inferior to equilibria in which co-ordination devices (such as unions or public holidays) restrain competition in hours of labour supply. Hence, in a JOB world of ranking characteristics, when equality of opportunity increases and circumstance characteristics decline in importance, increased ranking competition in relative effort implies the inequality of money earnings remains the same, but average worker well-being and labour's share of total output decline, because labour supply increases and average wages decline.

Milanovic has also raised the intriguing point that in the long run, the absolute level of effort that is possible may have a maximum. Although relative effort may be what matters for individual advancement, as people respond to the incentives of the rat race and try to outdo each other, effort supply eventually may hit an upper bound[66]. Societies in which many people approach those upper bounds will still have to allocate their top positions somehow. Milanovic suggests that as real differentials in credentials of skill and ability shrink: "Chance and family background will play much more of a role than ever before." (2015:215).

In a JOB world of ranking characteristics, for every person going up in the income distribution there is always somebody else going down. However, in reading the literature on equality of opportunity, it is striking how consistently the empirical examples and anecdotes suggested are restricted to the "going up" good news stories about increasing equality of opportunity ending unfair disadvantages. Left unmentioned are the "going down" stories when unfair advantages are ended. The anecdotes about mobility that authors (e.g. Leigh, 2013) use invariably focus on examples such as women of colour who rise from homelessness to mansions – but the previously advantaged (e.g. white men) who make the reverse journey to homelessness are unmentioned. However, if there are a fixed number of top slots, some of which now have new occupants, downward mobility for some is the inescapable corollary of upward mobility for others. Although both journeys are logically equivalent ways of describing greater equality of opportunity, in just the same manner as descriptions of a glass as half-full or

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premium" Weeden, Cha, and Bucca (2016:88). In addition to better odds of promotion, long hour jobs in the U.S. now also have higher current average hourly wages.

[65] An additional externality of labour over-supply is the reduced utility value of non-work time. Since the enjoyment of social leisure with others depends on one's potential leisure partners having free time, at the same time, a general increase in labour supply makes co-ordination of leisure time availability more difficult. As busier people have fewer friends, the marginal utility of leisure time declines. See Merz and Osberg (2009), Osberg and Jenkins (2005).

[66] Can rewarding by promotion those who work harder ever produce annual labour supply exceeding approximately 4200 hours (12 hours a day for 350 days a year)?

as half-empty are logically equivalent statements, behavioural economists such as Kahneman (2011) have emphasized that in practice the "framing" of issues matters a lot for attitude formation. "Equal Opportunity" sounds much nicer as a social objective when it is framed as equality of opportunity to live in a mansion rather than as equality of opportunity to be homeless – but unless there is some change in the distribution of income [i.e. if f(y)] is unchanged] both are equally implied.

In economics, the Social Welfare Function tradition has long argued (e.g. Lambert, 1989) that total societal well-being depends on the total utility derived from consumption, with the proviso that if a society is inequality averse, greater weight should be assigned to the utility of the less well-off. In that literature, it has always been a basic axiom that all people should get counted. This implies that in calculating the social welfare implications of increased equality of opportunity (i.e. $a_1 \rightarrow 0$), both the "winners" and the "losers" should be considered. If the distribution of income [i.e. f(y)] is completely unchanged, and if everyone is counted, income gains are matched by income losses, so greater EEOP has no impact, positive or negative, on total consumption utility[67]. If opportunity becoming more equal means that more people run harder after the same distribution of prizes, positions in the job queue are reshuffled and labour supply increases but the inequality of earnings is unchanged. If rising labour supply also implies that the average wage and labour's share of total income falls, changes in aggregate Social Welfare depend on the net difference between the improved well-being of capitalists and the decreased well-being of workers.

The EOP literature is often framed very broadly, as concerning social advantages and disadvantages in general. That generality has been accompanied by omission of any explicit discussion of how labour markets work. Although the mathematics of the current EOP approach have been firmly in the "human capital" / "earnings capacity" tradition (which this essay has described as the MPL world), the verbal context has emphasized "a level playing field" in the competition for desirable positions – i.e. the EOP literature implicitly bounces back and forth between the MPL and JOB worlds.

