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Abstract

Distributive value judgments based on the 'origins' of economic inequalities (e.g. circumstances and responsible choices) are increasingly evoked to argue that 'the worst form of inequality is to try to make unequal things equal' (Aristotele). However, one may reasonably agree that distributive value judgments should also account for the 'consequences' of economic inequalities in such a way as to prevent from subordination, exploitation and humiliation. In this way of thinking, by resorting the well known Rawlsian 'fair equality of opportunity' and 'difference principle', we propose a pragmatical non-parametric estimation strategy to compare income distributions in terms of Rawlsian inequity and its contribution to overall inequality. The latter methodology is applied to PSID data from 1999 to 2013 and compared with existing empirical evidences on Roemer's (1993, 1998) inequality of opportunity. Worryingly, Rawlsian inequity is found between 56% and 65%, with an increasing pattern originating from the recent financial and economic crisis.

Keywords: Rawlsian justice, equality of opportunity, equity.

JEL Classification: D63, I32, D3.

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1 Introduction

"*Conservative egalitarians have a dream. They dream of a society in which at some age all individuals have equal opportunities, and in which all inequalities in outcomes can be traced to responsible choices ... there is nothing in this picture which precludes the coexistence of misery and outrageous wealth ... All egalitarians do not have to share this dream, and one can rightly view it as a nightmare. [T]he bulk of the egalitarian program is precisely to fight against this view of social life, and to look for institutions that would enable the population to form a community in which values of solidarity and mutual care would be embodied in institutions and would guarantee that every individual ... would be preserved from subordination, exploitation, humilation*" (Fleurbaey 2001, p. 526).

From the perspective of a conservative egalitarian, inequalities are *illegitimate* (and so, compensation deserving) or *legitimate* (and so, not compensation deserving) depending on their determinants (e.g., luck, responsible choices), let's say, *inequality origins*. This view can be seen as innervating Sen's (1992) *capability* approach, as well as Roemer's (1993, 1998) ideal of *leveling the playing field*, or *luck egalitarianism* (e.g., Dworkin 1981a, 1981b, Cohen 1989), and *strict egalitarianism of opportunity* (Arneson 1999).

Differently, outcome egalitarians deny that members of a society are ever non-identical in a distributively important sense. Here, it is said, in the name of individual responsibility and meritocracy, human rights of equal respect, equal social status, equal participation in democratic arenas are often violated in such a way as to welcome oppression and destitution (Anderson 1999). In this view, inequalities are said to be illegitimate due to their immediate *consequences* - e.g., subordination, exploitation and humilation - whatever their *origins*.

To the extent that one or the other perspective - origins, or implications - is spoused, any attempt to reconcile distributive judgments is deemed to failure.

In this paper we propose a more general approach by which any pairwise disparity is said to be legitimate or illegitimate depending on both the *origins* and the *consequences* of inequality. In this way of thinking, we suggest that Rawls' approach - based on the "fair equality of opportunity" and the "difference principle" - is a better starting-gate for both (i) the identification of legitimate social and economic inequalities, and (ii) the measurement of distributive justice (equity).

The contribution of this paper intends to be both methodological and empirical. From a methodological point of view, given our interpretation of Rawls' theory, we propose a pragmatical approach by which Rawlsian inequity can be (non-parametrically) estimated from income distributions. In this scenario, any pairwise disparity is said to be legitimate if it is (i) "*attached to offices and positions open to all under conditions of fair equality of opportunity*", and (ii) "*to the greatest benefit of the least-advantaged members of society*" (Rawls

2001). As such, Rawls' meritocracy is defined in a broader setting where both (i) *fairness* of inequality origins, and (ii) *goodness* of inequality consequences for the society as a whole, are simultaneously required.

From an empirical point of view, given the separation between *social* and *natural* circumstances that is innervating Rawls' thought (Sugden 1993), US income distributions from 1999 to 2013 are compared over time in terms of both Rawlsian inequity and its contribution to overall inequality. Given the PSID resources (Panel Study of Income Dynamics), 64 subgroups are generated from the combination of two binary *social* circumstances (i.e., place of origin and economic situation of parents in the early years) and four binary *natural* circumstances (i.e., gender, health status in the early years, ethnicity, IQ-score). Iniquitous income disparities are found to account for between 55.7% and 64.9% of overall outcome inequality. As compared to the 15-20% of iniquitous income disparities as estimated for Roemer's inequality of opportunity (Pistolesi 2009, Abatemarco 2013), our analysis highlights that opting for Rawlsian idea of justice more than doubles the share of illegitimate inequalities in the US.

The paper is organized as follows. Rawlsian approach to distributive justice is discussed in Section 2. Here, the main rationales and implications of the *fair equality of opportunity* and the *difference principle* are interpreted according to the main literature. In Section 3 formal definitions are given by which legitimate pairwise inequalities are identified. As a result, an index for the measurement of Rawlsian inequity and its contribution to overall inequality is proposed. Remarkably, we show that Rawlsian perfect equity is attained if and only if (i) all individuals have access to the same investment opportunities in terms of both physical and human capital, (ii) equally responsible individuals achieve the same economic outcome, and (iii) poverty is eradicated from the society. In Section 4 our proposal for the non-parametric estimation of Rawlsian inequity is applied to US income distributions from 1999 to 2013. Section 5 concludes.

2 Rawlsian Equity

Rawls' (1971) theory of justice is grounded on two basic value judgments which are known as the *Liberty* and the *Equality* principle. According to the former, "*Each person is to have an equal right to the most extensive total system of equal basic liberties compatible with a similar system of liberty for all*". This is indicated by Rawls as the principle having priority on the second, which is the one we focus on in what follows.

The *Equality* principle consists of two ethical value judgments for the identification of fair/good social and economic inequalities within an equity perspective: *fair equality of opportunity* (hereafter, FEO) and *difference principle*

(hereafter, DP). By FEO, social and economic inequalities "*are to be attached to offices and positions open to all under conditions of fair equality of opportunity*", whereas, by DP, these inequalities are additionally required "*to be to the greatest benefit of the least-advantaged members of society*" (Rawls 2001).

The former principle (FEO) establishes a norm with respect to the *origins* of inequality, meanwhile the latter requirement (DP) concerns the *consequences* of inequality. In this sense, FEO is a *condition sine qua non* ensuring *fairness* of legitimate inequalities, while DP complements Rawls' idea of meritocracy by which *goodness*, intended as capacity to benefit (least-advantaged) individuals, is also required. Remarkably, to the extent that goodness (in addition to fairness) is evoked for the legitimation of inequalities (equity), Rawlsian equity implicitly embodies efficiency issues in such a way as to jeopardize its accommodation in the standard welfare economic theory (e.g., Rawlsian *maximin* principle is often reformulated in terms of Sen's *leximin* principle to preserve consistency with strong Pareto efficiency).

In what follows, we recall the basic foundations of both FEO and DP separately, the main objective being the identification of criteria by which a separating line is drawn between legitimate and illegitimate (pairwise) outcome inequalities according to our interpretation of Rawls' theory.

2.1 Fair Equality of Opportunity

According to Westen (1985), equality of opportunity is a three-way relationship between a person, some obstacles and a desired goal. A person only has an opportunity if she has a chance of achieving that goal, meanwhile opportunities are equal if each individual faces the same relevant obstacles, none insurmountable, with respect to achieving the same desirable goal. In this view, inequality of opportunity concerns the distribution of obstacles only.

Similarly, FEO requires that citizens have the same educational and economic opportunities (obstacles) regardless of whether they were born rich or poor: "*In all parts of society there are to be roughly the same prospects of culture and achievement for those similarly motivated and endowed*" (Rawls 2001). As such, FEO emphasizes the role of institutions, which are required to grant to all individuals *equal command over resources*. Basically, in Rawls' view the society is intended as a *system of fair cooperation* where "*what has to be distributed justly - or fairly - are the benefits and burdens of social cooperation*" (Sugden 1993). In this sense, optimal redistributive policies concern the distribution of social (e.g. training and education costs), not natural (e.g. talent) resources. [1]

[1] The interpretation of Rawls' *fair equality of opportunity* as proposed in this paper is not the only existing one. According to Michelbach et al. (2003), "[Rawls] *argues that individuals not only do not deserve the advantages they enjoy from wealth, con-*

Notably, Rawls' view has been criticized by Sen (1992) as "*equal command over resources can coexist with unequal real opportunities because individuals differ in their ability to convert resources into functionings*". Evidently, Sen and Rawls' views originate from two very different definitions of opportunity. In Rawls an opportunity is intended as a '*chance of access to resources*', whereas Sen refers to an opportunity as a '*chance of outcome*' (or outcome prospect). [2]

This aspect of Rawlsian justice is particularly relevant when considering FEO as one of the two criteria that outcome inequalities are required to satisfy to be regarded as legitimate. Since inequalities must "*be attached to offices and positions open to all under conditions of fair equality of opportunity*"(Rawls 2001), if outcome inequalities occur between individuals with the same endowment of *social* resources (e.g., economic conditions of parents in the early years, access to public services in the place of origin), then this inequality is said to be fair. But one may easily move a step forward. If the outcome disparity benefits the least endowed individual (e.g., with no access to same offices and positions as the other individual), according to Rawls' FEO, it must be the case that fairness holds once again. [3] This consideration is not superfluous because outcomes, as remarked by Sen's critique above, are not uniquely generated by social resources, i.e., better outcomes might be achieved by individuals with worse endowment of social resources because of different natural resources, or even luck (e.g., Lefranc et al. 2009).

So said, we claim that, in Rawls's view, pairwise outcome disparities are *unfair*, and so *illegitimate*, if and only if the better-off individual coincides with the better endowed one in terms of social resources. On the other way around, pairwise outcome disparities are *fair*, not yet *legitimate* (as goodness is also required), whenever the better-off individual is not the better endowed one in terms of social resources.

