

FAIRNESS IN SKILL ACQUISITION

P. BRUNORI, P. LUONGO

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P. Brunori, P.Luongo
University of Bari

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Abstract

In this paper we try to determine which policy implements fairness in the distribution of educational outcomes, in a framework in which skills arise from the combination of circumstances, effort and transfers, and determine individual utility. Our definition of fairness relies on two ethical principles, liberal reward and compensation, which have been well defined and studied by many authors in the last decade, and is linked to the philosophical debate that, since the late '60, has debated about the meaning of educational opportunities. According to this definition, to be fair an allocation should remove inequalities not due to individuals' responsibility.

1 Introduction

In the literature on fairness in income distribution, education is considered as a fundamental source of opportunity for income acquisition, as it determines workers' skills that can be sold for a wage in the labour market. Education, relative preferences for leisure and income, and government transfers are the unique source of income opportunity. In this framework education is considered a circumstance beyond individuals' control. Consequently, the solutions proposed to implement fairness aim at removing inequalities in income due to differences in education, and prescribe no intervention for disparities due to preferences. However, a growing literature, based on the same definition of fairness, considers education the result of circumstances and responsibility rather than purely circumstances. If this is the case, if variability in education is partly due to responsibility, some of the skill heterogeneity cannot be considered unfair. At the same time, unfair educational inequalities should be removed. Moreover, we may be interested in a fair distribution of education *per se*, and not only because it determines future wage and income. Having an intrinsic value, education should be itself distributed fairly. In what follows we adopt this approach and characterize a fair policy as the one which delivers a fair allocation of educational attainments and is neutral in the labour market.

The implementation of fairness in education poses a number of problems. First of all, skills are not transferable resources, they arise from the combination

of many inputs, like family environment, innate abilities, resources invested by the government, socioeconomic background, and so on. A policy whose aim is to reach fairness in educational outcomes needs to act on these factors, but most of them are not transferable as well. A possible way, we suggest, is to reduce the cost of education, and then let individuals freely choose the amount of skills they want to acquire.

Once the factors to intervene on are defined, we need to decide on which principles of distributive justice we want to rely on in the definition of a fair redistributive policy in education. From a normative point of view, fairness in education can be defined according to different principles of distributive justice, like egalitarianism or utilitarianism, just to mention two, each one prescribing different actions. We base our definition of fairness, and then our redistributive policies, on the Compensation principle, according to which inequality not due to responsibility should be eliminated, and the liberal Reward principle, which prescribes no intervention on inequalities due to individual responsibility.

As proved by Fleurbaey and other authors in different contexts, to rely on a responsibility-sensitive egalitarian definition of fairness implies to take into account the existing tension between the reward and the compensation principles, which generally cannot be solved. To overcome this issue we follow Fleurbaey's solutions which allow us to design two policies, one gives precedence to reward and the other to compensation. We axiomatically characterize these solutions in the specific context of education, showing that they have already been implemented in many Western society and refer to two different political view.

In this paper we adopt a mesojustice¹ approach to fairness in education. This means that we consider education as a fundamental item that concern everybody and we show what kind of policies can deliver a fair distribution of education. We are nevertheless aware of the partiality of this exercise. Education is a good that interacts with many other individuals welfare dimensions. For example, it is an instrumental good that serves to produce future earning abilities, hence it is strictly related to distributive justice in the labour market. Our conclusions may be considered as a benchmark for those who adopt a macrojustice approach and want to include education in the set of valuable goods that have to be redistributed fairly. Moreover, a policy that implements fairness in education could have prohibitive costs. A possible solution, we suggest, could be the coordination of education and tax policies able to deliver fairness in income distribution, derogating to fairness whenever efficiency requires it. However, the characterization of this solution is left for future research.

The rest of the paper is organized as follows: section 2 provides a brief review of the philosophical debate on the definition of Equality of Educational Opportunities; the analytical framework is introduced in section 3 while our solutions are characterized in section 4, which also provides a more complete definition of fairness. Section 5 suggests possible links between our results and fairness in taxation, and section 6 concludes.

¹Kolm suggests this name for such an approach underlining its relevance (Kolm, 2005).

2 Equality of Opportunity and Fairness in Education

The philosophical debate about education has often interpreted “*the general claim that everyone has an equal right to education, [...] to mean everyone has an equal right to an equal opportunity for education*” (Warnock, 1975, p. 4). Although very popular among academics and policy makers, the term equality of educational opportunity (EEOp hereafter) has been adopted to refer to very different ideas of fairness in education. Some authors interpreted EEOp as the absence of legal barriers in the access to education, others as a substantial equality of educational achievements. This diversity of interpretations led Coleman to claim “*But if equality of educational opportunity means neither equality of output nor equality of input resources, then what does it mean? The answer, I have concluded after examining the issue for a long time, is that it is not a meaningful term.*” (Coleman, 1975, p. 27). However, we believe that the recent development of a responsibility sensitive theory of distributive justice allows us to formulate a more precise definition of EEOp.

An outcome-based EEOp definition is grounded on the value associated to education as an instrumental good. Education is generally seen as the main source of opportunities in the adult life and, therefore, the equalization of education implies the equalization of welfare opportunities (Howe, 1989). However, the requirement of equal education for all may bring a number of problems. First, equal education requirement does not say anything about the absolute level of the equally distributed education. Such a definition would consider fair a distribution in which none get any education. Second, if some desired target of education is set, this comes at increasing costs for less talented individuals, which could be prohibitive for individuals cognitive-disabled. The implementation of equality in education attainments is therefore ethically undesirable for at least three reasons. Firstly, it requires to allocate enormous resources to improve school performances of disabled pupils. This could come at the cost of years of frustrating training for disables which may reduce, rather than increase, their welfare. Secondly, to target less talented pupils could reduce resources devoted to more talented students and this will result in leveling downward cognitive abilities of talented individuals, which may also be considered ethically repugnant (Brighouse, 2006). A last problematic point in this definition of EEOp is the absence of a role for individuals’ autonomy. Equality of educational outcome will not only force individuals with lower preference for education to acquire more education, but it would also dampen students willing and able to reach higher education level.