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[67] Assuming away differences in tastes and loss-aversion in the sense also discussed by Kahneman (2011). As well, a neo-classical social welfare function assumes that snobbery and envy do not exist because individuals do not care about relative consumption. The social welfare functional is then defined over the vector $\boldsymbol{u}$ of all individual utilities [i.e. SWF = swf($\boldsymbol{u}$)] assuming that individual utility (u_i) depends on individual own consumption C_i [i.e. $u_i = u(C_i)$]. To integrate this outcome-oriented SWF approach with the process-orientation of Roemer (1998) and EOP, one could assume that individuals also care about process equity. For example, suppose that individual utility depends on F (some measure of "Fairness" in society as a whole) – i.e. $u_i = u(C_i, F)$. Suppose further that summative conceptions of "Fairness" depend in turn on a vector of fairness outcomes. Process equity, like equality of opportunity in earnings determination (EEOP) can be seen as one element in that vector of fairness considerations – Section 3 has argued that capital/labour shares and wealth inheritance are others. If their well-being gain from increased societal fairness $\Omega_i = \partial(u_i)/\partial(EEOP)$ is big enough [i.e. $\Omega_i > -\partial(u)/\partial(C_i)$], the losers of unfair advantages in earnings feel so good about it that their warm glow from knowing discrimination has ended outweighs their personal loss of consumption utility. Normatively, this would be desirable. Positively, one can wonder how often it occurs.

This paper argues that the welfare implications of greater equality of earnings opportunities depend directly on the changes it may or may not imply for greater equality of outcomes – i.e. its impacts on the size distribution of income. It has used the MPL and JOB worlds as polar alternative models of the labour market in order to make the point that the reason why individual characteristics matter for individual earnings (i.e. how the labour market actually works) matters crucially for interpretation of the welfare implications of greater equality of opportunity. The real world is clearly neither wholly the MPL world nor the JOB world, but it matters which model is more nearly true.

The predictions of the MPL model depend greatly on whether greater equality of opportunity is the ending of unfair advantages (i.e. levelling down) or the ending of unfair disadvantages (i.e. levelling up). As well, non-marginal changes in labour supply are involved, so the elasticity of labour demand for specific productive traits is crucial. In the most optimistic MPL scenario, earnings are always levelled up and more EEOP produces higher average incomes, more efficiency and more growth. If the distribution of income shifts up, as well as becoming more equal, any EEOP losers could potentially be compensated by EEOP winners. In this Pareto-superior outcome, social welfare improves. But one has to stress that this is because the distribution of income has changed – the well-being improvement caused by greater equality of opportunity depends on whether it has sufficiently large positive impacts on the level and equality of outcomes[68].

The JOB world model is starker, because to the extent that it is approximately accurate, the "winners" due to more equal opportunities who go up the income hierarchy replace "losers" who go down. In this scenario, changes in measured EEOP cannot be expected to produce more equality in the distribution of earnings [i.e. $f(Y_L)$]. Indeed, if more people just run harder after the same distribution of prizes, increased labour supply may shift factor shares against labour.

However, although increasing equality of opportunity operates very differently in these different models of labour market processes, there is in fact a common theme, that the social welfare implications of greater equality of opportunity are inextricably dependent on any associated changes in the distribution of income – as Roemer (1998:90) in fact anticipated when he argued: "neither the scope nor the extent of the EOP policy is deducible without a theory of distributive justice for the community."

[68]Potential, not actual, compensation for "losers" from EEOP is the relevant criterion for considering the welfare impacts of ending unfair discrimination. A less optimistic MPL scenario, in which greater EEOP produces lower average incomes and potential compensation is unfeasible, might still increase social welfare if the Social Welfare Function is inequality averse and income inequality decreases sufficiently. The key point, however, remains – that the net well-being gains from greater equality of opportunity depend on the size of associated changes in inequality of outcomes.