2.2 Difference Principle

In Rawls' view, *fairness* of social and economic inequalities is ruled by FEO, meanwhile *goodness* comes from DP. Specifically, DP poses an additional condition to be verified to make social and economic inequalities legitimate, that is, "*... social institutions be arranged so that any inequalities of wealth and income work to the advantage of those who will be worst off. The difference*

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nections, and other privileges, but that they similarly do not deserve any advantages from the natural lottery, such as intelligence, beauty, strength, or even the desire to work hard".

[2] In a sense, this debate resembles the old distinction between *formal* and *substantive* equality of opportunity (Rosenfeld 1986).

[3] A similar procedure has been already implemented in the empirical strategy proposed by Abatemarco (2015) for the estimation of Roemer's equality of opportunity.

principle requires, that is, that financial inequalities be to everyone's advantage, and specifically to the greatest advantage of those advantaged least" (Wenar 2012).

Remarkably, to the extent that income inequalities are said to be *good* if generating benefits for the whole population, and especially for the worst-off, Rawlsian meritocracy takes into account the *consequences* of inequalities, besides their *origins* (i.e., responsibilities or circumstances).[4] Even more, as merit is defined by considering social consequences of inequalities, not just individual ones, DP is meant to be a threat to *methodological individualism* characterizing most of the standard economic theory.

Drawing from DP, two major implications can be emphasized. First, DP recalls one of the most relevant debate in the economic theory, that is the identification of the '*effects of inequality on growth*'. Second, since growth is required to benefit especially the worst-off, poverty is crucial, that is, "*in the basal space of primary goods, Rawlsian Difference Principle demands that the least well-off groups are made as well-off as possible, in terms of an overall index of the holding of primary goods*" (Sen 2000). In this sense, Rawlsian theory of justice relies, among all, on the capacity of social and economic inequalities to generate growth, which is additionally required to be of the '*pro-poor*' kind.

It turns out that DP concerns the *indirect* effect of inequality on poverty through growth, that is not the same as the *direct* effect (e.g., Bourguignon 2005) by which any inequality reducing transfer is inevitably poverty reducing (independently of growth) when the donor is a non-poor whereas the recipient is poor, and vice versa. Differently, in Rawlsian view inequalities are *good* whenever (i) growth enhancing, and (ii) of the greater benefit to the poorest individuals.

As such, the definition of a methodology for the empirical estimation of Rawlsian equity passes inevitably through the identification of implementable criteria by which good and bad (pairwise) inequalities can be identified according to their impact on (i) growth determinants, and (ii) pro-poor growth, which is not straightforward at all. In what follows, we consider both aspects separately.

a) Inequality on growth

In this section, we argue that any pairwise outcome inequality can be said to be growth enhancing if (i) the disparity is not jeopardizing individual opportunities to access profitable investments in terms of both human and physical capital accumulation, and (ii) the disparity enforces effort, and economic incentives in general. In what follows, we offer a justification for this claim. More specifically, given the most relevant growth determinants as identified

[4] "*[Rawls] argues that after establishing equality of opportunity, rational individuals would tolerate inequality only to the extent that any increased efficiency benefits everyone, and especially the least well-off*" (Michelback et al. 2003).

in Barro's (1998) seminal paper, we identify the expected consequences of inequality on growth by considering the impact of inequalities on each growth determinant.

According to Barro, "[long-run or steady-state level of per capita output] *depends on an array of choice and environmental variables. The private sector's choices include saving rates, labor supply, and fertility rates, each of which depends on preferences and costs. The government's choices involve spending in various categories, tax rates, the extent of distortions of markets and business decisions, maintenance of the rule of law and property rights, and the degree of political freedom*".

Let's consider first the effect of inequality on the saving rate. On the one hand, inequality affects the saving rate by giving to few people a better and deeper chance to invest in resource-demanding activities which would not be undertaken otherwise. This applies to both physical (e.g., Kaldor 1957) and human capital (e.g., Barro 2000, Wenar 2012). On the other hand, in the presence of credit market imperfections, inequality, by enlarging the set of people who may have access to profitable investments in human and physical capital, may increase efficiency, and so generate growth (Galor and Zeira 1993). These two causalities evidently conflict to each other. However, the latter is known to dominate the former on the basis of empirical evidences. [5] Also, according to Galor and Moav (2004), the dominating causality strongly depends on the degree of development in the society; more precisely, the positive effect of inequality is expect to prevail in developing countries only.

Let's now turn to the second determinant of growth as indicated by Barro. Labor supply is clearly affected by inequality as well. Compressed wage structures that do not reward merit will lead to more equal societies, but it also likely that they will reduce workers' incentives to put in additional effort or aim at outstanding achievements (Mirrlees 1971). "*Good inequalities are those that reflect and reinforce market-based incentives that are needed to foster innovation, entrepreneurship and growth*" (Chaudhuri and Ravallion 2006). In this sense, the principle of reward, [6] by which inequalities determined by responsible choices (e.g., effort) are legitimate (and not to be compensated), is implicitly relevant in Rawlsian justice as "*institutions promote or restrict growth according to the protection they accord to effort*" (Lewis 2013). Never-

[5] In a sequence that mirrors intellectual fashions on the empirics of growth, researchers have looked at rates of growth over long periods of time (e.g., Persson and Tabellini 1996, Perotti 1996, Alesina and Rodrik 1994), the level of income across countries (Easterly 2007), and the duration of growth spells (Berg, Ostry and Zettelmeyer 2012), and have found that inequality is associated with slower and less durable growth. The few exceptions (Forbes 2000, Banerjee and Duflo 2003) tend to pick up ambiguous short-run correlations (Aghion, Caroli, and Garcia-Penalosa 1999, Halter, Oechslin, and Zweimller 2014).

[6] See Fleurbaey and Maniquet (2006) for different formulations of the same principle.

theless, in contrast with Roemer's *levelling of the playing field*, here rewarding effort is to be intended as a step toward meritocracy, not meritocracy itself.

Then, from the former two growth determinants (i.e., saving rate and labor supply), we can infer that pairwise inequalities are expected to affect growth through (i) individual opportunities to access profitable investments in terms of both physical and human capital accumulation, and (ii) the optimal design of economic incentives. For the rest of growth determinants, instead, we simply observe that the way inequality may affect growth basically replicates these two rationales.

Fertility is a standard variable in basic growth models. An impact of inequality on the endogenous fertility rate [7] may exist if poor families show higher fertility rates and lower investment capacity. Then, in the presence of credit market imperfections, since access to profitable investments in human capital is not granted to the increasing part of the population, inequality lowers growth (de la Croix and Doepke 2003). Once again, pairwise inequalities are relevant to the extent that access to profitable investments (in terms of both human and physical capital) is jeopardized.

Similarly, market distortions due to government choices alter individual opportunities to invest in human or physical capital and/or economic incentives. In this sense, Alesina and Rodrik (1994) observe that high inequality enlarges the demand for (distorting) redistribution of the median-voter due to the lognormal distribution of income. As such, the focus is, once again, on effort incentives which are weakened.

Finally, as observed by Barro (1998), democracy is relevant for growth because, "*in extreme dictatorships, an increase in political rights tends to raise growth because the limitation on governmental authority is critical. However, in places that have already achieved some political rights, further democratization may retard growth because of the heightened concern with social programs and income redistribution*". Then, dictatorship limits individual liberties and so the possibility to exploit profitable investment, meanwhile excessive democratization may jeopardize, once again, economic incentives. [8]

b) Growth on poverty

The impact of growth on poverty rates has been the object of vibrant debates among those who believe that growth is itself the best anti-poverty policy and those who argue that growth is not necessarily alleviating poverty within a market economy.

According to the first view, Dollar and Kraay (2002) show empirically that

[7] On the endogeneity of fertility rates see Schultz (1989), and Barro and Lee (1994).

[8] Even more, the role of investment opportunities in human capital is additionally emphasized when the impact of democracy on growth is investigated once democracy is considered as endogenous with respect to education (Bourguignon and Verdier 2000).

the income of the poor rises one-for-one with overall growth. [9] As such, Dollar and Kraay conclude that governments need not follow pro-poor growth policies; they should simply maximize economic growth provided they avoid high inflation and maintain fiscal discipline.

In contrast, some others have observed that economic growth in the last decades has not changed the degree of relative inequality, meaning that, the proportional benefits of growth going to the poor are the same as those enjoyed by the non-poor. According to this view, Kakwani and Pernia (2000) observe that "*the growth process that results from market forces generally benefits the rich proportionally more than the poor. This is because the rich have inherent advantages (e.g., human and material capital) in a market economy*".

It is evident itself that the basic foundation of pro-poor growth is strictly related to Rawls' (1971) *maximin* principle. Even more, in line with Kakwani and Pernia (2000), DP clearly goes in the direction of pro-poor growth by claiming that growth is desirable to the extent that it is to the greatest benefit of the neediest part of the population.

Given Rawls' focus on pro-poor growth, it is worth observing that, within this literature, several definitions of pro-poor growth have been proposed. For some observers, growth is pro-poor if it leads to any reduction in poverty (e.g., Ravallion and Chen 2003, Ravallion 2004); for others, it is pro-poor only if it leads to a disproportionate increase in the incomes of the poor, that is, if it is associated with declining inequality (e.g., White and Anderson 2000). [10]

The former definition of pro-poor growth is much less strict and focuses solely on the link between poverty and growth; a growth episode is said to be pro-poor if poverty falls regardless of the developments on the inequality front. The second definition, instead, would basically require that the income share of the poor population increases. The simplest version of this definition is based on a relative concept of inequality and would simply state that the growth rate of the income of the poorest individuals is greater than the average growth rate (White and Anderson 2000). [11]

To the extent that growth is to benefit *more* the least well off, Rawls' DP clearly evokes the latter approach, that is, growth is of the pro-poor kind if it reduces both poverty and inequality. In this sense, DP resembles the definition of the Asian Development Bank (ADB 1999) by which "*growth is pro-poor when ... accompanied by policies and programs that mitigate inequalities and*

[9] This general relationship between the income of the poor and per capita GDP growth holds in a sample of 80 countries over four decades.