The adoption of the alternative view that equality of opportunity means absence of legal barriers is not less problematic. This is Friedman’s view when he claims that public intervention in education cannot be justified by redistributive purposes but only to correct market failures² (Friedman and Friedman, 2002). However, equality of access *de jure* does not prevent segregation and inequality

² Among which the parents’ inability to educate their children is included.

in chances *de facto* (Howe, 1992). Moreover, the absence of legal barriers may leave unsatisfied those who consider that equal educational opportunity implies, for example, to neutralize the effect of parental wealth on education perspectives. The influence of socioeconomic background on education has traditionally been the focus of EEOp literature. A principle often stated also by affirmative actions, like the recent "No Child Left Behind Act" of 2001 in US.

A stronger requirement consists in imposing individual education prospect to be independent from socioeconomic condition and being function of individual talent and effort. This meritocratic approach is consistent with a substantial degree of state intervention and targeting of most talented students and pupils coming from worst off socioeconomic environments (Brighouse and Swift, 2008). As we will see, this principle has been considered unfair because it implicitly recognizes innate ability as a characteristic to be rewarded.

Often EEOp is interpreted in a more substantial way. An example of this is presented by Brighouse: "*An individual's prospects for educational achievement should be a function neither of that individual's level of natural talent nor of her social class background*" and named "*radical principle of education equality*"³ (Brighouse, 2009b). This EEOp definition is based on the compensation principle, according to which all individuals should face the same set of education possibilities, independently from their socioeconomic background and their genetic endowment. However, it does not say anything about what the common set of possibilities should contain, admitting again an empty set for all. What is missing is a clear definition of what an individual prospect for educational achievement is. Given that educational outcome should be independent from circumstances, such as natural talent and socioeconomic background, how should it vary among individuals sharing the same circumstances?

Roemer, following a solid philosophical literature (Dworkin, 1981a,b; Cohen, 1989), underlines how to define fairness in education, as EEOp implies to recognize that individual outcomes are the joint result of circumstances beyond individual control, and choices (Roemer, 1998). In Roemer's approach, inequalities due to circumstances are unfair while inequalities due to choices are justified by individual responsibility and therefore have to be considered unproblematic. To achieve equality of opportunity an education system must neutralize the effects of circumstances on the educational attainments and let unaltered the effects of choices. It must make all individuals able to freely chose from the same set of possible education attainments, where the set of attainments is fully defined by individuals' effort decisions. This EEOp definition is what Fleurbaey calls "fairness in a responsibility sensitive egalitarian perspective" (Fleurbaey, 2008). As he underlined, this definition is based on two distinct principles: compensation and reward. The first prescribes to remove inequality in education level due to circumstances beyond individual control, the second to implement a policy neutral with respect to differences due to choices.

If we think about the practical implementation of this principle of equality of

³Interestingly Brighouse cuts the reference to effort that can be instead found in other contributions (2009a).

educational opportunity, we realize that it is nearly as unachievable as equality in education outcomes. By requiring that the set of possible choices of education achievements be the same for all individuals, it faces the same difficulties as implementing equality of achievement, with the sole difference of restricting the problem to those that have strong preferences for education. That is, we must bring less talented individuals at the same education level of more talented if they have the same preferences for education.

The nature of the tension between equality of educational opportunity and efficiency can be better understood if we analyze separately inequalities due to different social background and inequalities due to innate abilities, i.e. if we consider the differences in education prospects for individuals with different socioeconomic backgrounds. As stated by Okun “*A vigorous social effort to narrow the educational financing gap can improve both equality and efficiency.*” (Okun, 1975, pag. 81). When, instead, we consider inequality due to innate ability, as underlined by De Fraja (2001), a particularly harsh conflict between efficiency and equality in education arises. This tension stems from the fact that investing in talented individuals increases aggregate available resources, and therefore resources available to implement equality. This conflict may prescribe to widen rather than reduce differences in education prospects of individuals with different innate abilities (De Fraja, 2001).

Another possibility is to define fairness excluding the second source of unfair inequality. If, for example, we believe that innate ability should be rewarded in the skills acquisition process, we could simply require equality of educational opportunity including ability among responsibility characteristics, and this would take us back to the meritocratic definition of fair education⁴. However, one may ask how justifiable it is to consider talent as a choice variable rather than as a circumstance.

Alternatively, one can consider the EEOp distribution as the ideal distribution, and implement the policy that minimizes the maximum distance from this distribution (where distance can be defined in a number of ways). In what follow we will adopt the Roemer-Flerubaey’s approach to fairness in education. We are aware that this EEOp definition does not solve a number of issues. First of all, the fact that the value associated to education is deeply linked to the equality of opportunity perspective. Not only because of the role of education in producing opportunities in the adult life. A theory of justice based on both equality and responsibility must assume individuals able to judge the consequences of their action, as the idea of being responsible cannot be disentangled from the judgement ability. Education is probably among the most relevant ingredients for the development of judgment ability. Therefore some universal education level is the cornerstone of any theory of justice based on responsibility. It is not surprising then that a number of authors have claimed that equal opportunity is equal to education (Howe, 1989). The ethical principle that prescribes a minimum universal level of education goes further beyond the problem

