Economics and Philosophy, **20** (2004) 117–145
DOI: 10.1017/S0266267104001282

EQUALITY OF OPPORTUNITY AND OPPORTUNITY DOMINANCE

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All conceptions of equal opportunity draw on some distinction between morally justified and unjustified inequalities. We discuss how this distinction varies across a range of philosophical positions. We find that these positions often advance equality of opportunity in tandem with distributive principles based on merit, desert, consequentialist criteria or individuals' responsibility for outcomes. The result of this amalgam of principles is a festering controversy that unnecessarily diminishes the widespread acceptability of opportunity concerns. We therefore propose to restore the conceptual separation of opportunity principles concerning unjustified inequalities from distributive principles concerning justifiable inequalities. On this view, equal opportunity implies that that morally irrelevant factors should engender no differences in individuals' attainment, while remaining silent on inequalities due to morally relevant factors. We examine this idea by introducing the principle of 'opportunity dominance' and explore in a simple application to what extent this principle may help us arbitrate between opposing distributive principles. We also compare this principle to the selection rules developed by John Roemer and Dirk Van de Gaer.

We thank Brian Barry, Ken Binmore, Alex Brown, Jerry Cohen, Marc Fleurbaey, Dirk Van de Gaer, Jeroen Knijff, Peter Postl, John Roemer, Robert van der Veen, Peter Vallentyne, Jo Wolff and an anonymous referee for this journal for helpful discussions and comments on earlier drafts. Earlier versions of this paper were presented at the Analytical Philosophy National Postgraduate Conference in Reading, the Workshop on Equal Opportunity at the University of Bayreuth, the Political Theory Seminar at Yale University, the Meeting of the Society for Social Choice and Welfare at Caltech, and the Economics Seminar at London Metropolitan University. We thank the participants of these conferences for their comments. Alex Voorhoeve's research was supported by the Dr Hendrik Muller's Vaderlandsch Fonds, the Bisschoffsheim Stichting, the Radboudstichting Wetenschappelijk Onderwijsfonds, the

1. INTRODUCTION

Equality of opportunity is a popular ideal. Under its banner, many social movements have, in recent history, made their case for eliminating inequalities due to race, sex, cultural and religious differences, physical handicaps and social class. In some form or other, both private and public institutions in most Western democracies today appeal to this ideal to regulate the distribution of specific goods like jobs, educational resources and positions of political power. Nonetheless, the precise meaning of this normative concept remains unclear. Equality of opportunity in education, for example, may mean the absence of discrimination on the basis of race, religion or gender, but it can also entail the elimination of inequalities due to family circumstances and social background, or even due to students' innate physical and mental abilities. Confronted with this plethora of interpretations, some commentators have called for the abandonment of the 'treacherous' term 'equal opportunity' (Jencks 1988; Radcliffe Richards 1997). A further source of controversy is the fact that equal opportunity is often advanced in tandem with other distributive ideals, such as merit, desert, some consequentialist principle, or a theory of individual responsibility.

To help facilitate the debate on these controversies, we will construct a conceptual framework that allows us to place different notions of equal opportunity in relation to each other and to disentangle from them other normative principles that call for separate consideration. We then examine to what extent equality of opportunity may help us arbitrate between opposing distributive principles. We also extend this discussion to cases where we strive for equality of opportunity only in as far as it benefits the most disadvantaged.

In our view, the common core among different conceptions of equal opportunity is some distinction between morally justified and unjustified inequalities. When we advocate equal opportunities for a certain good among some group of people, we imply that certain morally irrelevant factors should engender no differences in the attainment of this good. At the same time, we permit unequal attainment as far as it flows from morally relevant factors. On this account, we start from a list of factors that influence individuals' attainment, and subsequently sort them into three categories. The first category collects all factors that are under the control of the policy maker. The second category comprises what one believes may be legitimate sources of differential attainment. The final category consists of all factors whose differential influence one wishes to eliminate. We will often refer to the first of these categories as policy instruments, and to the

UCL Graduate School and the AHRB. Matthias Hild acknowledges research support by the California Institute of Technology, Pasadena (California).

final two categories as relevant and irrelevant factors. Factors, such as race, take values, such as black and white, to which we refer as 'characteristics'. A policy establishes *equal opportunity* when individuals with the same relevant characteristics attain the same outcomes, irrespective of their irrelevant characteristics.[1] This abstract definition at once implies that any concrete opportunity principle involves the specification of the good in question and of the factors we regard as morally relevant and irrelevant. Different specifications of these elements also result in different normative conceptions of equal opportunity.

Our discussion will proceed as follows. In section 2, we canvass a range of positions on what ought to be legitimate and illegitimate sources of unequal outcomes. In section 3, we critically examine John Roemer's construction of individuals' relevant characteristics. In section 4, we illustrate the separation between equality of opportunity and other distributive principles with an example of racial income differentials in the USA in 1999. In section 5, we introduce the principle of 'opportunity dominance' that prioritizes those individuals who are most disadvantaged among their peers with identical relevant characteristics. In section 6, we critically discuss the selection rules developed by John Roemer and Dirk Van de Gaer. In section 7, we discuss the evaluation of behavioural responses to policy interventions and the limitations of the strong Pareto principle. We conclude with section 8.

2. RELEVANT AND IRRELEVANT CHARACTERISTICS

Some recent contributions to the social-choice literature have concentrated on the conception of relevant factors as either individuals' preferences or choices (Roemer 1993, 1996; Fleurbaey 1994). While such conceptions may suit some applications, the generic notion of equal opportunity makes no such general commitment (Roemer 2002, 2003; Fleurbaey 1995a, 1995b, 1998). In the debate on equal opportunity in higher education, for example, not only preferences for more or less schooling, but also innate capacities are cited as legitimate grounds for differential attainment. In order to chart the range of different positions, we will now review some of the rationales offered for distinguishing between moral relevance and irrelevance.

[1] Formally, we can express this definition as follows (see also Bossert 1995 and Fleurbaey 1995a: 30). Let $Y = \langle Y_1, \ldots, Y_M \rangle$ be a vector of morally relevant factors and $Z = \langle Z_1, \ldots, Z_N \rangle$ be a vector of morally irrelevant factors that can influence the individuals' attainment of the good in question. Let Φ be a set of feasible policies. Then $u(\phi, y, z)$ measures the attainment of a particular good under policy $\phi \in \Phi$ by an individual with a combination $Y = y$ of relevant characteristics and a combination $Z = z$ of irrelevant characteristics. A policy ϕ satisfies *strict equality of opportunity* exactly if $u(\phi, y, z) = u(\phi, y, z')$ for any combination of relevant characteristics y and any combinations of irrelevant characteristics z and z' (as long as some individual displays $\langle y, z \rangle$ and $\langle y, z' \rangle$).