[10] Specifically, the major benefit for the poorest part of the population can be defined in absolute or relative terms, depending on the use of money measures or shares.

[11] Another version of this definition is proposed by Kakwani and Pernia (2000) where poverty reduction and inequality improvement are taken into account simultaneously, that is, pro-poor growth is defined in such a way as to account for both (i) the impact of growth when the distribution of income does not change, and (ii) the effect of income redistribution when total income does not change.

facilitate income and employment generation for the poor, particularly women and other traditionally excluded groups". [12]

The latter definition, in line with Rawls' idea of *equal command over resources*, emphasizes the role of opportunities of access to income and employment positions. In this sense, "[pro-poor growth is obtained by removing *artificial barriers to entry into certain trades and professions, or into the formal labor market in general ...* [through] *adequate public spending for basic education, health and family planning services, improved access to credit, and the promotion of small and medium enterprises*" (Kakwani and Pernia 2000).

As such, we argue that, to generate pro-poor growth, pairwise outcome inequalities must be not jeopardizing the opportunities of access to profitable investments in human and physical capital accumulation. As this statement is the same as the first condition obtained in the previous section (i.e., for pairwise inequalities to be growth enhancing), in our view growth-enhancing pairwise inequalities are generally expected to generate growth of the pro-poor kind (not vice versa). Notably, this does not mean that growth is generally pro-poor (i.e., pro-poor growth policies are useless), but that growth originating from pairwise inequalities is always pro-poor.

Summing up, according to our interpretation of Rawlsian justice, pairwise outcome inequalities are *good* by DP (not necessarily *legitimate*), if (i) disparities enforce effort and economic incentives, and (ii) disparities do not jeopardize individual opportunities to access profitable investments in terms of both human and physical capital accumulation. In addition, to be *legitimate*, pairwise outcome disparities are required (iii) to be *fair* by FEO, that is, the better-off individual must not be the better endowed one in terms of *command over (social) resources*.

3 A Non-Parametric Pragmatic Estimation Strategy

3.1 Formal Definitions

Given a population of N individuals, let $\{y_1, ..., y_N\} \in \Re_+^N$ be the increasingly ordered outcome vector where y is the socioeconomic variable which, without loss of generality, may be intended as income.

Each individual is associated to a set of z_n *natural* circumstances $\{n_1, ..., n_{z_n}\}$ identifying genetic traits (e.g., gender, ethnicity). Moreover, each individual is characterized by a finite set of *social* circumstances $\{s_1, ..., s_{z_s}\}$ indicating the

[12] This is additionally supported by empirical evidences showing that pro-poor growth originates from the capacity of improving the opportunity set of the poorest individuals by giving them the chance of working in more profitable sectors or richer areas, as well as to improve their labor productivity (Klasen 2009).

social environment in the early years (e.g., parental income, access to public services/facilities). Evidently, both natural and social circumstances are intended as beyond individual control.

For each natural circumstance, let $n_q := \{n_q^1, ..., n_q^{\tau_q}\}$ be the vector indicating τ_q mutually exclusive discrete values (e.g., male or female) associated to the qth natural circumstance variable (e.g., gender). Similarly, let $s_q := \{s_q^1, ..., s_q^{\tau_q}\}$ be the vector indicating τ_q mutually exclusive discrete values (e.g., high/medium/low) associated to the qth social circumstance variable (e.g., parental income).

We define the ith *natural opportunity type* (θ_i^n) as a combination of discrete values (e.g., male and Hispanic) associated to each natural circumstance variable (e.g., gender and ethnicity), i.e. $\theta_i^n = (n_1^\alpha \cap ... \cap n_{z_n}^\omega)$. Similarly, the ith *social opportunity type* (θ_i^s) is defined as a combination of discrete values (e.g., low parental income and high public services performances) associated to each social circumstance variable (e.g., gender and ethnicity), i.e. $\theta_i^s = (s_1^\alpha \cap ... \cap s_{z_s}^\omega)$.

Given the finite set of natural opportunity types $\Theta^n := \{\{\theta_i^n\}_{i=1}^{\bar{n}}\}$ and social opportunity types $\Theta^s := \{\{\theta_i^s\}_{i=1}^{\bar{s}}\}$, let define with $\Theta := \{\{\theta_i^n\}_{i=1}^{\bar{n}}, \{\theta_j^s\}_{j=1}^{\bar{s}}\}$ the finite set of *opportunity profiles*, each one indicating a single natural and social opportunity type respectively, which can be reformulated as $\Theta := \{\theta_k\}_{k=1}^{\bar{n}\times\bar{s}}$. E.g., if natural circumstances consist of gender (male or female) and ethnicity (white or black), whereas social circumstances are parental income (low or high) and public services performances in the place of origin (low or high), then $\bar{n} = (2)^2$ and $\bar{s} = (2)^2$. In addition, the set of opportunity profiles consists of $(\bar{n} \times \bar{s}) = (2)^2 \times (2)^2 = (2)^4$ different opportunity types.

Given the opportunity types, individuals may also differ to each other with respect to their *responsibility type* (e.g., effort). More specifically, let $\mathcal{E} := \{e_i\}_{i=1}^{\bar{e}}$ be the finite set of responsibility types. We assume that $y = f(\theta^n, \theta^s, e)$ is the income generation function where $f : \Theta^n \times \Theta^s \times \mathcal{E} \to \Re_+$. Evidently, income is expected to increase when natural or social opportunity type improves, as well as when the responsibility type betters. As such, the definition of an empirical strategy crucially depends on the identification of both opportunity and responsibility orderings, that is not straightforward as strong assumptions are inevitably required. In what follows we opt for an *ordinal* pragmatic approach. [13]

3.1.1 Opportunity Orderings

Given the vector indicating τ_q mutually exclusive discrete values (e.g., male or female) associated to the qth natural circumstance variable (e.g., gender), i.e. $n_q := \{n_q^1, ..., n_q^{\tau_q}\}$, we assume that discrete values can be com-

[13] For cardinal approaches quantifying the contribution of effort and circumstance within the income generation function see, among all, Bourguignon et al. (2007), Checchi et al. 2008; Pistolesi 2009; Ferreira and Gignoux 2011; Almas et al. 2011

pletely ordered in terms of *propitiousness* within the income generation process (e.g., male more propitious than female), independently of other circumstances and responsible choices. Formally, this means that, holding fixed the rest of natural and social circumstance variables and the responsibility type, for each pair of values $\{n_q^\alpha, n_q^\beta\}$ - originating the two natural opportunity types θ_i^n and θ_j^n respectively - it is reasonable to expect, on *a priori* grounds, either $y_{\theta_i^n,\bar{\theta}^s,\bar{e}} = f(\theta_i^n,\bar{\theta}^s,\bar{e}) > f(\theta_j^n,\bar{\theta}^s,\bar{e}) = y_{\theta_j^n,\bar{\theta}^s,\bar{e}}\ \forall\ \bar{e},\bar{\theta}^s$, or $y_{\theta_i^n,\bar{\theta}^s,\bar{e}} = f(\theta_i^n,\bar{\theta}^s,\bar{e}) < f(\theta_j^n,\bar{\theta}^s,\bar{e}) = y_{\theta_j^n,\bar{\theta}^s,\bar{e}}\ \forall\ \bar{e},\bar{\theta}^s$. [14]

Given a complete ordering among discrete values associated to each natural circumstance, let $\{\theta_1^n,...,\theta_{\bar{n}}^n\}$ be the set of natural opportunity profiles and let indicate by y_{ijk} the income unit with the ith natural opportunity type, the jth social opportunity type and the kth responsibility type. We define the *partial natural opportunity ordering* $\succ_\theta^n$ as follows: (i) $y_{ijk} \succ_\theta^n y_{mjk}$, whenever θ_i^n can be obtained from θ_m^n by selecting more propitious values for some natural circumstance variable(s) without worsening any other, and (ii) $y_{ijk}||_\theta^n y_{mjk}$ (non-comparability), whenever θ_i^n can be obtained from θ_m^n by selecting more propitious values for some natural circumstance variable(s) but less propitious for some other(s). We write $\succeq_\theta^n$ and $\sim_\theta^n$ to indicate the asymmetric and symmetric component of the natural opportunity ordering respectively.

For instance, let gender (male, female) and race (white, black) be the only two (binary) natural circumstance variables. Since being white and male is usually found to be more propitious in the income generation process, then, by virtue of the natural opportunity ordering above, black-males benefit of a better natural opportunity type with respect to black-females, but the former is not comparable with the natural opportunity type consisting of white-females.

Evidently, the same formal framework can be replicated for social circumstance variables. Here, we assume that discrete values (e.g., high or low)) associated to the qth social circumstance variable (e.g., parental income in the early years) can be completely ordered in terms of *propitiousness* within the income generation process, independently of other circumstances and responsible choices. Formally, holding fixed the rest of natural and social circumstance variables and the responsibility type, for each pair of values $\{s_q^\alpha, s_q^\beta\}$ - originating the two social opportunity types θ_i^s and θ_j^s respectively - it is reasonable to expect, on *a priori* grounds, either $y_{\bar{\theta}^n,\theta_i^s,\bar{e}} = f(\bar{\theta}^n,\bar{\theta}^s,\bar{e}) > f(\theta_j^n,\theta_j^s,\bar{e}) = y_{\bar{\theta}^n,\theta_j^s,\bar{e}}$ $\forall\ \bar{e},\bar{\theta}^n$, or $y_{\bar{\theta}^n,\theta_i^s,\bar{e}} = f(\bar{\theta}^n,\theta_i^s,\bar{e}) < f(\bar{\theta}^n,\theta_j^s,\bar{e}) = y_{\bar{\theta}^n,\theta_j^s,\bar{e}}\ \forall\ \bar{e},\bar{\theta}^n$.