⁴This is quite similar to what many authors do when they calculate inequality of opportunity residually after controlling for a number of socioeconomic circumstances (Peragine and Serlenga, 2008).

of children cognitive ability and compulsory education. Gutmann (1987) and Curren (1995), in two rather distinct ways, have proposed that a fair education system must guarantee that all individuals achieve at least a threshold level of education outcome (that in Gutmann’s view is the level that allows individuals to effectively participate in the democratic process, while for Curren it is the threshold that guarantees “social inclusion” (Gutmann, 1987; Curren, 1995). In this perspective large transfers of resources to children with low talent and poor socioeconomic background will be justified. All inequalities above the threshold will instead be considered unproblematic. Warnock as well agrees: “We hold that everyone should have an equal right to two different things; to a certain amount of education, and the chance or opportunity to get more than this if they want it.” (Warnock, 1975, p. 5). In what follow, we will consider unproblematic the universal minimum education requirement. Our choice is arbitrary, however, at least in the majority of western countries, this issues may be solved by compulsory education provisions. The second unsolved issue concerns efficiency. We do not know either how exactly the cost of education acquisition can be lowered, nor how expensive it would be. We are therefore neglecting to investigate what kind of constraints can limit our policies. We believe that the analysis of this issues would lead us to discuss, in a macrojustice perspective, how redistribution of skills and redistribution of other goods, such as income, can be traded off, and this interesting topic is left for future research.

3 Model

The population of interest is composed by "young adults", i.e. individuals who have acquired the level of education which allows them not only to make a decision, but also to correctly evaluate the consequences of their choices, which is an essential assumption if we want to consider agents responsible for their preferences. We assume that cognitive abilities are developed in a previous period, that we do not model, in which individuals cannot be held responsible for their choices and all the variables determining their final achievements are considered circumstances.

We model the period of formal education, when individuals go to school or university, and responsibility starts to "play a role". The outcome of interest is individuals’ utility, u . It depends on educational outcomes, which in turn are affected by the cost of skill acquisition that is outside the sphere of individuals’ responsibility (*circumstances*), on their preferences over skill acquisition and leisure, for which agents are held responsible (*effort*) and, finally, on government transfers.

Formally, let $N = \{1, \dots, n\}$ be the population of interest. The skill level acquired by each individual $i \in N$ is causally determined by two classes of variables: (i) the socioeconomic background in which he grows up, b_i^5 , and

⁵We do not explicitly consider innate abilities in this model. Anyway, we can think of b_i as a variable representing both the socioeconomic background and individuals’ talent. This simplification does not affect our final results if we assume that background and innate abilities

(ii) his preferences over skill acquisition and leisure, f_i . A profile of relevant characteristics is $p = \{(b_1, f_1), \dots, (b_n, f_n)\} \in P$, where P is the domain of profiles. The skill acquired by each individual is denoted by $s_i = s(b_i, f_i)$, where $s : \mathbb{R}^2 \rightarrow \mathbb{R}$ is a function which assigns individual's skill to a combination of circumstances, b_i , and responsibility, f_i . In what follows we denote with s_i the skill level of individuals with background b_i and preferences f_i .

The socioeconomic background affects the cost of skill acquisition, which we denote with $\beta_i = \beta(b_i, s_i)$, where $\beta : \mathbb{R}^2 \rightarrow \mathbb{R}$. The properties of this function are defined in the following assumption

Assumption 1: The function β satisfies the following properties:

1. $\forall s \in \mathbb{R}_+, \frac{\partial \beta(b_i, s_i)}{\partial s_i} \geq 0; \frac{\partial^2 \beta(b_i, s_i)}{\partial s_i^2} \geq 0; \beta(b_i, 0) = 0$
2. $\exists i, j \in N$ such that if $b_i \geq b_j \Rightarrow \frac{\partial \beta(b_i, s)}{\partial b_i} \leq \frac{\partial \beta(b_j, s)}{\partial b_j} \quad \forall s \in \mathbb{R}_+$
3. $\forall s, s' \in \mathbb{R}_+$ with $s > s'$, the difference $\beta(b, s) - \beta(b, s')$ decreases as b increases.

Properties 1 and 2 simply say that the cost function is increasing in its second argument and decreasing in the first. The first one is intuitive, the more the education acquired, the higher the cost. As regard the second, it is justified if we think of b_i as the result of parents' income and/or preferences for investment in education of their children, the richer the family, the lower the cost of studying for children as the trade off between spending in education and other kind of consumption becomes weaker with the increase in available income, and also the credit constraint becomes weaker.

Individual preferences over skill acquisition and leisure are represented by the function $f_i = f(s_i, h_i)$, where s_i and h_i are respectively the skill level and the time subtracted to leisure. The properties of the function f_i , with $f : \mathbb{R}^2 \rightarrow \mathbb{R}$, are defined in Assumption 2

Assumption 2: The function f satisfies the following properties:

1. $\forall s \in \mathbb{R}_+, \frac{\partial f(s_i, h_i)}{\partial s} > 0; \frac{\partial^2 f(s_i, h_i)}{\partial s^2} < 0$
2. $\exists i, j \in N$ such that if $s_i > s_j \Rightarrow \frac{\partial f_i}{\partial s} > \frac{\partial f_j}{\partial s}$

In this framework skills are acquired by individuals evaluating cost and return to effort and it is not reasonable to assume redistribution of them among agents, as they are not transferable. An allocation policy is then a reduction of education costs faced by individuals via an allocation transfer $r = \{r_1, \dots, r_n\} \in \mathbb{R}^n$. An education system is $e = \{(p_1, r_1), \dots, (p_n, r_n)\} \in E$, where E is the domain of economies, and an allocation rule is a correspondence A such that $\forall p \in P, A(p) \subseteq E$.

influence the cost of skill acquisition in the same way. It does not seem a strong assumption, as it could be reasonable to think that, as a better background, grater abilities also imply a lower cost of skill acquisition.