One approach starts from some moral conception of the good to be distributed and deduces from it the legitimate sources of inequality. Bernard Williams (1973) and Michael Walzer (1984), for instance, argue that distributive criteria for a good follow from its 'nature' or 'social meaning'. In their view, we determine the right and wrong grounds for a good's distribution by taking account of the aims and interests the good is meant to serve, of any symbolic role it may play in the social life of a community, and of the values of those engaged in its production, distribution and consumption. Irrelevant factors are those whose differential influence would undermine these interests, purposes and values. Thus, Williams defines equal opportunity as the principle that bars ''exclusion [from access to a good] on grounds other than those appropriate or rational for the good in question'' (244). By way of illustration, Williams and Walzer apply this type of reasoning to education, citing ability and a desire to learn as relevant grounds for differential achievements, and parental income as an irrelevant factor.

Another approach applies to the distribution of generic goods like well-being or multi-purpose resources, like income, that are less likely to be tied up with specific 'social meanings'. Instead, the moral relevance of factors is judged by their relation to human attitudes and collective or individual responsibility. What Cohen (2001) calls *right-liberal* equality of opportunity aims to eliminate inequalities due to social status and unfounded negative or positive attitudes towards others' characteristics. It thus bars the differential influence of race, class, religion, and sex, considered in and by themselves. By contrast, it permits differential outcomes due to family and social circumstances, innate and developed abilities, individuals' beliefs, preferences, and motivation, and good or bad fortune. The *left-liberal* catalogue of irrelevant characteristics stretches further, including also family and social circumstances. Left-liberals typically try to distinguish between socially and naturally caused inequalities. They admit that this distinction may be hard to make, since human institutions significantly determine the degree to which 'natural' factors like innate talents and good or bad fortune affect outcomes. Whenever this distinction can be drawn, however, left-liberals argue that society can legitimately ''pass the buck to nature'' for naturally, but not socially caused inequalities (Nagel 1997: 314; Mansbridge 1988: 134).[2] Finally, what Cohen calls *socialist* equality of opportunity considers native

[2] In an alternative argument for left-liberal equal opportunity, Rawls (1999) and Green (1989) argue that, like discrimination, social class and family circumstances stand in the way of individuals' equal development of their natural abilities. They stress that left-liberal equal opportunity should not apply to social goods other than positions. The close connection between positions and personal development makes the form of their argument more akin to Williams's and Walzer's approach.

differences and good or bad fortune to be just as irrelevant as social bias or family circumstances. On this view, preference or choice count as the only morally relevant factors because, it is argued, an individual may be held responsible for at least some of their consequences, although some authors differ on the pre-conditions for and the extent of this responsibility (Dworkin 2000; Cohen 1989; Arneson 1989).

The moral relevance of an individual's characteristics is sometimes questioned when differences in relevant characteristics causally depend on irrelevant factors. This problem arises, for instance, for a left-liberal view in which family circumstances are irrelevant but individuals' preferences and motivation are relevant. Equality of opportunity in our sense would then permit that individuals with different preferences advance to different levels of education. Since differences in motivation and preferences stem partly from irrelevant differences in family circumstances, some are led to doubt the relevance of individual beliefs and preferences. In response to this concern, John Roemer (1993, 1996, 1998, 2002, 2003) sets out to redefine the set of prima facie relevant factors in order to purify it from any indirect influence by irrelevant factors. His method has been applied in a number of innovative studies on health care, educational achievement, development aid, and income distribution (Roemer 1999; Betts and Roemer 2001; Llavador and Roemer 2001; Roemer et al. 2003; Van de Gaer, Schokkaert and Martinez 2001). In the following section, we will argue that Roemer's purification method misses its target, except under fortuitous circumstances. More importantly, purification of relevant factors is not necessarily desirable. In higher education, for instance, left-liberals may stand by the moral relevance of preferences whatever their origin because, so they argue, the aims of higher education require differential treatment for students with different preferences (Barry 1988: 40–1). If, as Williams and Walzer suggest, the choice of relevant characteristics is based on the aims and values that are associated with a particular good, then purification runs the risk of undermining the reasons for adopting a principle of equal opportunity in the first place.

3. ROEMER ON 'RELATIVE EFFORT'

Over the past decade, Roemer has proposed two versions of his method for stemming the influence of irrelevant on relevant characteristics. He first developed his method while working within the socialist conception of equal opportunity, permitting inequalities only on the basis of different choices or preferences. The problem of indirect influence then takes the following form. Since choices and preferences are the product of individuals' information, cognitive abilities and socialization, they are differentially influenced by irrelevant factors. Roemer concludes that we cannot take as relevant the choices of individuals with different

irrelevant characteristics. Instead, we should find some purified measure of individuals' choices that is free from the differential influence of irrelevant characteristics.

To this end, Roemer first sorts individuals into 'types' by their irrelevant characteristics, e.g., by race. He then selects some choice variable, e.g., schooling, that contributes to differences in outcomes, e.g., income, and calls this variable 'effort'. He ranks individuals within a type according to the effort they expend. This ranking allows him to partition people within each type into quantiles of effort relative to their type. A person then belongs to the 10%-quantile of relative effort exactly if 10% of the entire population expend at most as much effort as this person. The individual's 'relative effort' is then measured by the individual's effort quantile. Relative effort, Roemer argues, is an appropriate measure of 'how hard an individual has tried' to achieve the outcome in question. Finally, he recognizes relative effort as the only relevant factor and concludes that equal opportunity obtains when all people who expend the same degree of relative effort also receive the same outcome (Roemer 1998: 15–16). In later work, Roemer (2002, 2003) switches to a different measure and defines relative effort as the quantile that individuals occupy in their type's outcome distribution. In contrast to his earlier method, this later approach no longer relies on the assumption that outcomes are adequately predicted by only one choice variable. If, among other things, we assume that, within each type, outcome is some increasing function of whatever it is we consider 'effort', then an individual's position in the distribution of outcome also reveals his position in the distribution of effort.

In recent papers, Roemer has abandoned his focus on the socialist conception of equal opportunity and has argued that we can apply his method to any catalogue of irrelevant factors. The only difference is that individuals' relative effort will not only be determined by choice-related variables, but by all factors that influence individuals' rank in their type's outcome distribution. Indeed, in applied work, Roemer uses this approach to analyse equal opportunity for income when parental education, as a proxy for social class and family background, is the only irrelevant factor (Roemer et al. 2003). Van de Gaer, Schokkaert and Martinez (2001) likewise apply this method in the analysis of equal opportunity for income among individuals whose parents are from different social classes. It is unfortunate that these studies continue to use the earlier terminology of 'effort'. The term 'effort' is surely a misnomer for the amalgam of the many residual factors, like innate ability, that are not used in the construction of types but which also influence income. However, the problems with Roemer's methodology run much deeper than this terminological point. As Marc Fleurbaey (1998) points out, it is only under very special circumstances that the method of relative effort correctly identifies the influence of irrelevant factors. One of these assumptions is that the relevant factors that are not

differentially influenced by irrelevant factors and which therefore require no purification are also statistically uncorrelated with irrelevant factors.