6. Parental Income and Intergenerational Mobility

Intergenerational income mobility is about comparisons over time of the incomes of different generations of individuals within the same family lines. A particularly salient comparison for many people is whether they are doing better in income terms than their parents were doing at the same age, either in the relative sense of having a higher rank in the income distribution or in the absolute sense of having a higher real income. Interest in absolute income mobility has been heightened by findings like those of Chetty et al (2016) who used linked income tax records and found that in the United States the fraction of children whose annual income[69] at age thirty was more than that of their parents at the same age has fallen dramatically. Although 90 per cent of Americans born in 1940 had a real income in 1970 at age thirty that was greater than their parents, only 50 per cent of the cohort borne in 1980 had higher annual incomes in 2010 than their parents at the same age. The stagnation of middle class income growth has meant that absolute income mobility has become basically a coin toss. Most (70%) of this decline in absolute mobility was due to the increased inequality of income growth rates. The overall economy's rate of income growth, and the inequality of income growth rates at each percentile of the income distribution, are thus central to any individual's chances of having a higher absolute income than their parents. But although these issues may also be central to public discontent with income inequality in rich countries, growth theory is well outside the EOP literature.

The EOP literature therefore emphasizes the determination of relative individual earnings. It has done so within a single generation framework, in the sense that parental background is seen as a circumstance which may affect the income of the current generation of adults but no impact of any change in the earnings of the current generation on their children's and grandchildren's generations is considered. If more equal opportunities increased the incomes of some families (and perhaps decreased the incomes of others), presumably the children in those families would be affected, with follow-on impacts on the grandchildren, but such impacts on future generations are not mentioned. In this single generation approach, the EOP discussion is similar to the early Human Capital approach (e.g. Mincer (1974)) which focussed on models of earnings determination within a single generation. In that early literature, inequality of opportunity was defined in terms of the differing costs of borrowing faced by individuals for their investments in human capital. Those unequal human capital investments determined unequal individual earnings, but the analysis stopped there. As in the EOP literature, there was no mention of what is done with higher incomes – i.e. no discussion of bequest behaviour and its impacts on subsequent generations.

[69] Household pre-tax income, after adjustment for inflation.

However, in a seminal contribution Becker and Tomes (1979) broadened the human capital perspective to include multiple generations by modelling the choices of altruistic parents about how much of their own lifetime incomes to spend on the financial bequest and the human capital which they pass on to their children. Because those financial and human capital inheritances help determine the lifetime incomes which will finance the bequests passed on by the children to the grandchildren, who in turn will make bequest decisions which transfer resources to the great-grandchildren, the Becker-Tomes model linked the choices and constraints facing individuals in different generations of family lines and thereby sought to explain the correlation of incomes across different generations of family lines.

From the point of view of the children who comprise any given birth cohort of individuals, heritability of family endowments implies the inheritance of unequal opportunities. Becker and Tomes explicitly included in their concept of endowments "genetically determined race, ability and other characteristics" (1979:1153) as well as financial bequests and human capital in education and training. Those attributes are assumed (as per the MPL model) to earn specific rates of return, and not to be criteria which rank individuals.[70] In the Becker-Tomes model, endowment luck through random variations in inherent ability and market luck in rates of return on endowments imply some intergenerational mobility. Indeed, regression to the mean implies that, if one waits for enough generations, a run of good luck in rates of return within a family dynasty will eventually be followed by a run of bad luck, so in the very long-run all family lines have equal income expectations – a conclusion which is little consolation to the children of poor parents in any given generation.

The Becker-Tomes model shows how, in a market economy, the inequality of opportunity facing each generation depends directly on the inequality of outcomes in their parents' generation. A key insight was that money matters. Because the income constraints and the bequest decisions of parents link the fortunes of successive generations within family lineages, greater equality of opportunity requires greater equality of incomes. Their emphasis on the importance of parental income contrasts with the EOP literature, which restricts attention to parental characteristics such as race, education or occupation and assumes by omission that the distribution of parental incomes is inconsequential, which in turn implies that transfer payments are not seen as a potentially useful policy tool to reduce inequality of opportunity. In the Becker-Tomes model, the life chances of children depend on the parental household's income, as well as on race, ethnicity and other ascriptive characteristics, implying

[70] Although a productivity related labour market return to "ability" is plausible (indeed tautological, when "ability" is implicitly defined as "ability to make money"), the same cannot be said for race. Becker and Tomes did not even mention gender.

that transfer payments to poor households can lessen the disadvantages of poor children and thereby increase equality of opportunity[71].