At the end, the utility of individual i is fully determined by circumstances, responsibility and transfers:

$$u_i = u(b_i, f_i, r_i) = f_i - \beta_i + r_i \quad (1)$$

We assume that there is an infinite amount of resources the social planner can redistribute. Even if unrealistic, this assumption is retained for the moment, as it avoids strange negative transfers among agents, which would force some of them to choose a level of skill lower than the one they would acquire if the price charged was the market price

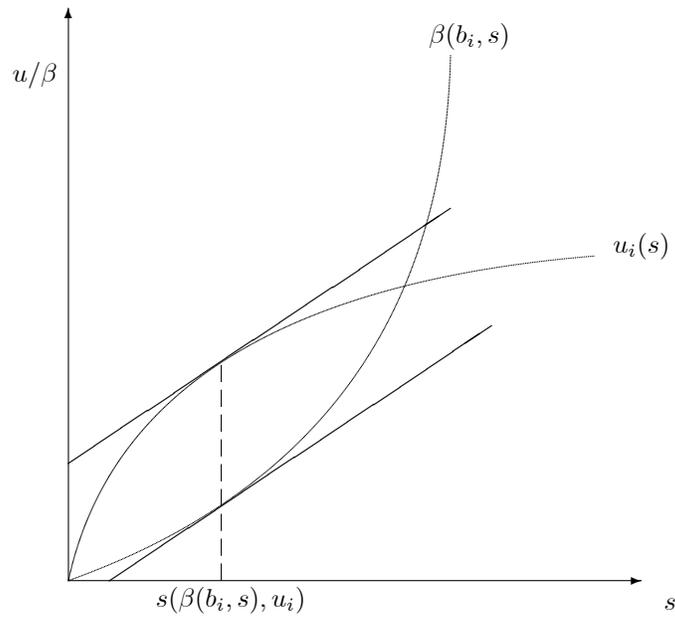


Figure 1: Individual i schooling choice.

4 Redistribution in a Fairness Perspective

4.1 Definition of Fairness

In a responsibility-sensitive egalitarian approach fairness should imply both reward for responsibility choices and compensation for circumstances beyond individuals control. Hence, a redistributive scheme can focus on responsibility characteristics, and be based on the *liberal Reward Principle* (among possible definition or reward), or on circumstances, and use the *Compensation Principle*.

The liberal Reward Principle requires that consequences of responsibility characteristics should be unproblematic. In our framework it could be intended as neutrality with respect to inequality in utility due to agents' preferences. Two axioms, among others, can be used in order to express this principle:

Axiom 1 *Equal Treatment for Equal Background (ETEB)*: For all $p \in P$ and for all $e \in A(p)$, if $\exists i, j \in N$ such that $b_i = b_j$, then $r_i = r_j$

Axiom 2 *Equal Treatment for Reference Background (ETRB)*: $\exists \tilde{b}$ such that, for all $p \in P$ and for all $e \in A(p)$, if $\forall i, j \in N$, $b_i = \tilde{b}$, then $r_i = r_j$

The first axiom (**ETEB**) requires the redistributive mechanism to be independent of individuals preferences, hence, according to **ETEB**, two individuals with identical background should receive the same transfer. **ETRB** weakens this axiom, as it requires equality of treatment only for a given value of background. It requires equal transfers only for individuals whose background is equal to a particular value.

The Compensation Principle implies that differences in outcomes due to circumstances should be considered unfair, and here it requires inequalities in utility not due to individuals' preferences to be compensated. This principle can be expressed by using the following axioms:

Axiom 3 *Equal Utility for Equal Preferences (EUEP)*: For all $p \in P$ and for all $e \in A(p)$, if $\exists i, j \in N$ such that $f_i = f_j$, then $u_i = u_j$

Axiom 4 *Equal Utility for Reference Preferences (EURP)*: $\exists \tilde{f}$ such that, for all $p \in P$ and for all $e \in A(p)$, if $\forall i, j \in N$, $f_i = \tilde{f}$, then $u_i = u_j$

EUEP requires two individuals with identical preferences over skill acquisition and leisure to end up with the same utility, while **EURP** requires equality of utility level only when individuals' preferences take a particular value⁶.

In the definition of allocation rules, the tension between the Compensation and the Reward Principles forces to give priority to one of them, as there is no redistributive scheme which satisfies both simultaneously (Fleurbaey, 2008)⁷. The

⁶These axioms are based on the definition of Equal Treatment for Equal Circumstances, Equal Treatment for Reference Circumstances, Equal Well-Being for Equal Responsibility and Equal Well-Being for Reference Responsibility used by Fleurbaey (Fleurbaey, 2008).

⁷How incompatible are the two depends on how circumstances and responsibility interact in generating outcome. The only case in which both principles are satisfied occurs when the outcome function is additively separable.

Compensation principle is embodied in the **Egalitarian Equivalent (EE)** solution, which is defined in terms of outcomes of individuals endowed with different circumstances. The recommended redistributive scheme is defined by using a counterfactual distribution in which all individuals have the same reference circumstances and consistency with the liberal reward principle is preserved only for those whose current circumstances are equal to the reference. The **EE allocation rule** consists in equalize the level of outcome individuals would have with their current responsibility characteristics if their circumstances were equal to the reference. The **Conditional Equality (CE)** solution, on the other side, focuses on the reward principle, and the corresponding allocation rule prescribes to choose a reference value of responsibility and redistribute so as to equalize the level of outcome individuals would have if their circumstances were unchanged and their responsibility characteristics equal to the reference. With this allocation rule consistency with compensation is guaranteed only for individuals whose responsibility characteristics correspond to the reference.