To illustrate this limitation, suppose we are interested in equal opportunity for health, interpreted as the chance of contracting a serious disease, and believe that different health risks are only permissable when they are caused by different preferences for healthy over unhealthy behaviour. (We are here dealing with health risks rather than health outcomes, under the assumption that what can be controlled by health care policy and behaviour is the risk of contracting a serious illness and not the health outcomes themselves.) Suppose that, for every individual, the chance of contracting a serious illness is an identical function of just two variables, the amount of cigarettes she smokes and government policy, with the risks to an individual's health increasing in the amount of cigarettes smoked. Individuals' choice of cigarette consumption is determined by their preferences over health and cigarettes, and by their beliefs about the hazards of smoking. Individuals in one third of the population appreciate the risks of smoking correctly, but smoke 10–20 cigarettes per day with little regard for their health. Another third of the population correctly appreciates the risks of smoking, is health conscious and smokes 0–5 cigarettes per day. The remaining third of the population, all of whom are health conscious, is targeted by cigarette manufacturers in a misleading advertising campaign that leads them to underestimate the true risks of smoking. Although this campaign leaves preferences unchanged, it affects choices via differences in information and leads to a consumption of 5–15 cigarettes per day.

To apply Roemer's method, we type individuals by exposure and non-exposure to the campaign, and then determine their rank in their type's distribution of cigarette consumption (or in the distribution of their health risk, which yields the same result in this example). We then choose a policy that equalises the health risks of all individuals with the same rank in this distribution. Let us now look at some individuals from different types whom Roemer considers to have tried equally hard to stay healthy, for instance, the heaviest smokers of either type. In the unexposed type, these people smoke 20 cigarettes per day; in the exposed type, they consume only 15 cigarettes per day. Roemer's method thus implies that exposure to the mis-information campaign was advantageous!

The source of this anomaly lies, of course, in the statistical correlation between the relevant factor of preference for health and the irrelevant factor of exposure. Roemer's method implies that, under equal opportunity, both the exposed and unexposed type should display the same pattern of outcomes. When relevant and irrelevant factors are statistically correlated, however, differences in the distribution of outcomes have the dual source of, on the one hand, the reprehensible influence of irrelevant factors and, on the other hand, uneven frequencies of relevant factors. Equal opportunity

does not require us to equalise just any statistical distribution of outcomes, but allows for differences due to non-identically distributed relevant factors. To equalise opportunity, any two individuals with different irrelevant characteristics must receive equal outcomes *if* their relevant characteristics are also equal. The problem identified here also arises in applied work on opportunity for income in which Roemer and his co-authors use parental education, a proxy for social class and family circumstances, to type their population by irrelevant characteristics. While individuals' income depends partly on their genetics and innate abilities, sociological research indicates that genetic differences are statistically correlated with, although not caused by, parental education (Saunders 1996; Flynn 2000). Equalising the income distribution between types with different levels of parental education would then inappropriately compensate for the effects of innate ability. The same criticism also applies to the use of Roemer's method by Van de Gaer, Schokkaert and Martinez (2001).

4. DISTINCT DISTRIBUTIVE PRINCIPLES

Equal opportunity, as we have defined it, forbids unequal outcomes due to irrelevant factors, but is agnostic about inequalities due to relevant factors. The source of this agnosticism is the goal of exploring to what extent the notion of equal opportunity can help us arbitrate between opposing distributive principles. By our definition, many allocations with very different returns to relevant characteristics can establish equal opportunity, so long as they equalise the effect of irrelevant characteristics. Rather than declaring indifference between such distributions, our notion of equal opportunity says nothing about their relative merits. By implication, we will usually not be able to select a unique policy by opportunity criteria alone. In order to make a unique choice, we will have to draw on additional, distinct distributive principles to help us specify a particular relationship between outcomes and relevant factors. As one would expect, particular conceptions of equal opportunity are therefore often advanced in tandem with, or as part of, other distributive principles based on merit, desert, consequentialist criteria, or on individuals' responsibility for outcomes (Roemer 1998; Cohen 1989; Arneson 1989; Mason 2001). This bundling of normative principles strains and sometimes blurs their conceptual separation, leading to some unfounded criticism of equal opportunity. John Schaar (1967), for instance, criticises equal opportunity for leading to large inequalities of outcomes. This criticism is misplaced, since it is perfectly possible to combine an equal-opportunity principle with an additional distributive principle that is averse to inequalities of outcomes. Marc Fleurbaey and Walter Bossert also emphasise this separation of normative principles by exposing what they see as an internal tension between

	High School No Degree	High School w/Degree	College No Degree	Associate Degree	Bachelor's or More	Total
WHITE						
number ('000)	23,816	52,642	31,574	12,218	39,338	159,588
percentage	12.5%	27.7%	16.6%	6.4%	20.7%	84.0%
income	$14,885	$23,822	$27,930	$32,116	$54,208	$31,426
BLACK						0
number ('000)	4,655	7,581	4,812	1,401	3,398	21,847
percentage	2.5%	4.0%	2.5%	0.7%	1.8%	11.5%
income	$11,948	$19,934	$24,445	$29,155	$42,361	$23,306
OTHER						0
number ('000)	1,299	1,985	1,541	598	3,093	8,516
percentage	0.7%	1.0%	0.8%	0.3%	1.6%	4.5%
income	$13,129	$20,199	$22,330	$28,769	$49,966	$30,919
TOTAL						0
number ('000)	29,770	62,208	37,927	14,217	45,829	189,951
percentage	15.7%	32.7%	20.0%	7.5%	24.1%	100.0%
income	$14,349	$23,232	$27,260	$31,684	$53,043	$30,469

TABLE 1. US Income in 1999 (US Census Bureau).

the elimination of unjust inequalities and principles of responsibility (Fleurbaey 1994, 1995a,b, 1998; Bossert 1995; Bossert and Fleurbaey 1996).

We illustrate this separation of issues by looking at the relationship between schooling, race and the mean income of workers in the USA who were at least 18 years of age in 1999. As the data in Table 1 show, whites earn a substantially higher mean income than members of racial minorities with the same educational qualifications. Blacks and 'others' (which include Asians and Pacific islanders) alternate in having the lowest mean income at a given educational level. Others have the highest mean level of schooling, while blacks have the lowest mean level of schooling. The causes of this pattern of educational achievement and mean income are complex, and include factors correlated with race and educational levels, such as parental income and education, individuals' preferences and information, and the quality of the educational institutions attended. Furthermore, the use of mean incomes suppresses information about different distributions of income for members of different racial categories at each level of schooling. Our only purpose in choosing the present table, an extract from a much richer database, is to provide a simple illustration of our conceptual point and its application in the political debate. With this aim in mind, we make the following simplifying assumptions. First, we are exclusively concerned with the distribution of mean income, based on education as the only relevant factor and on race as the only

irrelevant factor. Second, we assume that redistribution of income has a constant variable cost. Thus, for each dollar collected, only ρ dollars are available for redistribution while the remainder $(1 - \rho)$ covers the cost of the intervention. For concreteness, we will assume that this cost amounts to 20 cents per dollar redistributed ($\rho = 0.8$). Finally, we assume that transfers do not affect individuals' educational levels (i.e. there are no disincentive effects of taxation). We will lift this overly restrictive assumption in section 7.