In other work, Becker also noted how if some families were at a "corner solution", without enough resources to invest in the human capital of their children, public schools have the potential to improve both efficiency and equality of opportunity. However, his approach is always firmly in the MPL world. In such a world, parents individually decide how much to invest in their children's human capital with no constraint other than the family budget and no impact on the fortunes of other families. For example, because in a MPL world there is no competition among families for scarce positions, all the parents who decide that they can afford to pay Harvard tuition can get their children into Harvard. In such a world there are no rankings of individuals and no positional externalities, so the taxes paid by high income families which help finance good public schools will increase the human capital and the life chances of the children of poor parents, without any adverse impact on the life chances of the children of rich parents.

But in a JOB world, top positions are scarce, so families who are now at the top of the income distribution have nowhere to go but down. In a JOB world, adequate funding for public schools, and any other policies which increase equality of opportunity across income classes, enable the children of poor parents to compete more effectively for top positions, which lessens the chances that the children of the elite will get those jobs and retain elite status. Although the affluent are, of course, always rhetorically supportive[72] of equality of opportunity, the self-interest of elite families lies in staying at the top.

In the real world, there is no "veil of ignorance" which prevents individual families from guessing how particular policies would affect them personally. The self-interest of top 0.1% families is unambiguously for greater equality of opportunity *for everyone else* – i.e. zero intergenerational mobility for themselves combined with complete equality of opportunity in intergenerational mobility among the 99.9%[73]. For the top 0.1%, who depend particularly on

[71] Chen, Osberg and Phipps (2015, 2019) establish the causal role of higher transfer payments in improving the high school performance and college attendance of the children of disabled parents in Canada.

[72] Rhetorical support is widespread partly because talk is cheap, partly because it legitimates the status of current elite members and partly because policy initiatives which may improve equality of opportunity (like improved primary schools) have impacts that will not be observed for decades.

[73] Using the EOP literature's ratio measures of "inequality of opportunity" (as summarized either by the Gini or the Mean Log Deviation) complete equality of opportunity among the 99.9% and complete intergenerational immobility for the top 0.1% would add up to an improvement in measured "equality of opportunity", compared to present day intergenerational mobility patterns (for the top 0.1%, going from current levels of income immobility to complete immobility would not be much change, while for the 99.9% it would be a large increase in intergenerational mobility, for 99.9% of the population, to go from current levels of income immobility to complete mobility). With these changes, society would also more closely resemble 18th century France, before the revolution.

inheritance and capital income, any tendency of greater equality of earnings opportunity among commoners to increase aggregate labour supply and shift factor shares in favour of capital would be a welcome development. More generally, their interest lies in minimizing the impact of taxation on intergenerational wealth transfers and annual capital income flows. To the extent that the taxation of inheritances and capital income can be dropped from the inequality debate and slipped off the political radar, quiet changes to tax law and tax administration to enhance tax avoidance and tax evasion possibilities has been, in many nations, an effective strategy. Nonetheless, the U.S. has shown, in the Tax Cuts and Jobs Act of 2017, that more cuts in top tax rates are also possible.

However, greater equality of opportunity only has unambiguous self-interest impacts at the extremes of the income distribution. Although, for example, the lower ranks of top 1% and top 5% families might aspire to upward mobility and penetration into the top 0.1%, the maintenance of their current status depends on avoiding downward mobility. Greater intergenerational mobility thus has both potential costs and potential benefits. For the 95^{th} to 99.9^{th} families, intergenerational persistence of labour earnings is crucial – the balance of their self-interest shifts from safeguarding the inheritance of financial wealth, by preventing estate taxation, to ensuring the transmission of human capital, by maintaining a differential in the school quality available to their own children. Further down the income distribution, greater equality of earnings opportunity for families now in the middle would mean that their children could go up more easily (a benefit) but could also go down more easily (a hazard) – their perception of self-interest depends on their risk aversion, on just where in the distribution of middle class advantages they sit, on how much they may now benefit or lose from unfair employment (dis)advantages and on whether greater equality of earnings opportunity actually also produces more growth and greater equality of incomes.

Self-interest is clear for families who are now at the very bottom of the income distribution, since they have nowhere to go but up, and can only gain from greater equality of earnings opportunity. However, the social welfare implications of their upward mobility depend on whether the distribution of income remains the same. If currently poor families just trade places with other families who become the new inhabitants of the bottom rungs of an unchanged distribution of income, any social welfare function (even a Rawlsian one) will be unchanged.