Assuming that we are in a first best context, in which all individuals characteristics are completely observed, and that there are no incentive issues to take into account, in next section we adapt these solutions to our framework.

Moreover, we require our transfer scheme to satisfy the two following conditions:

Axiom 5 Non Negative Transfer (NNT): $\forall e \in A(p), \forall i \in N, r_i \geq 0$

Axiom 6 Efficiency Requirement (ER): if $e \in A(p)$ then $\nexists e' \in A(p)$ such that $\sum r'_i < \sum r_i$.

The first (**NNT**) requires the transfer to be such that, after its implementation, the education cost faced by each individuals is never higher than the market cost. more. The second (**ER**) simply says that the authority aims at minimizing the cost of fairness implementation, that is, among fair education systems the least expansive is selected.

4.2 Compensation: Max Egalitarian Equivalent Solution

The Compensation Principle is embodied in the Egalitarian Equivalent solution (**EE**) which here, assuming infinite resources, consists in choosing a reference value of $b = \tilde{b}$ and redistribute so as to equalize the utility individuals would have if their preferences were unchanged and their background equal to the reference.

However, as utility is a function of skills, which are not transferable, the transfer is conceived so as to reduce the cost of education. It is designed as a function of the difference between actual individual background and the level of b chosen as the reference, hence it can change according to the definition of \tilde{b} , and this clarifies the relevance of this choice⁸. In our context the choice of \tilde{b} cannot

⁸The reference value of circumstances could be, for example, zero or the minimum observed in the population, and this brings to the Zero Egalitarian Equivalent or the Min Egalitarian Equivalent solutions proposed by Fleurbaey (2008),

be different to b^{\max} (i.e. the lowest level of cost observed), otherwise we would have strange negative transfers which would impose to students coming from richer households a cost for skills acquisition higher than the market price. This brings us to the definition of a *Max Egalitarian Equivalent (MEE)* solution:

Definition 4.1 A_{MEE} : Let $\tilde{b} = b^{\max}$ be the reference. For all $p \in P$, for all $e \in A_{MEE}$, for all $i \in N$

$$r_i = \beta(b_i, s) - \beta(\tilde{b}, s) \quad (2)$$

The transfer compensates for differences in outcomes due to differences in background, as it is such that, for all values of effort, individuals with the same preferences end up with the same utility. Individuals with the same background receive a different amount of transfer depending on their preferences, and this is why the Reward Principle (ETEB) is violated whenever individuals' background is different from the reference. On the other hand, compensation is guaranteed from the fact that, for given preferences, the transfer changes according to individuals' background.

These conditions, together with Axioms 5 and 6, give us the following proposition:

Proposition 4.1 $A_{MEE} \Leftrightarrow EU\text{EP}, \text{ETRB}, \text{NNT and ER}$

Proof. $A_{MEE} \Rightarrow EU\text{EP}$. *EU\text{EP}* requires that if $\exists i, j \in N$ such that $f_i = f_j$, then $u_i = u_j$. With A_{MEE} after the transfer u_i and u_j become respectively $u_i = f_i - \beta(b_i, s) + \beta(b_i, s) - \beta(\tilde{b}, s) = f_i - \beta(\tilde{b}, s)$ and $u_j = f_j - \beta(b_j, s) + \beta(b_j, s) - \beta(\tilde{b}, s) = f_j - \beta(\tilde{b}, s)$. Then

$$u_i = f_i - \beta(\tilde{b}, s) = u_j \quad (3)$$

$A_{MEE} \Rightarrow \text{ETRB}$. *ETRB* requires $r_i = r_j \forall i, j \in N$ such that $b_j = b_i = \tilde{b}$. With A_{MEE} whenever $b_i = b_j = \tilde{b}$ we have $r_i = \beta(\tilde{b}, s) - \beta(\tilde{b}, s) = 0$ and $r_j = \beta(\tilde{b}, s) - \beta(\tilde{b}, s) = 0$, and then

$$r_i = 0 = r_j \quad (4)$$

$A_{MEE} \Rightarrow \text{NNT and ER}$. *NNT* requires $r_i \geq 0 \forall i \in N$. With A_{MEE} it is immediate, as the transfer is $r_i = \beta(b_i, s) - \beta(b^{\max}, s)$. By property 2 of assumption 1 we have that r_i is always positive and zero only when $b_i = b^{\max}$. Then, for *NNT* $\tilde{b} \leq b^{\max}$. To prove that A_{MEE} satisfies also *ER* assume $\tilde{b} < b^{\max}$. The transfer now is $r' = \beta(b_i, s) - \beta(\tilde{b}', s)$. By adding and subtracting the same amount, $\beta(b^{\max}, s)$, we get

$$r'_i = \beta(b_i, s) - \beta(b^{\max}, s) + \beta(b^{\max}, s) - \beta(\tilde{b}', s) \quad (5)$$

with $\beta(b^{\max}, s) - \beta(\tilde{b}', s) = \delta > 0$. Equation [4.5] becomes $r'_i = r_i + \delta > r_i$ and one necessarily has