Let $\{\theta_1^s,...,\theta_{\bar{s}}^s\}$ be the set of natural opportunity profiles. The *partial social opportunity ordering* $\succ_\theta^s$ is defined as follows: (i) $y_{ijk} \succ_\theta^s y_{iok}$, whenever θ_i^s can be obtained from θ_o^s by selecting more propitious values for some social circumstance variable(s) without worsening any other, and (ii) $y_{ijk}||_\theta^s y_{iok}$ (non-comparability), whenever θ_i^s can be obtained from θ_o^s by selecting more propitious values for some circumstance variable(s) but less propitious some

[14] Propitiousness orderings may be inferred *a priori* from empirical evidences as well as theoretical insights.

other(s). We write $\succeq_\theta^s$ and $\sim_\theta^s$ to indicate the asymmetric and symmetric component of the social opportunity ordering respectively.

Finally, let's recall the finite set of opportunity profiles $\Theta := \{\{\theta_i^n\}_{i=1}^{\bar{n}}, \{\theta_j^s\}_{j=1}^{\bar{s}}\}$. We define the *opportunity profiles ordering* $\succ_\theta$ as follows: (i) $y_{ijk} \succ_\theta y_{mok}$, whenever $y_{ijk} \succeq_\theta^n y_{mok}$ and $y_{ijk} \succeq_\theta^s y_{mok}$ with at least one of the two preferences holding strictly, (ii) $y_{ijk}||_\theta y_{mok}$ (non-comparability), whenever $y_{ijk} \succ_\theta^n y_{mok}$ and $y_{ijk} \prec_\theta^s y_{mok}$, or $y_{ijk} \prec_\theta^n y_{mok}$ and $y_{ijk} \succ_\theta^s y_{mok}$, or $y_{ijk}||_\theta^n y_{mok}$, or $y_{ijk}||_\theta^s y_{mok}$. Once again, we write $\succeq_\theta$ and $\sim_\theta$ to indicate the asymmetric and symmetric component of the opportunity profiles ordering respectively.

3.1.2 Responsibility Ordering

In line with Roemer's (1993) pragmatic theory, if a disjoint and exhaustive partition rule is assumed to exist by which individuals within the same population can be grouped depending on the opportunity profile (accounting for both natural and social circumstances), two individuals belonging to different subgroups are said to be *comparable* in terms of responsible choices (not necessarily the same degree of responsibility) if they are equally ranked in the respective subgroup income distributions. In this sense, the income gap among equally ranked individuals may capture the contribution of circumstances to overall inequality.

Here, a more demanding pragmatic approach is proposed by which rank-based *partial responsibility orderings* are defined (Abatemarco 2010). Given the disjoint and exhaustive partition of the population with respect to the finite set of opportunity profiles $\Theta := \{\theta_k\}_{k=1}^{\bar{n}\times\bar{s}}$, let $F_k(y)$ be the subgroup cumulative frequency distribution associated to the kth opportunity profile. Let $\phi(\cdot)$ be a monotone transformation and y_{ik} the income of the ith individual associated to the kth opportunity profile, we identify the responsibility type of y_{ik} with the interval $\phi[F_k(y_{i-1,k})] < e_{ik} \leq \phi[F_k(y_{ik})]$. As such, the partial responsibility ordering $\succ_e$ can be (pragmatically) defined as follows: (i) if $F_k(y_{i-1,k}) \geq F_h(y_{jh})$ then $y_{ik} \succ_e y_{jh}$, (b) if $F_k(y_{ik}) \leq F_h(y_{j-1,h})$ then $y_{jh} \succ_e y_{ik}$, (c) if $F_k(y_{i-1,k}) = F_h(y_{j-1,h})$ and $F_k(y_{ik}) = F_h(y_{jh})$ then $y_{ik} \sim_e y_{jh}$, and (d) the income units are non-responsibility comparable otherwise ($y_{ik}||_e y_{jh}$). [15] The asymmetric component of the responsibility ordering is indicated by $\succeq_e$.

Within the rank-based approach, since individuals belonging to the same subgroup are characterized by the same opportunity type, within-group income gaps are unequivocally ascribed to different responsible choices. As such,

[15] For instance, given two increasingly ordered subgroup income vectors, $x := \{x_1, x_2\}$ and $y := \{y_1, y_2, y_3\}$, then $x_2 \succ_e x_1$, $y_3 \succ_e y_2 \succ_e y_1$, $y_3 \succ_e x_1$ and $x_2 \succ_e y_1$, while the couples (x_1, y_1), (x_1, y_2), (x_2, y_2) and (x_2, y_3) identify the set of non-responsibility comparable income units. Evidently, this rank-based approach generates complete responsibility orderings in the presence of equally sized subgroups.

rank-based responsibility orderings allow to overcome very information demanding processes which would inevitably be required otherwise. However, this is not a *free-meal*. To the extent that some circumstances may be unobservable at reasonable costs, individuals within the same subgroup may indeed differ to each other in terms of circumstances, and the rank-based ordering would erroneously legitimate such income disparities in the name of nonexisting differences in terms of responsible choices. This is a relevant problem which is known to afflict both parametric and non-parametric estimation strategies (Ramos and Van de gaer 2012). In this context, we argue that *partial* responsibility orderings are definitely to be preferred with respect to *complete* ones, as this may allow to mitigate distortions originating from unobserved circumstances.

An additional consideration concerns the *indirect* effect of circumstances; it is known that responsible choices may be significantly influenced by circumstances (e.g., Bourguignon et al. 2007). In this sense, it is worth observing that the rank-based approach automatically accounts for the indirect effect because responsibility orderings are invariant with respect to both translations and scale transformations applied to each subgroup.

3.2 Fairness and Goodness

According to FEO, social and economic pairwise inequalities are unfair if and only if the better-off individual is the better endowed in terms of social resources, or, equivalently, pairwise income inequalities are fair whenever the better-off individual did not enjoy any advantage in terms of command over social resources. As such, fairness of pairwise income inequalities can be defined as follows.

Definition 3.1 (Fairness) *Given the finite set of social opportunity types* $\Theta^s := \{\theta_i^s\}_{i=1}^{\bar{s}}$ *and the income distribution* $\{y_1, ..., y_N\} \in \Re_+^N$ *with* $y_j > y_i$*,*

3.1.i) if $y_j \preceq_\theta^s y_i$*, then* $|y_j - y_i|$ *is fair;*

3.1.ii) if $y_j \succ_\theta^s y_i$ *or* $y_j || _\theta^s y_i$ *, then* $|y_j - y_i|$ *is not fair.*

To the extent that the sole social circumstance variables are accounted for, Rawlsian fairness in Definition 3.1 differs with respect to the standard *compensation principle* for two reasons at least. First, Rawlsian fairness is not sufficient to claim legitimacy of an income gap, and so compensation deservingness. Second, natural circumstances are not accounted at all, as fairness is uniquely concerned with institutions intended as a system of fair cooperation.

Rawlsian fairness is a necessary but not sufficient condition for *legitimacy* of pairwise inequalities, as the additional criterion to be considered for sufficiency purposes is goodness. In turn, as argued above, by virtue of DP two

necessary conditions are required for goodness, i.e. (i) income disparities must enforce effort and economic incentives (hereafter, goodness for incentives), and (ii) income disparities must not jeopardize individual opportunities to access profitable investments in terms of both human and physical capital accumulation (hereafter, goodness for access). Remarkably, the simultaneous verification of both conditions is sufficient and necessary for an income disparity to be good.

Definition 3.2 (Goodness for Incentives) *Given the finite set of opportunity profiles* $\Theta := \{\theta_i\}_{i=1}^{\bar{n}\times\bar{s}}$ *and the income distribution* $\{y_1, ..., y_N\} \in \Re_+^N$ *with* $y_j > y_i$*,*

3.2.i) if $y_j \succ_e y_i$*, then* $|y_j - y_i|$ *is good for incentives;*

3.2.ii) if $y_j \preceq_e y_i$*, or* $y_j||_e y_i$*, then* $|y_j - y_i|$ *is not good for incentives.*

As such, Definition 3.2 resembles the principle of reward as intended by Arneson's (1999) *strict egalitarianism of opportunity*, where maximum equality of opportunity is obtained if "*no one is worse off than others through no fault or voluntary choice of her own*". Notice that, to be coherent with Rawlsian framework, reward has not to be regarded as the *legitimate* prize for better individual responsible choices. Here, reward is *borne* to the extent that it represents an incentive to better responsible choices, which are expected to be growth enhancing in the interest of the society as a whole. Most importantly, a *legitimate* prize does not need to be *incentivizing*, and vice versa.

In addition, as compared to alternative definitions of the reward principle (e.g., Fleurbaey and Maniquet 2006), Definition 3.2 better suits the ordinal approach to responsible choices and circumstances we have opted for, because a distinction is made between good and non-good income disparities without any possibility to separate a good from a non-good component in each single income gap. Differently, to the extent that the contribution of circumstances and responsible choices within the income function is monetized (i.e., parametric approach), good inequalities may be identified according to the principle of *natural* reward, by which the effect of heterogeneous circumstances are to be canceled out across the entire population, or, alternatively, according to the principle of *utilitarian* reward, by which heterogeneous circumstances are to be canceled out across equally deserving individuals in such a way as to maximize the sum of individual utilities.

Moving a step forward, as observed above, to be good pairwise income inequalities are additionally required to be not jeopardizing individual opportunities to access profitable investments in terms of both human and physical capital accumulation. The very basic question to be answered is the following: when do pairwise income inequalities jeopardize individual opportunities of access? Evidently, an answer to this question cannot be given independently of a definition of access opportunities.

From a methodological point of view, opportunities of access can be differently defined depending on main objectives. For instance, within a strictly dichotomic approach, one may say that two individuals differ in terms of opportunities of access when access is granted to one but not to the other. However, if the dichotomic approach is abandoned, opportunities of access may still differ in magnitude even if access is granted to both individuals.