7. Conclusion

How much of current income inequality is "fair"?

If "fairness" improved, would social well-being also increase?

Could one expect more "fairness" to reduce discontent with the distribution of income?

This paper has asked whether improvement in the measures of "fairness" of the income distribution proposed by the Equality of Opportunity (EOP) literature might conceivably mitigate some of the discontent with income inequality now evident in many societies. More specifically, it has asked whether a decline in the importance of unfair circumstances in the determination of individual earnings could be expected to improve social welfare and decrease discontent. The political importance of the issue has been underlined by the EBRD (2017): "Unequal access to opportunities may .. lead to a loss of confidence in the key economic and political institutions that underpin society and the market-based economic system as a whole."

As an empirical matter, the measures of inequality of opportunity proposed by the EOP literature appear to correspond weakly with public perceptions. Brunori (2017) has used micro-data from a large sample of respondents to the International Social Survey Program (ISSP) to compare subjective perceptions of inequality of opportunity with the objective measures suggested by the EOP literature, finding only a "weak correlation". His estimates suggest that "the two most adopted measures of inequality of opportunity have no clear role in explaining its perception." (2017:464). However, this weakness of correlation could be ascribed either to the public's inability to understand objective reality or to conceptual problems underlying the empirical measurements proposed in the current EOP literature. Which explanation is more plausible?

This paper began in section 1 by outlining the EOP approach, which categorizes the characteristics of individuals as indicating either the efforts that they have made to earn income or the circumstances which have constrained their efforts – a distinction which is then used to estimate the fraction of existing inequality considered "fair". Section 2 emphasized, as others have already done, that the ubiquity of chance and the ambiguity of determination of many characteristics imply that EOP estimates can at best provide a lower bound estimate of the role which inequality of opportunity plays in determining totally inequality.

The empirical EOP literature addresses systemic issues like the influence of race or gender on earnings, but it does not address individual inheritances, either of wealth or of DNA and only considers inequality of opportunity to earn labour income. As Section 3 noted, the income from capital ownership which is left unexamined is roughly half of GDP, and rising. Since the fairness of capital and labour shares in income distribution and of the unequal inheritance

of wealth has historically been a crucial component of the debate on equality of opportunity, the EOP approach only addresses part of "fair inequality" and should arguably be relabelled as EEOP (Equality of Earnings Opportunity). Section 4 then examined the role played by genetic inheritance and the past public policies which have influenced epigenetic inheritance. If the quantitative psychology literature on genetic influences on personality is to be believed, the preferences which determine the efforts of individuals are to an important degree genetically and epigenetically determined – i.e. due to inherited circumstances – which very much muddies the interpretation of "fair" inequality and of cross-national EOP comparisons.

More fundamentally, the EOP literature is implicitly premised on the hypothesis that inequalities of opportunity can be examined without reference to inequalities of outcome. But if the equality of earnings opportunity improves because one or more circumstance characteristics become less important to earnings determination, what happens? A causal model of why characteristics matter is required. Section 5 noted that if wages are determined by the job which individuals are able to get and workers have to compete with each other for good jobs, greater equality of opportunity may just mean more people running harder after the same distribution of prizes, with very ambiguous implications for social welfare. When individuals have to compete with each other for jobs, greater equality of earnings opportunity is good for some people, but bad for others. In general, the net well-being impact of greater equality of earnings opportunity depends on whether there are any simultaneous positive impacts on the inequality of outcomes. After discussing intergenerational mobility and the linkages between the life chances of children and the bequest choices and the wealth constraints of their parents, Section 6 came to a similar conclusion – that the inequality of opportunities within one generation cannot really be separated from the inequality of outcomes within the preceding generation.

For all these reasons, this paper concludes that there is much more complexity in the concept and measurement of "fair inequality" than the EOP approach now sometimes seems to suggest. The low correlation between public perceptions of inequality of opportunity and the measurements suggested in the EOP literature is therefore not unreasonable. Improvements in EOP, as now measured, are thus unlikely to suffice to reduce current public dissatisfaction with income distribution. The EOP agenda has advanced our understanding of the empirical importance of discrimination in earnings inequality, but much more remains to be done before "fair inequality" can be plausibly measured.

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