$$\sum_{i=1}^n r'_i > \sum_{i=1}^n r_i \quad (6)$$

EUEP, *ETRB*, *ER* and *NNT* \Rightarrow A_{MEE} . Take the family of all possible education policies $\{r_1, \dots, r_n\} \in \mathbb{R}^n$. *EUEP* requires that, if $\exists i, j \in N$ such that $f_i = f_j$, then $u_i = u_j$, i.e. $f_i - \beta(b_i, s) + r_i = f_j - \beta(b_j, s) + r_j$. To fulfill this condition the transfer has to be $r_i = \beta(b_i, s) - g(f) - k$, where $g(f)$ is any function of individuals preferences and $k \in \mathbb{R}$ any constant. *ETRB* requires that, for a reference \tilde{b} , $r_i = r_j$ whenever $b_i = b_j = \tilde{b}$. Therefore $g(f)$ has to be such that, $\forall i \in N$, if $b_i = \tilde{b}$, $r_i = \beta(b_i, s) - k$. Because of *EUEP* this requirement determines all transfers up to a constant that guarantees non negative transfer, that is, $\forall i \in N$, $k = \beta(b^{\max}, s)$. The transfer then is

$$r_i = \beta(b_i, s) - \beta(b^{\max}, s) \quad (7)$$

■

The meaning of the MEE solution is intuitive. Compensation is obtained by making all students face the same cost for education acquisition, then students are let free to stay in school/university as long as they wish. This solution, in a simple framework in which the cost of education is only a function of household income, is more or less delivered by any system of tuition fees based on socio-economic condition. This mechanism is partially implemented in Italy, where university tuition fees are determined by an indicator based on the household equivalent income and there is no limit to the amount of years one can receive this transfer.

The crucial characteristics of the A_{MEE} allocation rule is that there is no limit in the quantity of subsidy students can get. In principle, a poor student could spend his entire life studying and getting subsidy from the state, if he has sufficiently high preferences for education acquisition.

4.3 Liberal Reward: Min Conditional Equality Solution

The Conditional Equality solution (CE) embodies the Reward Principle and equalizes the utility individuals would acquire if their preferences were equal to the reference, given their background. The corresponding allocation rule consists in choosing a reference value of responsibility f , and redistribute so as to equalize the utility individuals would reach with their current background, if their preferences were equal to the reference. This description characterizes a solution that we call *Min Conditional Equality (mCE)*

Definition 4.2 A_{mCE} : Let $\tilde{f} = f^{\min}$ be the reference. For all $p \in P$, for all $e \in A_{mCE}(p)$, and for all $i \in N$

$$r_i = f(s^*) - \beta(b^{\max}, s^*) - f(s_{i,\min}) + \beta(b_i, s_{i,\min}) \quad (8)$$

where $s^* = s(b^{\max}, \tilde{f})$ and $s_{i,\min} = s(b_i, \tilde{f})$.

Differently from what is usually done with the CE solution, in this particular context, together with a reference value of preferences, we need to choose also a reference value of circumstances. Again this is done in order to avoid strange negative transfers which would bring the cost of education for some individuals

to a level higher than the market price. This is why we use a particular value of s in the definition of the transfer.

The Reward Principle is here intended as neutrality with respect to differences in outcomes due to a different exercise of responsibility, and the aim of the transfer is to remove differences in outcomes caused by individual backgrounds. Individuals with the same background should receive the same amount of resources, but it does not guarantee that agents with the same preferences end up with the same utility (*EUPE*). Hence the Compensation Principle is not satisfied, unless individuals preferences are equal to the reference (*EURP*).

These conditions, together with **NNT** and **ER** give us the following result:

Proposition 4.2 $A_{mCE} \Leftrightarrow ETEB, EURP, NNT \text{ and } ER.$

Proof. $A_{mCE} \Rightarrow ETEB.$ ETEB requires that, if $\exists i, j \in N$ such that $b_i = b_j$, then $r_i = r_j$. With A_{mCE} , if $b_i = b_j$, $r_i = f(s^*) - \beta(b^{\max}, s^*) - f(s_{i,\min}) + \beta(b_i, s_{i,\min})$ and $r_j = f(s^*) - \beta(b^{\max}, s^*) - f(s_{j,\min}) + \beta(b_j, s_{j,\min})$, hence

$$r_i = r_j \quad (9)$$

$A_{mCE} \Rightarrow EURP.$ EURP requires $\forall i, j \in N$ $u_i = u_j$ whenever $f_i = f_j = \tilde{f}$. With A_{mCE} , after the transfer $u_i = f(s_{i,\min}) - \beta(b_i, s_{i,\min}) + f(s^*) - \beta(b^{\max}, s^*) - f(s_{i,\min}) + \beta(b_i, s_{i,\min}) = f(s^*) - \beta(b^{\max}, s^*)$ and $u_j = f(s_{j,\min}) - \beta(b_j, s_{j,\min}) + f(s^*) - \beta(b^{\max}, s^*) - f(s_{j,\min}) + \beta(b_j, s_{j,\min}) = f(s^*) - \beta(b^{\max}, s^*)$.