In this paper, as we aim at separating pairwise inequalities which jeopardize access opportunities from the rest of pairwise inequalities, we opt for the former approach, that is, we claim that access is not granted for socially excluded individuals, and vice versa. As such, goodness for access can be formally defined as follows.

Definition 3.3 (Goodness for Access) *Given the income distribution* $\{y_1, ..., y_N\} \in \Re_+^N$ *with* $y_j > y_i$*, let* z *be the poverty line capturing social exclusion in the society*

3.3.i) if $y_i > z$*, or* $y_j \leq z$*, then* $|y_j - y_i|$ *is not bad for access;*

3.3.ii) if $y_j > z$ *and* $y_i \leq z$*, then* $|y_j - y_i|$ *is bad for access.*

Basically, by Definition 3.3 any pairwise income inequality jeopardizes access opportunities for one of the two individuals whenever the income disparity is associated with an access disparity as well. On the contrary, if the income disparity does not concur with an access disparity, then such inequality is said to be not jeopardizing access. Intuitively, goodness cannot hold whenever the income disparity can be said to be contributing to the generation of access disparities. Remarkably, by claiming that a necessary (but not sufficient) condition to legitimize social and economic inequalities is that such a disparity should be not *responsible* for poorness, our interpretation of DP principle is coherent with Rawlsian maximin principle. [16]

3.3 Gini-based Aggregation

Recalling formal definitions in the previous Section, Ralwsian equity can be reformulated as follows.

Definition 3.4 (Rawlsian Equality Principle) *Given the income distribution* $\{y_1, ..., y_N\} \in \Re_+^N$ *with* $y_j > y_i$ *and the poverty line* z *capturing social exclusion in a specific society, let* $\Theta^s := \{\theta_i^s\}_{i=1}^{\bar{s}}$ *be the finite set of social opportunity types, and* $\Theta := \{\theta_i\}_{i=1}^{\bar{n}\times\bar{s}}$ *the finite set of opportunity profiles,*

[16] To the extent that the income threshold z is country-specific, Definition 3.3 allows to account for the heterogeneity of institutional contexts which clearly matters for the identification of social exclusion.

I) if $|y_j - y_i|$ *satisfies (3.1.i), (3.2.i), and (3.3.i), then* $|y_j - y_i|$ *is legitimate;*

II) if (3.1.i), or (3.2.i), or (3.3.i) does not hold, then $|y_j - y_i|$ *is illegitimate.*

According to this definition, inequity is given by the aggregation of income gaps satisfying condition (II), meaning that, equity differs from equality due to legitimate income inequalities (I). Specifically, for measurement purposes, in line with the old tradition of the Gini index, we opt for the unweighted aggregation of income gaps, even if weighted aggregation functions may be supported as well.

Let Ω be the set of pairwise income gaps satisfying conditions (I) in Definition 3.4, given income distribution $\{y_1, ..., y_N\} \in \Re_+^N$, inequality is measured as,

$$G = \frac{1}{2N^2\mu} \sum_{i=1}^{N} \sum_{j=1}^{N} |y_j - y_i| \tag{1}$$

where μ stands for mean income. Most importantly, following the same logic behind Dagum's (1997) decomposition (two-components), G can be decomposed as follows

$$G = \frac{1}{2N^2\mu} \left[\sum_{i=1}^{N} \sum_{j=1}^{N} |y_j - y_i| + \sum_{h=1}^{N} \sum_{k=1}^{N} |y_h - y_k| \right] \ \forall \ (i,j) \in \Omega, \ \forall \ (h,k) \ni \Omega \tag{2}$$

where the second component in squared brackets captures inequity. As such, we measure Rawlsian inequity (G_R) as

$$G_R = \frac{1}{2N^2\mu} \sum_{h=1}^{N} \sum_{k=1}^{N} |y_h - y_k| \ \forall \ (h,k) \ni \Omega \tag{3}$$

where the contribution of Rawlsian inequity to overall inequality is defined as

$$G_R^c = \frac{G_R}{G} \tag{4}$$

The inequity index G_R (and G_R^c) is scale invariant, partially symmetric in Cowell's (1980) sense, and defined in $[0, 1]$. In addition, it is replication invariant to the extent that a k-fold replication of the entire population refers to all characteristics of each income unit (i.e., income, responsibility type, social opportunity type).

Any non-reranking rich-to-poor transfer (hereafter, PD transfer) between

y_k and y_h is inequity reducing whenever $h, k \ni \omega$. Also, it can be shown that, given $y_k > y_h$ with $k \in \Omega$ and $h \ni \Omega$, any PD transfer is inequity reducing whenever $y_h < \tilde{y}$ with $\tilde{y}$ indicating the median income for all $i \ni \Omega$. Similarly, given $y_k > y_h$ with $k \ni \Omega$ and $h \in \Omega$, any PD transfer is inequity reducing whenever $y_k > \tilde{y}$ with $\tilde{y}$ indicating the median income for all $i \ni \Omega$.

According to this framework, it must be the case that inequity is null when inequality is null, but not vice versa. Mostly, perfect equity may be attained in the presence of social and economic inequalities. Proposition 3.1 makes the point.

Proposition 3.1 (Perfect Equity) *Given the set of natural and social opportunity types $\Theta^n := \{\theta_i^n\}_{i=1}^{\bar{n}}$ and $\Theta^s := \{\theta_i^s\}_{i=1}^{\bar{s}}$ respectively, let $\Theta := \{\theta_i\}_{i=1}^{\bar{n}\times\bar{s}}$ be the set of opportunity profiles whose corresponding subgroup income distributions are $\bar{y}_i := \{y_{1i}, y_{2i}, ...\}$, and let $\{y_1, ..., y_N\} \in \Re_+^N$ be the income distribution where $\exists i : y_i \neq y_j$. The two following statements are equivalent.*

i) $G_R = 0$.

ii) *(a.)* $\forall\ i, j$, $\theta_i^n \neq \theta_j^n \Leftrightarrow \theta_i \neq \theta_j$;
(b.) $\exists\, i : \bar{y}_j$ *is a k-fold replication of* $\bar{y}_i\ \forall\ j$, *and*
(c.) $y_i \geq z\ \forall\ i$, *or* $y_i < z\ \forall\ i$.

Proof 3.1 *Given $\theta_i \neq \theta_j$ if and only if $\theta_i^n \neq \theta_j^n$, it must be $y_i \sim_\theta^s y_j\ \forall\ i, j$ by which (3.1.i) holds for all $|y_j - y_i|$. Similarly, if $y_i \geq z\ \forall\ i$, or $y_i < z\ \forall\ i$, then (3.3.i) holds for all $|y_j - y_i|$. Finally, if each subgroup, as obtained through a disjoint and exhaustive partition w.r.t. $\{\theta_i\}_{i=1}^{\bar{n}\times\bar{s}}$, is the k-fold replication of another subgroup, then $y_i = y_j\ \forall\ i, j : y_i \sim_e y_j$ and $y_j > y_i\ \forall\ i, j : y_j \succ_e y_i$. As such, (3.2.i) holds for all $|y_j - y_i|$. This proves that $G_R = 0$. On the other way around, given $\{y_1, ..., y_N\} \in \Re_+^N$ such that $\exists i : y_i \neq y_j$ (i.e., $G \neq 0$), if $G_R = 0$, we prove that all pairwise income inequalities must be Rawlsian equitable according to Definition 3.4. Given $G_R = 0$, by (3.2.ii), if $y_j \sim_e y_i$, or $y_j||_e y_i$, then it must be $y_j = y_i\ \forall\ i, j$. As such, by definition of $\prec_e$, if $\{y_1, ..., y_N\} \in \Re_+^N$ is such that $\exists i : y_i \neq y_j$, then each subgroup associated to an opportunity profile must be the k-fold replication of another subgroup. Indicating by N_i the size of the ith subgroup, this ensures that $N_j = k_j N_i$ for all subgroups, with k_j being any positive integer. By (3.3.ii), $|y_j - y_i| = 0$ whenever $y_j \geq z > y_i$, which is possible if and only if all $y_i \geq z\ \forall\ i$, or $y_i < z\ \forall\ i$. Finally, given that (i) $\{y_1, ..., y_N\} \in \Re_+^N$ is such that $\exists i : y_i \neq y_j$, (ii) $i, j \in \theta_k$ implies $i, j \in \theta_h^s\ \forall\ i, j, k, h$, and (iii) each subgroup is the k-fold replication of another subgroup, let's assume, by contradiction, that $\exists i, j : y_j \succ_\theta^s y_i$, or $y_j||_\theta^s y_i$ (i.e., (3.1.ii)), by which two subgroups differs to each other with respect to θ^s. It is clear that, if each subgroup consists of more than one individual, there must exist at least one unfair inequality, which would contradict $G_R = 0$. As such, it must be the case that $y_i \sim_\theta^s y_j\ \forall\ i, j$.*

Proposition 3.1 emphasizes that within Rawlsian view the focus is on a social system of fair cooperation where the same opportunities of investments in human and physical capital must be granted to everybody. In addition, in line with a broader interpretation of the maximin principle, equity is maximized when there is no group of more disadvantaged individuals, or, equivalently, all of them are disadvantaged. Finally, given these two conditions above, inequalities can be tolerated if and only if these are determined by effort in such a way as to be growth enhancing. In this sense, as compared to Roemer's ideal of *leveling the playing field*, the applicability of the principle of reward is restricted *a priori* by additional normative requirements concerning the *consequences* of income disparities.

4 An Empirical Application to PSID

4.1 Data

The PSID [17] is used to compare US income distributions over time in terms of Rawlsian equity as defined above. This database has been preferred due to (i) the availability of information on both natural and social circumstance variables, and (ii) the high number of records. The former aspect is crucial because, as we observed above, omitted variables may cause the misleading legitimation of illegitimate income gaps (Ramos and van de Gaer 2012). The latter aspect is crucial as well; to the extent that the initial population is to be partitioned into several subgroups, a high number of observations is required to ensure a sufficient number of records in each subgroup (Ferreira and Gignoux 2011).