To start with, we consider income transfers on the basis of both race and education. Although these policy instruments may not be feasible in the current political climate, they are theoretically interesting because they are able to achieve many different income distributions with equalised opportunities. The choice of a unique policy unavoidably involves a stance on how to reward education and how to structure the relationship between outcomes and relevant characteristics. Table 2 shows the income distributions corresponding to two particular equal-opportunity policies.[3] The first, traditional egalitarianism, equalises the income of all individuals at the highest possible level. The egalitarian

[3] Let $1, \ldots, k, \ldots K$ be a list of the possible values of the irrelevant race variable and $1, \ldots, l, \ldots L$ be a list of the possible values of the relevant education variable. In our example, $K = 3$ and $L = 5$. Unless mentioned otherwise, the indices k and l range over $\{1, \ldots, K\}$ and $\{1, \ldots, L\}$. I is a $K \times L$ matrix with incomes in the status quo depending on combinations of relevant and irrelevant characteristics and N is a $K \times L$ matrix with number of the individuals possessing these combinations of characteristics. Policies are now of the form $\phi \in \mathbb{R}^{K \times L}$ and the set of feasible policies Φ satisfies the budget constraint $\sum_{kl} \max(\phi_{kl}, \rho \cdot \phi_{kl}) \cdot N_{kl} = 0$. Income under policy ϕ is given by $I^{\phi} := I + \phi$. A negative transfer $r \in \mathbb{R}^{-}$ makes an amount of $\rho \cdot (-r)$ available for redistribution. The contribution of an arbitrary transfer $r \in \mathbb{R}$ to the budget is therefore $\min(-r, -\rho \cdot r) = -\max(r, \rho \cdot r)$. Since under our assumptions taxing individuals who are better off for a given level of education always increases the budget with which we can aid the less-well-off at that educational level, equal opportunity need not always be achieved through 'leveling down'. Egalitarians maximise μ within the budget constraint $\sum_{kl} N_{kl} \cdot \max(\mu - I_{kl}, \rho(\mu - I_{kl})) = 0$. Using non-linear optimisation algorithms, we find $\mu \approx 29{,}288$.

It is interesting to note that given our assumption of the same variable cost of redistribution for all characteristics, we can show that the unique cheapest equal-opportunity policy is *self-financing in relevant characteristics*. A policy with the latter property equalises the income among individuals with the same relevant characteristic by using only transfers among these individuals. In other words, each group of individuals with the same level of education pays to redress the inequalities within its own ranks: college attendees pay for college attendees and dropouts pay for dropouts. In proving this result, we make use of the concept of opportunity dominance set out in section 5. In search of the cheapest policy that is undominated in opportunity (or OD-policy for short), our task is to minimise $B(\phi) := -\sum_{kl} \min(\phi_{kl}, 0) \cdot N_{kl}$ within the budget constraint such that $(+)\, I^{\phi}_{kl} = I^{\phi}_{k'l}$ for all k, k', l. The budget constraint induces a non-linear boundary, thus complicating our optimisation problem. It is very helpful to note: *The unique solution to this optimisation problem is identical to self-financing by relevance.*

	High School No Degree	High School w/Degree	College No Degree	Associate Degree	Bachelor's or More	Total
	Leximinism					
WHITE income	$29288	$29288	$29288	$29288	$29288	$29288
change	$14403	$5466	$1358	$-2828	$-24920	$-2138
BLACK income	$29288	$29288	$29288	$29288	$29288	$29288
change	$17340	$9354	$4843	$133	$-13073	$5982
OTHER income	$29288	$29288	$29288	$29288	$29288	$29288
change	$16159	$9089	$6958	$519	$-20678	$-1632
TOTAL income	$29288	$29288	$29288	$29288	$29288	$29288
change	$14939	$6055	$2027	$-2396	$-23756	$-1182
	Utilitarianism Constrained by Equal Opportunity					
WHITE income	$14247	$23113	$27127	$31594	$52802	$30551
change	$-638	$-709	$-803	$-522	$-1406	$-875
BLACK income	$14247	$23113	$27127	$31594	$52802	$27269
change	$2299	$3179	$2682	$2439	$10441	$3964
OTHER income	$14247	$23113	$27127	$31594	$52802	$33865
change	$1118	$2914	$4797	$2825	$2836	$2946
TOTAL income	$14247	$23113	$27127	$31594	$52802	$30322
change	$-102	$-120	$-134	$-90	$-241	$-147

TABLE 2. Income Transfers Based on Race and Education.

Proof: We note that (++) neither $\phi \geq \phi'$ nor $\phi' \geq \phi$ for any $\phi, \phi' \in \Phi$ with $\phi \neq \phi'$. Suppose $\phi' \in \Phi$ is an OD-policy that minimises the budget $B(.)$ and differs from the self-financing policy ϕ. Let $I_l^{\phi} := I_{1l}^{\phi}$ and $I_l^{\phi'} := I_{1l}^{\phi'}$ denote the income of individuals with relevant characteristic l under these two OD-policies. By ((++)), there exists some l such that $I_l^{\phi'} > I_l^{\phi}$ and some l' such that $I_{l'}^{\phi'} < I_{l'}^{\phi}$. Clearly, some of the l'-individuals must receive negative transfers under ϕ'. We now define a policy ϕ'' that, first, agrees with ϕ' in the treatment of all characteristics l'' that differ from both l and l' ($\phi''_{kl''} := \phi_{kl''}$ for all $l'' \neq l, l'$ and all k) and, second, agrees with ϕ in the treatment of characteristic l ($\phi''_{kl} := \phi_{kl}$ for all k).

intervention involves a high volume of redistributed income and carries a cost of $1,182 per person (as shown in the margin of the table). The second policy intervention ('Utilitarianism Constrained by Equal Opportunity'), for instance, allows income to vary with education, still equalising the income of whites, blacks and others. Debates about a particular policy choice thus cannot be conclusively settled by appealing to the equality of everyone's opportunities.