Then

$$u_i = f(s^*) - \beta(b^{\max}, s^*) = u_j \quad (10)$$

$A_{mCE} \Rightarrow NNT$ and $ER.$ NNT requires $r_i \geq 0$. It is sufficient to notice that s^* is the point of maximum distance between $\tilde{f}(s)$ and $\beta(b^{\max}, s)$, where $\beta(b^{\max}, s)$ is the lower cost function observed. It follows that for all $s \in \mathbb{R}_+$ and for all $b \in \mathbb{R}_+$

$$\tilde{f}(s) - \beta(b^{\max}, s) > \tilde{f}(s) - \beta(b_i, s) \quad \forall i \in N \quad (11)$$

To see why A_{mCE} satisfies also ER consider a transfer $r'_i = f(s') - \beta(b^{\max}, s') - f(s_{i,\tilde{f}}) + \beta(b_i, s_{i,\tilde{f}}) \neq r_i$. To satisfy NNT b can not be different from b^{\max} , hence s^* and s' differ only in the preference chosen as the reference: $s' = s(b^{\max}, \tilde{f}) \neq s(b^{\max}, f^{\min}) = s^*$. Consider $\tilde{f} > f^{\min}$, one has $s' > s^*$ and $s_{i,\tilde{f}} > s_{i,\min}$. By property 2 of assumption 2, $f(s') > f(s^*)$ and $f(s_{i,\tilde{f}}) > f(s_{i,\min})$. We want to prove that

$$f(s^*) - \beta(b^{\max}, s^*) - f(s_{i,\min}) + \beta(b_i, s_{i,\min}) < f(s') - \beta(b^{\max}, s') - f(s_{i,\tilde{f}}) + \beta(b_i, s_{i,\tilde{f}}) \quad (12)$$

$$\beta(b^{\max}, s') - \beta(b^{\max}, s^*) - \beta(b_i, s_{i,\tilde{f}}) + \beta(b_i, s_{i,\min}) < f(s') - f(s^*) + f(s_{i,\min}) - f(s_{i,\tilde{f}}) \quad (13)$$

which is necessarily true as the left hand side is negative, while the right hand side is positive, and we get $r_i < r'_i, \forall i \in N$. Hence

$$\sum_{i=1}^n r'_i > \sum_{i=1}^n r_i \quad (14)$$

ETEB, *EURP*, *NNT* and *ER* $\Rightarrow A_{mCE}$. Take the family of all possible education policies $\{r_1, \dots, r_n\} \in \mathbb{R}^n$. *EURP* requires that for a reference \tilde{f} , $\forall i, j \in N$ such that $f_i = \tilde{f}$ the transfer has to be such that $u_i = u_j$. To fulfill this condition $r_i = \beta(b_i, s_{i, \tilde{f}}) - f(s_{i, \tilde{f}}) + g(f) - k$, $\forall i \in N$, where $g(f)$ is any function of individual preferences. *ETEB* requires that, if $\exists i, j \in N$ such that $b_i = b_j$, then $r_i = r_j$. To satisfy this condition $g(f)$ has to be equal for individuals with the same background, i.e. $\forall i, j \in N$ such that $b_i = b_j$, $g(f) = f(s_{i, \tilde{f}})$, and the transfer becomes $r_i = \beta(b_i, s_{i, \tilde{f}}) - f(s_{i, \tilde{f}}) + f(s_{i, \tilde{f}}) - k$. *ER* and *NNT* requires k to be the lowest constant which ensures $r_i \geq 0$, $\forall i, j \in N$. Then $k - f(s_{i, \tilde{f}}) = \beta(b_i, s_{i, \tilde{f}}) - f(s_{i, \tilde{f}})$. Non Negativity requires $k - f(s_{i, \tilde{f}}) = f(s_{\max, \tilde{f}}) - \beta(b^{\max}, s_{\max, \tilde{f}})$ with $\tilde{f} = f^{\min}$. Then the transfer is $r_i = \beta(b_i, s_{i, \min}) - f(s_{i, \min}) + f(s_{\max, \min}) - \beta(b^{\max}, s_{\max, \min})$. Hence

$$r_i = f(s^*) - \beta(b^{\max}, s^*) - f(s_{i, \min}) + \beta(b_i, s_{i, \min}) \quad (15)$$

■

With the A_{mCE} solution the amount of resources received by individuals decreases with b , but it is fixed for each particular value of background. We can think of this solution as a policy that allots an education voucher to each student; this voucher depends on their parents income but is fixed, it does not depend on the choices about education acquisition⁹. It is adjusted to the value of s^* chosen by the social planner and not linked to individuals' preferences, as in the previous case. If some individuals want to acquire a level of skills higher than s^* they are left on their own, in the sense that the transfer does not ensure they will be able to, as it is independent from the "amount" of education individuals acquire. The definition of s^* also depends on the choice of \tilde{f} , which here is $\tilde{f} = f^{\min}$. It is driven by efficiency concerns, as the authority aims at minimizing implementation costs. However, it could be the case that the minimum value of f is equal to zero, better, that there are individuals in the society which are completely averse to skill acquisition. In such a case, if the minimum value of f is chosen as the reference, the prescribed allocation rule would recommend always a transfer equal to zero, which corresponds to a "no intervention" policy. However, the choice of the particular value of f that should be used as the reference depends on the social planner. The social planner could decide to derogate from efficiency and inform the allocation rule to a different criterion, considering that education is not only an instrumental good, which will be used in the future to produce earnings, but it is also positively correlated with other dimensions of individuals' well-being, as, for example, it increases social inclusion and improves health status. Anyway, here we do not consider this problem, taking from granted that the minimum value of f observed in the population is always positive.

⁹This is not necessarily what Friedman proposed in the late '50s. Friedman's focus was not (or not explicitly) on the reward principle, but on the implementation of a free market for education.

5 The way forward

If one of the two policies is implemented, and EEOp is achieved, fairness is implemented before individuals enter the labour market. In this perspective, if the unique sources of income variability are education and relative preferences for consumption and leisure, and in the labour market there is a fair distribution of skills, inequalities arise only from responsibility, past and present, and there is no need for intervention. A *laissez-faire* solution, in this case, will be fair.

However, the redistributive schemes introduced in the previous section do not consider feasibility problems. We neglect to investigate how expansive the redistribution could be, ignoring in this way the equality-efficiency trade-off. Our allocation policies are obtained under the unrealistic assumption that there is an infinite amount of resource to redistribute. Actually, education is mostly financed through income taxation, hence the choice of the amount of resources to invest in education is taken under some budget constraint. In this case it is probable that the constrained redistributive policy does not deliver a fair distribution of education, individuals will end up with too unequal skills and some redistribution of labour income will be necessary.