To facilitate the comparison with the existing empirical literature, we consider the same initial wave as in Abatemarco (2015), where the evolution of equality of opportunity in the US is measured according to Roemer's idea of *leveling the playing field*. More specifically, eight waves are considered from 1999 to 2013 (1999, 2001, 2003, 2005, 2007, 2009, 2011, 2013). [18]

We refer to the sole population of heads aged less than 80 years old. Evidently, the estimation of the impact of circumstance and effort variables on the income generation function requires a population of individuals, not households. In addition, we choose to focus on the sole population of heads because (i) the decisions of non-heads are usually more influenced by family needs

[17] Panel Study of Income Dynamics public use dataset. Produced and distributed by the Institute for Social Research, Survey Research Center, University of Michigan, Ann Arbor, MI (2015).

[18] Income data refer to the previous chronological year (e.g., 1999 income records refer to 1998).

than heads' ones, and (ii) some variables are not available for non-heads (e.g., taxable income).

Income is measured in disposable terms. More specifically, disposable income is defined as total income from labor and capital investments plus public (monetary) transfers minus income and property taxes. [19] Poverty thresholds for each wave are taken from publicly available data of the US Census Bureau. [20]

According to the distinction between natural and social circumstances, we consider four *natural* circumstance variables, i.e. gender, health status in the early years (before 16-17 years old), ethnicity, and IQ score [21] , and two *social* circumstance variables, i.e. economic situation of parents in the early years, and place of origin in the early years. [22]

Remarkably, we consider health status in the early years and not current health, as (i) the latter is more informative about chances given to each individual to invest in human capital accumulation, and (ii) it is less influenced by responsible choices even if, as observed by Sen (2002), the impact of responsible choices may be ambiguous in this field "*since we tend to give priority to good health when we have the real opportunity to choose.*" In addition, as compared to Abatemarco (2015), for our purposes the place of origin is not considered in terms of employment opportunities (i.e. unemployment rate in the place of origin in the early years), but as the characterization of opportunities given to an individual to invest in human capital accumulation whenever willing to. This aspect is captured by using information on the degree of urbanization in the place where the respondent grew up (i.e., farm, rural area, small town, large city).

Binary circumstance variables are defined even if, except for gender, more than two alternatives are available from the PSID. This choice is to be in-

[19] Total income is determined by head's income from labor, asset, trust fund, dividends, and interest. To account for the Federal Income Tax, brackets and tax rates from 1998 to 2012 have been considered. The property tax is entirely imputed to the head when single, whereas it is halved for married heads. To save as many observations as possible, missing values for each income variable (e.g. 1999) have been been replaced by the corresponding value of the same respondent as resulting from the subsequent wave (e.g. 2001) if available. Finally, outliers in the distribution of disposable income have been dropped by eliminating observations below and above the 5th and the 95th centile respectively (e.g. Jarvis and Jenkins 1998).

[20] Data for unrelated individuals available at https://www.census.gov/hhes/www/poverty/data/threshld/.

[21] The introduction of a proxy for cognitive abilities (IQ test) within the set of circumstance variables is not straightforward from a philosophical point of view because a trade-off may occur between different social and ethical objectives, that is, the"*above notion of equality of opportunity may contradict other ethical principles such as self-ownership and freedom*" (Lefranc et al. 2008).

[22] To preserve a sufficient number of observations, missing values are replaced by records available from other waves for the same variable and individual.

tended as a compromise aimed at minimizing the loss of information. On the one hand, an increase in the number of alternatives for each variable would grant more precise information at the individual level. On the other hand, the number of subgroups would exponentially increase with a serious loss of information due to the lack of statistical significance for many subgroups.

As such, 64 subgroups are generated from the combination of six binary circumstances: gender (male [M], female [F]), health in the early years (no health problems [H], health problems [$\bar{H}$]), ethnicity (propitious [E], non-propitious [$\bar{E}$]), IQ score (high [I], low [$\bar{I}$]), economic situation of parents in the early years (pretty well off [W], non-pretty well off [$\bar{W}$]), and place of origin (low [U], high [$\bar{U}$]). [23] Subgroups with less than five observations have been disregarded.

[23] To construct each subgroup, both the PSID family and the PSID individual data files have been used. Cross-sectional sample weights have been considered for each wave. The health variable is slightly changed across waves. From 1999 to 2003 the health variable has been used to distinguish individuals reporting "excellent" and "very good" health with respect to the remaining population answering "good", "fair", or "poor". This definition of the binary variable is mostly expected to identify individuals with no health problems at all. Remarkably, starting from 2005 the questionnaire strongly changed for health in the early years. Individuals are no longer asked about their generic health conditions in the early years, but if they had specific health problems. We assume that health in the early years was not good in the presence of: missed a month or more of school due to health problems, difficulty seeing even with eyeglasses, or diabetes, or chronic ear problems or infections, or epilepsy, or severe headaches/migraines or high blood pressure. For the sole 2005, missing questions are covered by using available information for the same respondent in subsequent waves. With respect to ethnicity, a separating line is drawn between income units reporting "American" or "national origin" (e.g., French, German) or "religious" (e.g., Jewish, Catholic) and the others reporting "hyphenated American", "non-specific Hispanic identify", "racial" or "other". This partition is supported by empirical evidence on average disposable incomes for each group (Abatemarco 2015). IQ test records are obtained from the family data file for the 1968 and the 1972 waves. The latter variables have been associated with the corresponding income units from the 1999 to the 2013 waves using family, not person identifier, i.e., the IQ score is not referred to the single individual but the family. The IQ score is assumed to be low whenever (i) family has been interviewed in both waves, obtaining a score that is below the median score in both waves, or (ii) family has been interviewed in one of the two waves and is positioned below the median score. For the economic situation of parents in the early years, the population has been partitioned by drawing a separating line between individuals reporting "pretty well off" and the remaining population answering "poor" or "average". This definition is primarily aimed at the identification of true benefits in the income generation process due to family origins. Finally, the place of origin is assumed to limit access to profitable investment in human capital if individuals grew up in a "farm", or "rural area", "suburb", or "small town" as compared to opportunities offered by "large cities".

The number of observations varies across waves from a minimum of 4,999 to a maximum of 6,146 records, which is enough to grant statistical significance of the results. [24] In addition, from 1999 to 2013 the population consists of 66-69% male, 76-81% no health problems, 21-27% pretty well off parents, 50-66% propitious ethnicity, 55-57% high IQ scores and 37-40% high urbanization.

Tab. 1: Groups of subgroups average disposable incomes (thousand dollars) and shares by number of favorable circumstances

		1999		**2001**		**2003**		**2005**	
ID	No.F.	(%)	$\frac{\$}{1000}$	(%)	$\frac{\$}{1000}$	(%)	$\frac{\$}{1000}$	(%)	$\frac{\$}{1000}$
1	6	0.02	43.0	0.02	38.5	0.03	44.3	0.02	43.9
2-7	5	0.16	36.1	0.17	39.5	0.16	37.4	0.15	41.0
8-22	4	0.29	29.4	0.30	32.8	0.31	32.1	0.30	34.1
23-42	3	0.29	26.6	0.28	26.9	0.28	28.1	0.30	29.3
43-57	2	0.17	20.2	0.16	22.9	0.15	22.6	0.17	25.6
58-63	1	0.05	15.9	0.05	17.5	0.05	14.9	0.05	17.9
64	0	0.01	13.1	0.01	10.3	0.01	11.2	0.00	16.8
		2007		**2009**		**2011**		**2013**	
ID	No.F.	(%)	$\frac{\$}{1000}$	(%)	$\frac{\$}{1000}$	(%)	$\frac{\$}{1000}$	(%)	$\frac{\$}{1000}$
1	6	0.01	48.6	0.02	44.3	0.02	38.9	0.02	37.4
2-7	5	0.13	42.8	0.14	42.2	0.13	38.9	0.14	40.3
8-22	4	0.32	39.2	0.33	39.1	0.32	35.8	0.33	37.2
23-42	3	0.31	32.2	0.31	33.0	0.31	31.4	0.30	31.9
43-57	2	0.16	27.4	0.15	28.2	0.16	27.0	0.16	28.9
58-63	1	0.06	19.8	0.04	20.4	0.05	21.6	0.05	22.4
64	0	0.01	17.5	0.00	23.7	0.00	18.8	0.00	21.8

Tab.1. Each group of subgroups is characterized by the same number of favorable circumstances (No.F.). Average disposable incomes (thousand US dollars) and frequencies (%) are reported for each group and wave. Source: author's computation on PSID data.

The average disposable income is 27.422 USD in 1999, 29,796 USD in 2001, 29,794 USD in 2003, 31,542 USD in 2005, 34,474 USD in 2007, 35,148 USD in 2009, 32,741 USD in 2011, and 33,962 USD in 2013. Given the focus on the population of heads, these statistics confirm previous evidences in the existing literature (Heathcote et al. 2009).

Income data are disaggregated at the subgroup level in Table 1, where subgroups are grouped on the basis of the number of favorable circumstances from the better-off to the worst-off. Reasonably, subgroup average income is increasing with the number of favorable circumstances. More specifically, to highlight the contribution of each circumstance variable, correlation matrices have been computed between circumstance variables and disposable income (Table A.1, Appendix). By the latter, it turns out that *natural* circumstance variables are much more relevant than *social* ones within the income generation process.

[24] Subgroups with less than five observations are considered statistically insignificant and are eliminated from the computation. This condition occurs for two subgroups only in 1999 wave, i.e. $F\bar{H}E\bar{I}WU$ and $F\bar{H}E\bar{I}W\bar{U}$.

Remarkably, the degree of urbanization in the place of origin and economic conditions of parents in the early years seem to have a non-significant impact on disposable income.