Through its agnostic impartiality, our notion of equal opportunity may help to arbitrate at least some ideological conflicts. The controversy surrounding traditional utilitarianism is a case in point. A common criticism of this position notes that even the most inequitable allocation of resources may maximise average utility. While certain inequalities may seem tolerable, others are blatantly unjust. If we measure personal utility in our example by personal income, then average utility is maximised when the cost of redistribution is minimised. Given free reign, the utilitarian formula therefore selects the status quo without any income transfers, leaving significant racial inequalities in place. If one sympathises with the utilitarian outlook but objects to racial inequalities, then equal opportunity may provide the right constraint to reign in any utilitarian excesses. Equal opportunity could pre-select a set of candidate policies that eliminate any unacceptable inequalities while the final choice from this this restricted set would fall to the utilitarian calculus. In our example, this hierarchical procedure selects the policy that minimises the cost of equalising opportunity, i.e., the cheapest redistributive policy under which all individuals with the same level of education receive the same income. The selected policy is the second of the two policies considered above and

Compared to ϕ', this policy redistributes $\delta := \sum_k [\max(\phi'_{kl}, \rho \cdot \phi'_{kl}) - \max(\phi_{kl}, \rho \cdot \phi_{kl})] \cdot N_{kl}$ less income among individuals with characteristic l where $\delta > 0$. We finally use these savings to increase the equalised income of individuals with characteristics l' (the values of $\phi''_{kl'}$ are fixed by (+)). Since some of these payments go to l'-individuals who receive negative transfers under ϕ', ϕ'' must have a lower budget $B(\phi'')$ than ϕ'. Contradiction! ■

The condition that a policy be self-financing in relevant characteristics requires that $\sum_k \max(\phi_{kl}, \rho \cdot \phi_{kl}) \cdot N_{kl} = 0$ for every l. By (+), we know that $\phi_{2l} = I_{1l} - I_{2l} + \phi_{1l}$ and $\phi_{3l} = I_{1l} - I_{3l} + \phi_{1l}$. In the current example, a quick calculation shows that we must have $\phi_{1l} < 0$ and $\phi_{2l}, \phi_{3l} > 0$. Self-financing then implies $\phi_{1l} \cdot (N_{1l} \cdot \rho + N_{2l} + N_{3l}) + N_{2l}(I_{1l} - I_{2l}) + N_{3l}(I_{1l} - I_{3l}) = 0$ where $\phi_{1l} = \frac{N_{2l}(I_{2l} - I_{1l}) + N_{3l}(I_{3l} - I_{1l})}{N_{1l} \cdot \rho + N_{2l} + N_{3l}}$.

Policies that are self-financing in education may be of interest in their own right. Bossert and Fleurbaey (1996), for instance, propose a similar criterion favouring a policy that leaves the average payoff to education in the status quo untouched. Their reward schema is equivalent to self-financing in relevant characteristics if redistributive inefficiencies are absent. Since, in the presence of inefficiencies, a policy satisfying Bossert and Fleurbaey's criterion does not always exist, self-financing in relevant characteristics may be of interest.

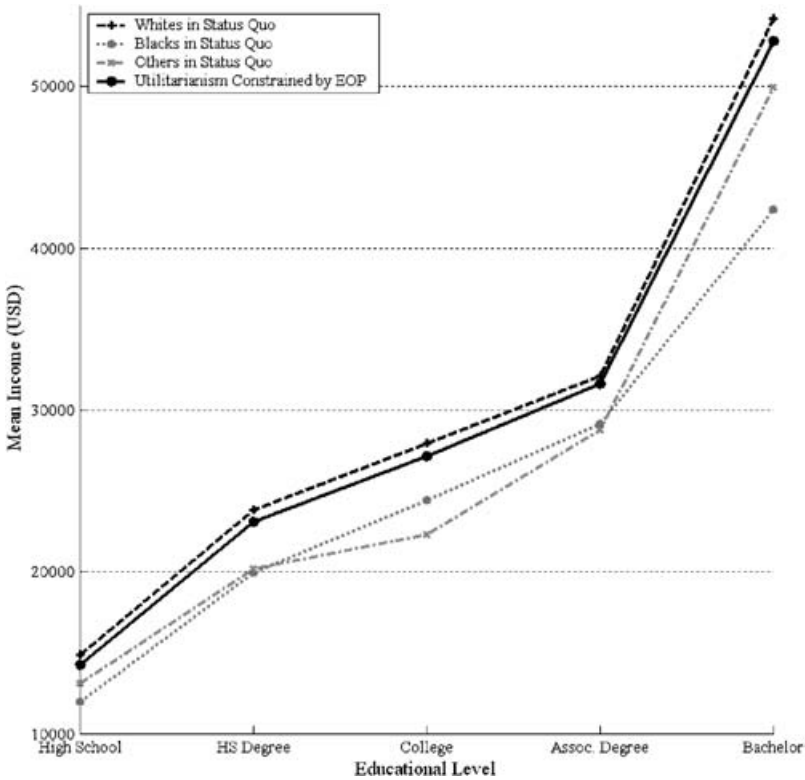

FIGURE 1. Income Transfers Based on Race and Education.

shown in Table 2 and Figure 1 under 'Utilitarianism Constrained by Equal Opportunity'.

5. OPPORTUNITY DOMINANCE

Inequalities can become powerful symbols of society's concern for fairness. When motivated by this symbolism or by some ideal fairness norm, we might want to eliminate inequalities caused by discrimination, for example, even if we have to hurt the victims of discrimination themselves, simply to indicate that discrimination is unacceptable (Wolff 2001). When our aim is, however, to aid the most disadvantaged, we not only tolerate but welcome certain departures from strict equality. From the viewpoint of individuals on a particular educational level, for instance, we then prefer a policy that increases the income of the most disadvantaged racial group. Following this train of thought, we may say that a policy ϕ is at least as good as a policy ψ conditional on a combination of relevant characteristics y if the worst-off y-individuals under ϕ are at least as well off as the

worst-off y-individuals under ψ (where an y-individual is an individual with a combination of characteristics y). On a moment's reflection, it is clear that this 'conditional maximin' criterion fails to distinguish between two policies that lead to the same lowest level of income, but differ in their second lowest income level. The 'conditional leximin' rule offers the perhaps best-known solution to this limitation, tending first to the most disadvantaged, then to the second-most disadvantaged etc. (Sen 1970): A policy ϕ is *better than* a policy ψ *conditional on* a combination of relevant characteristics y exactly when the worst-off y-individuals under ϕ are better off than the worst-off y-individuals under ψ and, in case of a tie, the second worst-off y-individuals under ϕ are better off than the second worst-off y-individuals under ψ, etc. We say that ϕ is *as good as* ψ *conditional on* y just in case the worst-off y-individuals under ϕ are as well off as the worst-off y-individuals under ψ and the second worst-off y-individuals under ϕ are as well off as the second worst-off y-individuals under ψ, etc. We say that ϕ is *at least as good as* ψ *conditional on* y exactly if ϕ is as good as or better than ψ conditional on y.[4]

For each educational level, this rule ranks policies by their effect on racial income differentials. Typically, however, no policy is best for all