One possibility would be to consider redistribution in education and labour income as complementary, in the sense that, as a fair distribution of skills implies no intervention in the distribution of labour income, another solution could be to apply *laissez-faire* in the skill acquisition process to implement fairness later on, in the distribution of income. These could be the solution suggested by supporters of a private funding of education (Barr,1991), like unsubsidied loans, which can be seen as a sort of "intertemporal redistribution" through which individuals redistribute to themselves during the acquisition of higher education from himself in later life. Supporters of these kind of instruments often stress the regressive effect on income distribution of a public financing of higher education (Carmichael, 1999, 2004; Hansen and Weisbrod, 1969; Nerlove, 1972). The regressive impact comes from the consideration that most of the individuals who benefit from the public funding comes from the middle and upper classes, and only marginally from lower income families ¹⁰.

Besides these two "extremes", a third solution would be the coordination of education and tax policies. Such a coordination should deliver a distribution of educational outcomes and labour income which, provided a certain level of education is "universally guaranteed", satisfies Compensation in the distribution of skills, and Reward in the distribution of income. To satisfy the first requirement the allocation rule should be such that, if individuals have exerted the same responsibility in school, they face the same choice set when they enter the labour market (which does not necessarily imply that they end up with the same skills). Reward, on the other hand, is satisfied if the sum of the transfer received during the skill acquisition process and the tax paid on labour income should be equal for individuals with the same circumstances.

¹⁰Supporters of public funding of higher education state that, once the progressive nature of the tax system is taken into account, this effect disappear (Leslie and Brinkman, 1988).

This kind of allocation will imply a different subsidy/tax treatment across individuals, and is similar to the so called "tax on graduates", proposed by many authors (Merret, 1967; Nerlove, 1972), which allows to regain part of the subsidy received by individuals during the schooling years¹¹. It consist in levying an higher tax on individuals who have benefitted from greater transfers for higher education, as they are supposed to earn higher labour incomes.

The characterization of this solution is left for future research.

6 Conclusion

Education is often considered as a fundamental source of opportunity for income acquisition, together with individuals' preferences over consumption and leisure, and government transfers. In such a framework differences in skill are always considered as a source of unfair inequality. However, a growing literature based on the same definition of fairness, is challenging this interpretation, and considers skill acquisition as a single process in which both circumstances and responsibility play a role. If this is the case, some of the variability in skills is due to individuals' responsibility, and hence it is fair, but, at the same time, unfair educational inequality should be removed.

In this paper we have adopted a mesojustice approach to fairness in education. This means that we considered education as a fundamental item that concerns everybody and we have shown what kind of policies can deliver a fair distribution of utility. We are nevertheless aware of the partiality of this exercise. Education is a good that interacts with many other individual welfare dimensions. For example, it is an instrumental good that serves to produce future earning abilities and then it is strictly related to distributive justice in the labour market, and it also favours social participation. Nevertheless, we think our conclusions may be considered as a benchmark for those who adopt a macrojustice approach and wants to include education in the set of valuable goods that have to be redistributed fairly.

We have characterized two redistributive schemes which act in this direction. Our definition of fairness is based on the Compensation and the Liberal Reward principles, and requires the redistributive scheme to remove inequalities arising from circumstances, letting the effect of individuals' choices unaltered. Clearly, this definition of EEOp does not solve a number of problems. A responsibility sensitive theory of justice must assume that individuals are able to correctly evaluate the consequences of their choices, as the idea of being responsible cannot be disentangled from the judgement ability, and education is probably among the most relevant ingredients for its development. Even if we take for granted that all individuals reach a certain level of education, which allows us to consider them responsible for their preferences, the implementation of fairness in education poses a number of questions. First of all, skills cannot

¹¹It shouldn't be confused with the public financing income contingent loans through which students finance higher education and have to be paid only if and when they have left the university and earn income above a certain threshold.

be redistributed, they are not transferable resources but result from the combination of different factors, most of them non-transferable as well. We have suggested that a possible solution is to implement a policy which affects the education cost faced by individuals. One of the two solutions we characterize is similar to those already implemented in Western society. With the A_{MEE} allocation rule the transfer is such that individuals with the same background receive a different transfer depending on their preferences. A transfer designed in this way is such that the skill acquired by each individual corresponds to the desired one. This idea of transfers in education policy is close to what is done in many countries, such as Italy, where education fees are determined as a function of household income, and resources are only marginally transferred as a function of effort exerted by students.

However, some efficiency issues remains unsolved. The implementation of fairness in education could have prohibitive costs, and we do not investigate the way in which the cost of education acquisition can be lowered, nor how expensive these policies could be. We have therefore neglected to investigate what kind of constraints can limit our policies.

Moreover, if an education policy related to individual circumstances exists, some redistribution is implemented before workers have access to the labour market. In this perspective responsibility, circumstances, and government redistribution interact at two points in time. First in the process of skill formation, then in income production. Assume, for instance that education policy is such that all individuals get a fair education level before they start to work. If circumstances are fair in the labour market, there are no reasons to intervene: the only source of inequality is responsibility, past and present. If, on the contrary, the education policy does not deliver a fair distribution of skills, workers will end up with too unequal skills and redistribution of labour income will be needed. We believe that the analysis of these issues would lead us to discuss, in a macrojustice perspective, how redistribution of skills and redistribution of other goods, such as income, can be traded off, but we leave this interesting topic for future research.

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