4.2 Results

In this section we discuss the results of the empirical methodology we have proposed for the estimation of Rawlsian inequity. As such, we do not discuss immediate policy implications as this would go beyond the scopes of this paper. On the contrary, the reliability of our results is verified by considering previous evidences on inequality of outcomes and opportunities in the US.

The US Gini index for the distribution of disposable incomes is usually found to be between 0.36 and 0.38 from 1998 to 2004 (Gottschalk and Smeeding 2000; Heathcote et al. 2009). In our analysis, due to the focus on the sole population of heads aged, on average, between 42 and 44 years old, the Gini index is found between 0.405 and 0.419 from 1999 to 2013 (Table 2). This result is consistent with previous findings in Heathcote et al. (2009), where inequality is found to be sensibly larger in the population of singles [25] (income pooling within married households reduces inequality) and is increasing with the age of the sample (early retirements and the experience wage premium usually increase inequality).

	1999	**2001**	**2003**	**2005**	**2007**	**2009**	**2011**	**2013**
G	0.413	0.414	0.410	0.410	0.419	0.405	0.413	0.414
G_R	0.243	0.231	0.232	0.245	0.240	0.239	0.263	0.269
G_R^c	**58.9%**	**55.7%**	**56.5%**	**59.6%**	**57.3%**	**58.9%**	**63.8%**	**64.9%**

Tab.2. Gini's decomposition. Source: author's computation on PSID data.

As reported in Table 2, Rawlsian inequity from 1999 to 2013 is found between 55.7% and 64.9% of overall inequality. This result sensibly differs with respect to previous parametric and non-parametric empirical evidences for Roemer's inequality of opportunity, which is usually found between 15% and 20% (Abatemarco 2015, Pistolesi 2009). Nevertheless, this is just what one may expect; Roemer's view is grounded on the legitimation of income gaps with respect to the sole origins of inequality, whereas Rawlsian inequity is defined by accounting for both the origins and the implications of income inequality.

Additional information can be obtained by considering the dynamics of inequity from 1999 to 2013. Starting from 2007 a rapid increase in the absolute and relative amount of inequity can be observed. This is evidently determined

[25] Evidently, the population of singles is not the same as the population of heads, but the latter definitely accentuates the share of singles.

by the financial crisis in 2007, whose major effects are detected from 2009 on. The main rationale behind the impact of this crisis on Rawlsian inequity appears immediately from Table 3, where the contribution of FEO and DP are computed separately. [26]

	1999	**2001**	**2003**	**2005**	**2007**	**2009**	**2011**	**2013**
G^c_R	(58.9%)	(55.7%)	(56.5%)	(59.6%)	(57.3%)	(58.9%)	(63.8%)	(64.9%)
G^c_R(FEO)	28.1%	25.5%	27.3%	31.8%	30.8%	31.7%	35.9%	37.4%
G^c_R(DP)	43.8%	41.7%	42.1%	42.3%	41.7%	43.3%	47.4%	49.6%
G^c_R(DP1)	9.3%	8.6%	8.2%	8 .4%	9.1%	9.1%	10.7%	13.1%
G^c_R(DP2)	39.5%	37.7%	38.5%	38.9%	38.5%	40.7%	44.5%	46.9%

Tab.3. G^c_R(FEO) and G^c_R(DP) indicate the shares of illegitimate income disparities whenever FEO and DP are separately accounted for respectively. Similarly, G^c_R(DP1) and G^c_R(DP2) account for illegitimate income disparities due to failure of (3.2.i) and (3.3.i) respectively. Source: author's computation on PSID data.

Both FEO and DP have sensibly increased in the latter three waves. However, by considering separately the contribution of "goodness for incentives" (DP1) and "goodness for access" (DP2), it can be observed that the financial crisis has mostly worsened the existing poverty conditions, so that a larger share of income inequality is found to cause social exclusion and limited access to profitable investments in human and physical capital.

Remarkably, in addition to the (expected) impact of the financial crisis on poverty, and so Rawlsian inequity, Table 3 also highlights a relevant contribution of FEO, whose increase from 1999 is even stronger than DP's one. According to our framework, this means that the financial crises has been paid relatively more by individuals with poor parental origins in rural areas.
Finally, the U-shaped pattern of DP1 in Table 2 suggests that the financial crisis has seriously jeopardized the capacity of the economic system to reward better responsible choices. A discussion on the motivations of this result, although of crucial importance for the design of optimal redistributive policies, is beyond the aims of this paper. For our purposes, it is enough observing that this result confirms previous evidences on the U-shaped pattern of Roemer's inequality of opportunity (Abatemarco 2015).

5 Conclusive Remarks

Equality is a neutral concept whose interpretation in statistical and normative terms is straightforward. Equity, instead, inevitably inherits value judg-

[26] We report the contribution of FEO and DP, as considered separately, and not the decomposition of the Rawlsian inequity index, which is decomposable. This is evident itself when observing that the sum of the two components taken separately do not sum up to the overall index of Rawlsain inequity.

ments on the distinction between *fair/good* and *unfair/bad* inequalities. To the extent that no valid judgments are agreed by which some inequalities may be said to be fair/good, or some equalities are said to be unfair/bad, equality is said to be equitable or just.

The existing literature is full of theories of justice discerning equity from equality. Nevertheless, empirical investigations have been almost generally concerned with the measurement of equality of opportunity as intended by Roemer (1993, 1998). The success of Roemer's ideal of *leveling the playing field* is, for some (e.g., Fleurbaey 2001), originating from the increasing concern for '*individual responsibility*' characterizing the Protestant culture. However, to our opinion, part of this success also originates from the peculiarities of Roemer's equality of opportunity which, in the era of *publish-or-perish*, makes it more suitable for empirical investigations.

In this paper, Rawlsian *fair equality of opportunity* and *difference principle* have been interpreted in such a way as to render Rawlsian equity *pragmatically* workable in empirical settings. Undeniably, Rawls' theory of justice is less user-friendly and much more information demanding than other approaches, but, to our opinion, this should not be a valid reason for abandonment.

A methodology for non-parametric estimation of Rawlsian inequity has been proposed. The latter approach has been implemented to calculate the contribution of Rawlsian inequity to overall income inequality in the USA from 1999 to 2013. Iniquitous income disparities are found to account for 56-65% of overall outcome inequality, which more than doubles the usual 15-20% of iniquitous income disparities as estimated for Roemer's inequality of opportunity (Abatemarco 2013, Pistolesi 2009). Even worst, our analysis suggests that, due to the recent financial and economic crisis, the huge amount of inequity is found to be rapidly increasing in the last waves.

From a policy perspective, we wish to emphasize two major aspects. First, as it appears from our empirical findings, distributive inequity is a very relevant problem, and, today more than yesterday, policy-makers should better take care about the promotion of equity in the income distribution. Second, egalitarian policies cannot be aimed exclusively to the promotion of equality of opportunity intended as the compensation of outcome inequalities due to circumstances, and legitimation of inequalities originating from responsible choices. This is valuable but risky, because welfare improvements in terms of equality of opportunity may be offset by increasing subordination, exploitation, and humilation.

Appendix

Tab. A.1: Correlation matrices

1999	*Income*	*Gender*	*Health*	*Urbanization*	*Parents*	*Ethnicity*	*IQ Score*
Income	1						
Gender	0.28	1					
Health	0.14	0.09	1				
Urbanization	0.01	-0.07	-0.01	1			
Parents	0.06	-0.01	0.04	0.05	1		
Ethnicity	0.17	0.13	0.06	-0.08	-0.01	1	
IQ Score	0.18	0.10	0.07	0.00	0.05	0.25	1
2001	*Income*	*Gender*	*Health*	*Urbanization*	*Parents*	*Ethnicity*	*IQ Score*
Income	1						
Gender	0.27	1					
Health	0.15	0.08	1				
Urbanization	0.00	-0.08	-0.01	1			
Parents	0.10	0.03	0.02	0.05	1		
Ethnicity	0.16	0.13	0.07	-0.10	-0.01	1	
IQ Score	0.19	0.10	0.07	-0.00	0.04	0.26	1
2003	*Income*	*Gender*	*Health*	*Urbanization*	*Parents*	*Ethnicity*	*IQ Score*
Income	1						
Gender	0.27	1					
Health	0.11	0.06	1				
Urbanization	0.01	-0.09	-0.02	1			
Parents	0.08	0.01	0.04	0.03	1		
Ethnicity	0.14	0.12	0.05	-0.10	-0.01	1	
IQ Score	0.17	0.10	0.06	-0.00	0.03	0.25	1
2005	*Income*	*Gender*	*Health*	*Urbanization*	*Parents*	*Ethnicity*	*IQ Score*
Income	1						
Gender	0.27	1					
Health	0.05	0.04	1				
Urbanization	-0.01	-0.08	-0.01	1			
Parents	0.09	0.01	0.01	0.03	1		
Ethnicity	0.11	0.10	-0.03	-0.12	-0.01	1	
IQ Score	0.18	0.11	-0.02	-0.03	0.03	0.21	1

Tab. A.1: Correlation matrices

2007	*Income*	*Gender*	*Health*	*Urbanization*	*Parents*	*Ethnicity*	*IQ Score*
Income	1						
Gender	0.27	1					
Health	0.08	0.10	1				
Urbanization	-0.02	-0.09	-0.01	1			
Parents	-0.01	-0.07	-0.02	0.02	1		
Ethnicity	0.11	0.10	-0.06	-0.12	-0.00	1	
IQ Score	0.18	0.11	-0.02	-0.03	-0.01	0.21	1
2009	***Income***	***Gender***	***Health***	***Urbanization***	***Parents***	***Ethnicity***	***IQ Score***
Income	1						
Gender	0.24	1					
Health	0.07	0.08	1				
Urbanization	0.04	-0.10	-0.01	1			
Parents	-0.03	-0.05	-0.01	0.05	1		
Ethnicity	0.11	0.11	-0.07	-0.12	0.00	1	
IQ Score	0.18	0.11	-0.02	-0.05	-0.01	0.19	1
2011	***Income***	***Gender***	***Health***	***Urbanization***	***Parents***	***Ethnicity***	***IQ Score***
Income	1						
Gender	0.23	1					
Health	0.06	0.08	1				
Urbanization	-0.06	-0.11	-0.01	1			
Parents	-0.05	-0.06	-0.01	0.06	1		
Ethnicity	0.07	0.11	-0.06	-0.12	0.05	1	
IQ Score	0.18	0.11	-0.03	-0.06	-0.01	0.18	1
2013	***Income***	***Gender***	***Health***	***Urbanization***	***Parents***	***Ethnicity***	***IQ Score***
Income	1						
Gender	0.23	1					
Health	0.05	0.10	1				
Urbanization	-0.08	-0.09	-0.01	1			
Parents	-0.04	-0.05	0.01	0.06	1		
Ethnicity	0.8	0.10	-0.06	-0.11	0.05	1	
IQ Score	0.17	0.10	-0.03	-0.07	-0.02	0.17	1

References

Abatemarco, A.:, Measuring inequality of opportunity through between-group inequality components, *Journal of Economic Inequality* **8**, 475 – 490 (2010).