[4] As before, let $Y = \langle Y_1, \ldots, Y_M \rangle$ be a vector of morally relevant factors and $Z = \langle Z_1, \ldots, Z_N \rangle$ be a vector of morally irrelevant factors that can influence the individuals' attainment of the good in question. Let Φ be a set of feasible policies. Then $u(\phi, y, z)$ measures the attainment of a particular good under policy $\phi \in \Phi$ by an individual with a combination $Y = y$ of relevant characteristics and a combination $Z = z$ of irrelevant characteristics. Let $\phi, \psi \in \Phi$, let N_y^ϕ be the number of y-individuals under policy ϕ and let N_y^ψ be the number of y-individuals under policy ψ, allowing for behavioural responses to policies that change relevant characteristics. Number the y-individuals under ϕ by $1, \ldots, N_y^\phi$ and number the y-individuals under ψ by $1, \ldots, N_y^\psi$. The comparisons of inequalities across groups of different sizes poses a common difficulty for inequality measures (cf. Sen 1973). In our case, it compromises the ability of the leximin rule to yield complete conditional orderings (cf. section 7). Let σ be a permutation of $\{1, \ldots, N_y^\phi\}$ such that $u(\phi, y_{\sigma(1)}, z_{\sigma(1)}) \leq \ldots \leq u(\phi, y_{\sigma(N_y^\phi)}, z_{\sigma(N_y^\phi)})$ and let τ be a permutation of $\{1, \ldots, N_y^\psi\}$ such that $u(\psi, y_{\tau(1)}, z_{\tau(1)}) \leq \ldots \leq u(\psi, y_{\tau(N_y^\psi)}, z_{\tau(N_y^\psi)})$. Then ϕ is *better than* ψ *conditional on* $Y = y$ exactly when there exists some $1 \leq i \leq \min(N_y^\phi, N_y^\psi)$ such that $u(\phi, y_{\sigma(i)}, z_{\sigma(i)}) > u(\psi, y_{\tau(i)}, z_{\tau(i)})$ and, for all $1 \leq j \leq i$, $u(\phi, y_{\sigma(j)}, z_{\sigma(j)}) = u(\psi, y_{\tau(j)}, z_{\tau(j)})$. This strict relation is asymmetric and transitive. When $N_y^\phi = N_y^\psi$ and ϕ and ψ are not better than each other conditional on y, we say that ϕ is *as good as* ϕ *conditional on* $Y = y$ but refrain from such comparisons for policies that differentially affect the number of individuals with characteristic y. We say that ϕ is *at least as good as* ψ *conditional on* $Y = y$ exactly if ψ is either not better than or as good as ϕ conditional on $Y = y$. This relation is transitive, but not complete. We say that ϕ *opportunity-dominates* ψ exactly if ϕ is at least as good as ψ conditional on every value $Y = y$ (displayed by some individual) and ϕ is better than ψ conditional on some value $Y = y'$ (displayed by some individual). Opportunity-dominance is transitive, but not complete. Finally, ϕ is *opportunity-undominated*, or *opportunity-optimal*, just in case there exists no $\psi \in \Phi$ that opportunity dominates ϕ. If there are only finitely many feasible policies, the set of opportunity-undominated policies is non-empty, even when feasible policy instruments are too blunt to establish strict equality of opportunity.

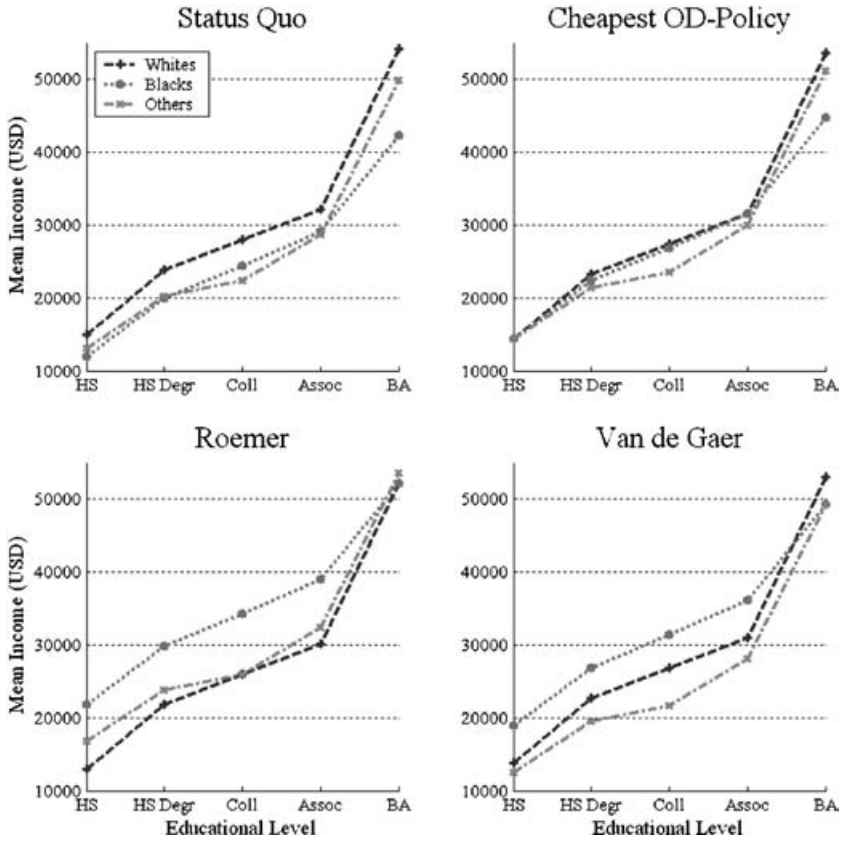

FIGURE 2. Income Transfers Based on Race.

combinations of relevant characteristics. As an illustration, we continue our earlier example, but now consider redistributions of income based on the irrelevant factor of race alone. (More realistic policies, like income taxes etc., encounter the exact same problems whenever they react to characteristics that are correlated with irrelevant factors.) Feasible policies now add the same, perhaps negative, amount to the income of every individual of the same race. To maximise the income of the most disadvantaged individuals with the lowest recorded educational achievement, whites must pay $501, blacks must receive $2,436 and others must receive $1,255. This is the 'Cheapest OD-policy' in Table 3 and Figure 2. (We will explain below the meaning of the names given to the policies in this table and figure.) While this redistribution is the best possible policy for the lowest educational level, the most disadvantaged individuals on the next highest level profit more from 'Roemer's policy' shown in the same table and figure. When one policy is not uniformly