Abatemarco, A.: A Gini approach to inequality of opportunity: evidence from the PSID, *Empirical Economics* **49** (4), 1497 – 1519 (2015).

Asian Development Bank (ADB): Fighting Poverty in Asia and the Pacific: The Poverty Reduction Strategy of the Asian Development Bank, Manila, Philippines (1999).

Aghion, P., Caroli, E., and Garcia-Peñalosa, C.: Inequality and Economic Growth: The Perspective of the New Growth Theories, *Journal of Economic Literature*, **37** (4), 1615 – 1660 (1999).

Almas, I., Cappelen, A.W., Lind, J.T, Sorenses, E.O. and Tungodden B.:, Measuring unfair (in)equality, *Journal of Public Economics* **95**, 488 – 499 (2011).

Alesina, A., and Rodrik, D.: Distributive Politics and Economic Growth, *The Quarterly Journal of Economics* **109** (2), 465 – 490 (1994).

Anderson, E.:, What is the point of equality?, *Ethics* **109**, 287–337 (1999).

Arneson, R.J.:, Equality of opportunity for welfare defended and recanted, *Journal of Political Philosophy* **7**(4), 488–497 (1999).

Banerjee, A.V., and Duflo, E.: Inequality and Growth: What Can the Data Say?, *Journal of Economic Growth*, **8**, 267–299 (2003).

Barro, R.J., and Lee, J.-W.: Sources of Economic Growth, *Carnegie-Rochester Conference Series on Public Policy*, **40** (1994).

Barro, R.J.: Determinants of Economic Growth: A Cross-Country Empirical Study, *The Economic Journal*, **108**(450), 1607–1609 (1998).

Berg, A., Ostry, J.D., and Zettelmeyer, J.: What Makes Growth Sustained?, *Journal of Development Economics*, **98**(2), 149–166 (2012).

Bourguignon, F., and Verdier, T.: Is financial openness bad for education? A political economy perspective on development, *European Economic Review*, **44**(4-6), 891–903 (2000).

Bourguignon, F.: Poverty-growth-inequality triangle: With some reflections on Egypt, Distinguished Lecture Series, No. 22, Cairo, Egypt: Egyptian Center for Economic Studies (2005).

Bourguignon, F., Ferreira, F.H.G. and Menéndez, M.:, Inequality of opportunity in Brazil, *Review of Income and Wealth* **53**, 585–618 (2007).

Chaudhuri, S., and Ravallion, M.: Partially Awakened Giants: Uneven Growth in China and India, *Policy Research Working Paper* 4069, (2006).

Checchi, D., Peragine, V. and Serlenga, L.:, Income inequality and opportunity inequality in Europe, *Rivista di Politica Economica* **98**, 263–292 (2008).

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

Cowell, F.:, On the structure of additive inequality measures, *Review of Economic Studies* **XLVII**, 521–531 (1980).

Dagum, C.:, A new approach to the decomposition of the Gini income inequal-

ity ratio, *Empirical Economics* **22**, 515–531 (1997).

de la Croix, D., and Doepke, M.: Inequality and Growth: Why Differential Fertility Matters, *American Economic Review*, **93**(4), 1091–1113 (2003).

Dollar, D., and Kraay, A.: Growth Is Good for the Poor, *Journal of Economic Growth*, **7**(3), 195–225 (2002).

Dworkin, R.: What is equality. Part 1: Equality of welfare, *Philosophy and Public Affairs* **10**, 185–246 (1981a).

Dworkin, R.: What is equality. Part 2: Equality of resources, *Philosophy and Public Affairs* **10**, 283–345 (1981b).

Easterly, W.: Inequality does cause underdevelopment: Insights from a new instrument, *Journal of Development Economics* **84**, 755–776 (2007)

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

Fleurbaey, M.:, Egalitarian opportunities, *Law and Philosophy* **20**, 499–530 (2001).

Fleurbaey, M. and Maniquet, F.:, Compensation and responsibility, *in Arrow K., Sen A. and Suzumura K. (Eds), Handbook of Social Choice and Welfare*, Elsevier, New York, (2006).

Forbes, K.J.: reassessment of the relationship between inequality and growth, *American Economic Review*, **90** (4), 869–887 (2000).

Galor, O., and Zeira, J.: Income Distribution and Macroeconomics, *Review of Economic Studies* **60**, 35–52 (1993).

Galor, O., and Moav, O.: From Physical to Human Capital Accumulation: Inequality and the Process of Development, *Review of Economic Studies* **71**, 1001–1026 (2004).

Gottschalk, P. and Smeeding, T.M.:, Empirical evidence on income inequality in industrialized countries, *in A. Atkinson and F. Bourguignon (eds), Handbook of Income Distribution* , Elsevier Science, Amsterdam, (2000).

Halter, D., Oechslin, M., and Zweimüller, J.: Inequality and Growth: The Neglected Time Dimension, Journal of Economic Growth, **19**, 81–104 (2014).

Heathcote, J., Perri, F. and Violante, G.L.:, Unequal we stand: an empirical analysis of economic inequality in the United States, 1967-2006, *NBER Working Paper* (15483) (2009).

Jarvis, S., and Jenkins, S. P.: How much income mobility is there in Britain?, *The Economic Journal*, **108**(447), 428–443 (1998).

Kaldor, P.A.: A Model of Economic Growth, *The Economic Journal*, **67**(268), 591–624 (1957).

Kakwani, N., and Pernia, E.: What is pro-poor growth. *Asian Development Review*, **16**(1), 1–22 (2000).

Klasen, S.: Levels and Trends in Absolute Poverty in the World: What we know and what we dont, in (eds.) Mack E., Schramm M., and Pogge T., *Absolute poverty and Global Justice*, London: Ashgate, 21–36 (2009).

Lefranc, A., Pistolesi, N. and Trannoy, A.:, Inequality of opportunities vs. inequality of outcomes: are western societies all alike?, *Review of Income*

and Wealth **54**, 513 – 546 (2008).

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

Lewis, W.A.: Theory of Economic Growth, Routledge Library Editions, (2013).

Michelback, P.A., Scott J.T., Matland R.E., and Bornstein B.H.: Doing Rawls Justice: an Experimental Study of Income Distribution Norms, *Americal Journal of Political Science* **47**, 523–539 (2003).

Mirrlees, J.A.: An Exploration in the Theory of Optimum Income Taxation, *Review of Economic Studies*, **38**(2), 175–208 (1971).

Persson, T., and Tabellini, G.: Federal Fiscal Constitutions: Risk Sharing and Redistribution, *The Journal of Political Economy*, **104**(5), 979–1009 (1996)

Perotti, R.,: Growth, Income Distribution, and Democracy, *Journal of Economic Growth*, **1-2**, June (1996).

Pistolesi, N.:, Inequality of opportunity in the land of opportunities, 1968-2001, *Journal of Economic Inequality* **7**, 411–433 (2009).

Ramos, X. and Van de gaer, D.:, Empirical approaches to inequality of opportunity: principles, measures, and evidence, EQINEQ WP 2012-259 (2012).

Ravallion, M., and Chen, S.: Measuring Pro-poor Growth, *Economic Letters*, **78**(1), 93–99 (2003).

Ravallion, M.: Pro-poor Growth: A Primer, Development Research Group, The World Bank, Washington DC (2004).

Rawls, J.:, A Theory of Justice, *Massachusetts: Harward University Press*, (1971).

Rawls, J.: Justice as Fairness: A Restatement, E. Kelly (ed.), Cambridge, MA: Harvard University Press, (2001).

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

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

Rosenfeld, M.: Substantive Equality and Equal Opportunity: A Jurispridential Appraisal, *California Law Review*, **74**(5), 1687–1712 (1986).

Sen, A.: Inequality Re-examined, Oxford: Clarendon Press (1992).

Sen, A.: Social Justice and the Distribution of Income, in ed. Atkinson A.B. and Bourguignon F., "Handbook of Income Distribution", North-Holland (2000).

Sen, A.:, Why health equity?, *Health Economics*, **11**, 659–666 (2002).

Schultz, T.W.: Investing in people: Schooling in low income coun tries, *Economics of Education Review*, **8**(3), 219–223 (1989).

Sugden, R.:, Welfare, resources and capabilities: A review of inequality reexamined by Amartya Sen, *Journal of Economic Literature*, **31**, 1947–1962 (1993).

Wenar, L.: John Rawls, *Stanford Encyclopedia of Phylosophy*, http://plato.stanford.edu/entries/rawls/ (2012).

Westen, P.: The concept of equal opportunity, *Ethics*, **95**(4), 837–850 (1985).
White, H., and Anderson, E.: Growth versus Distribution: Does the pattern of growth matter?, *Development Policy Review*, **19**(3), 267–289 (2001).