	High School No Degree	High School w/Degree	College No Degree	Associate Degree	Bachelor's or More	Total
	Cheapest OD–Policy					
WHITE income change	$14384 $-501	$23321 $-501	$27429 $-501	$31615 $-501	$53707 $-501	$30925 $-501
BLACK income change	$14384 $2436	$22370 $2436	$26881 $2436	$31591 $2436	$44797 $2436	$25742 $2436
OTHER income change	$14384 $1255	$21454 $1255	$23585 $1255	$30024 $1255	$51221 $1255	$32174 $1255
TOTAL income change	$14384 $35	$23146 $-87	$27203 $-57	$31546 $-138	$52879 $-165	$30385 $-84
	Roemer					
WHITE income change	$12945 $-1940	$21882 $-1940	$25990 $-1940	$30176 $-1940	$52268 $-1940	$29486 $-1940
BLACK income change	$21855 $9907	$29841 $9907	$34352 $9907	$39062 $9907	$52268 $9907	$33213 $9907
OTHER income change	$16789 $3660	$23859 $3660	$25990 $3660	$32429 $3660	$53626 $3660	$34579 $3660
TOTAL income change	$14506 $157	$22915 $-318	$27051 $-209	$31146 $-537	$52360 $-684	$30143 $-326
	Van de Gaer					
WHITE income change	$13728 $-1157	$22665 $-1157	$26773 $-1157	$30959 $-1157	$53051 $-1157	$30269 $-1157
BLACK income change	$18911 $6963	$26897 $6963	$31408 $6963	$36118 $6963	$49324 $6963	$30269 $6963
OTHER income change	$12479 $-650	$19549 $-650	$21680 $-650	$28119 $-650	$49316 $-650	$30269 $-650
TOTAL income change	$14484 $135	$23081 $-151	$27154 $-106	$31348 $-335	$52523 $-521	$30269 $-200

TABLE 3. Income Transfers Based on Race

better than another policy, we must therefore decide whether to put more weight on the most disadvantaged workers on the lowest or on the second-lowest educational level. This balancing opens as much room for quarrels as there was for controversy about the supplementary distributive principles discussed in the previous section.

Some uncontroversial policy comparisons, however, can garner the support of any opportunity principle that gives absolute priority to the most disadvantaged. 'Van de Gaer's policy' in the same table and figure clearly does not exploit the full range of possible transfers that would make the most disadvantaged as well-off as possible. For both the 'Cheapest OD-policy' and 'Roemer's policy' lead to a higher minimal income at any educational level. To capture this uniform superiority, we say that a policy ϕ *dominates* a policy ψ *in opportunity*, or that ϕ *opportunity-dominates* ψ if and only if ϕ is at least as good as ψ conditional on every combination of relevant characteristics displayed by some individuals and better conditional on some such combination. An opportunity-dominated policy is not a plausible candidate for selection because there are uncontroversially better instruments for aiding the most disadvantaged. We therefore focus on policies that are *opportunity-undominated* by any other feasible policy and which are in this sense *opportunity-optimal*. The shaded area in Figure 3 contains exactly the opportunity-undominated policies when transfers are based exclusively on race (which here happen to involve only positive transfers to other races).[5] The Cheapest OD-policy and Roemer's policy mark two corners of this area, while Van de Gaer's

[5] Policies are now of the form $\phi \in \mathbb{R}^K$ and the set Φ of feasible policies satisfies $\sum_{1 \leq k \leq K} \max(\phi_k, \rho \cdot \phi_k) \cdot N_k = 0$ where N_k is the number of individuals with irrelevant characteristic k. Income under policy ϕ for individuals with characteristics k and l equals $I^{\phi}_{kl} := I_{kl} + \phi_k$. In our example, ϕ_1, ϕ_2, ϕ_3 represent transfers to whites, blacks and others. This restriction of feasible policies means that all policies respect Bossert and Fleurbaey's (1996) axiom of 'equal transfer for equal irrelevant characteristics'.

When computing the set of opportunity-undominated policies by brute force, we have to search the entire set of feasible policies when testing whether a given policy is opportunity-dominated. The running time required by the brute force algorithm increases quadratically in the size of the set of feasible policies. Although a more sophisticated algorithm has a somewhat better performance, the calculation still remains difficult. In the current model, it is, however, immensely simplified by the following useful equivalence: *A policy $\phi \in \Phi$ is undominated in opportunity if and only if (*) every racial group is worst-off at some level of education (i.e., if for all k there exists some l such that $I^{\phi}_{kl} = \min_{k'} I^{\phi}_{k'l}$).*

Proof: (a) Suppose (*) is false. We have to show that ϕ is dominated in opportunity. We know that there exists some k such that, for all l, $\delta_l := I^{\phi}_{kl} - \min_{k'} I^{\phi}_{k'l} > 0$. Let $\delta := \min_l \delta_l$. We can now redistribute $\rho \cdot \delta \cdot N_k > 0$ in a positive transfer among all individuals with irrelevant characteristics other than k, thus increasing their wealth. Hence, ϕ is dominated in opportunity. (b) Suppose (*) is true and $\phi' \in \Phi$ differs from ϕ. We have to show that ϕ is opportunity-undominated. By the budget constraint, there must exist some k such that $\phi'_k < \phi_k$. By (*), there exists some l such that $I^{\phi}_{kl} = \min_{k'} I^{\phi}_{k'l}$. It follows that $I^{\phi'}_{kl} < \min_{k'} I^{\phi}_{k'l}$ and ϕ' therefore does not dominate ϕ in opportunity. ■

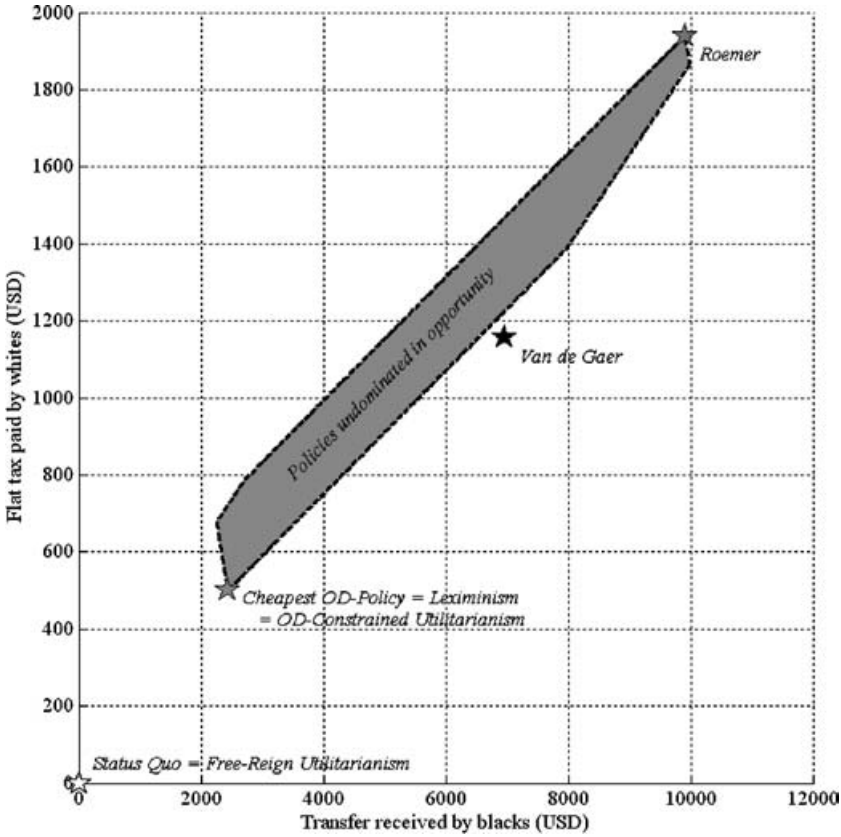

FIGURE 3. Income Transfers Based on Race.

We note that this equivalence depends only on the following property of the set Φ of feasible policies: (**) Whenever $\phi, \phi' \in \Phi$ with $\phi \neq \phi'$, then neither policy dominates the other, in the sense that neither $\phi \geq \phi'$ nor $\phi' \geq \phi$. For feasible sets of this nature, it follows that the use of the maximin instead of the leximin criterion is innocuous.

Redistributive cost is minimised exactly when $-\phi_1$ is minimised because all OD-policies have positive ϕ_2 and ϕ_3 (ϕ_3 is positive exactly if $-\phi_1 > \frac{N_2}{N_1 \cdot \rho} \cdot \phi_2$). By the equivalence proven in the previous footnote, an OD-policy ϕ renders whites at some educational level worst-off. Since the difference between white incomes and the smallest incomes is minimised at the lowest educational level, $-\phi_1$ is minimised when whites at this level obtain the same income as the remainder of the population at that level. The incomes of individuals in this category are equalised precisely when $14885 + \phi_1 = 11948 + \phi_2 = 13129 + \phi_3$. Equivalently, we must have both $\phi_2 = 2937 + \phi_1$ and $\min\left(-\frac{(N_1 \cdot \rho + N_2) \cdot \phi_1 + 2937 \cdot N_2}{N_3}, -\frac{(N_1 \cdot \rho + N_2) \cdot \phi_1 + 2937 \cdot N_2}{N_3 \cdot \rho}\right) = 1756 + \phi_1$. This implies $\phi_1 \approx -501$, $\phi_2 \approx 2436$ and $\phi_3 \approx 1255$. The resulting income shows that this policy is undominated in opportunity (by the above equivalence).

selection falls outside of this set. After deselecting dominated policies like Van de Gaer's, a range of different candidates remains for selection by additional distributive principles. Compared to the range of all possible transfers, opportunity concerns have substantially reduced the range of eligible policies. For reasons of opportunity alone, whites will have to make relatively moderate payments (between roughly $500 and $2000) while blacks and others experience substantial increases in their income.

In our example, opportunity concerns also contribute impressively to the arbitration between outcome criteria that do not distinguish between just and unjust inequalities. Free-reign utilitarianism, for instance, accepts all inequalities as long as they maximise 'the greatest happiness of the greatest number'. When utility is measured by income and redistribution is costly, this criterion fails to address any racial inequalities whatsoever, favouring the status quo without any loss in average income. When we constrain the utilitarian formula to a choice from the pre-selected set of opportunity-undominated policies, we force it to address racial inequalities in a serious manner and arrive at the 'Cheapest OD-policy' shown in the table and figures. The same policy is, in our example, also selected by an outcome criterion on the opposite end of the ideological spectrum. Absolute priority for the worst-off accepts no inequalities unless they maximise the wealth of the worst-off individuals in the entire population, whatever their relevant or irrelevant characteristics may be. In our example, the worst-off individuals are always located in the lowest educational category, regardless of the policy chosen. Absolute priority for the worst-off therefore also selects the Cheapest OD-policy, equalising income between the races on the lowest educational level. At least on this occasion, opportunity concerns are sufficient to reconcile profound divergences through a more nuanced view of moral relevance and unfair disadvantage.

While we have here ranked policies by the leximin criterion, we can pursue the same programme with any other inequality criterion (such as the Gini coefficient, Atkinson's measure etc.). In a first step, we again compare how policies perform on the preferred metric conditional on each relevant characteristic, e.g., levels of education. In a second step, we then construct an incomplete ranking of policies across all relevant characteristics and determine dominance relations. Finally, we constrain policy choices to the set of all policies that are undominated in opportunity according to our preferred inequality criterion.

6. ROEMER'S AND VAN DE GAER'S RULES

John Roemer pursues the same goal of striking a compromise between utilitarianism and concern for the worst-off. Combining elements from both positions, he creates a hybrid 'utilitarianism for the most

disadvantaged'. In our example, he first ranks income distributions on each educational level by their lowest income and then averages these lowest incomes across all educational levels. If N is the number of individuals in the population, N_y is the number of individuals with irrelevant characteristic y and $u(\phi, y, z)$ measures the attainment of some good under policy ϕ by an individual with a combination y of relevant characteristics and a combination z of irrelevant characteristics, then Roemer selects a policy ϕ that maximizes:

$$\sum_y \frac{N_y}{N} \cdot \min_z u(\phi, y, z)$$

When income transfers are based on race alone, Roemer's criterion selects the policy that is shown in Table 3 and Figure 2.[6] In this

[6] We discuss Roemer's criterion without his method for determining relevant characteristics by individuals' quantile of the outcome distribution for each type. We criticised this method in section 3. Roemer's and Van de Gaer's rules are also discussed in Bossert, Fleurbaey and Van de Gaer (1999) and Ooghe, Schokkaert and Van de Gaer (2003). When income transfers are based on race alone, we find $\phi_1 \approx -1940$, $\phi_2 \approx 9907$ and $\phi_3 \approx 3660$, using algorithms for non-linear optimisation problems. The resulting policy makes whites uniformly the worst-off. When transfers depend on both race and educational level, Roemer maximises $\sum N_l \cdot \phi_{1l}$ within the budget constraint and subject to (+) $I^{\phi}_{kl} = I^{\phi}_{k'l}$ for all k, k', l. By (+), this target function is maximised exactly when the average population income is maximized and, equivalently, when the cost of redistribution and therefore the amount of redistribution is minimised. Roemer's criterion therefore selects the same policy as utilitarianism constrained by equal opportunity (cf. section 4).

There are some questions about the appropriate choice of weights in Roemer's formula. When transfers depend on the irrelevant characteristic of race alone, this formula tends to favour rare over frequent irrelevant characteristics. In our example, the criterion makes blacks, at every level of education except the highest, much better off than whites who drop to the lowest income level throughout (Table 3 and Figure 2). The reason is that a $1 transfer from blacks to whites would only increase each white's income by about $0.13, as the share of whites in the population is much larger than that of blacks. This would improve the minima at 'High School, No Degree', 'High School, With Degree' and 'Associate Degree'. However, it would worsen the minimum at the highest educational level, 'BA or more'. The $1 loss in the minimum at 'BA or more' is weighted by the population share of this educational level, which is 24%. This weighted loss outweighs the $0.13 gain in the other three minima, since their joint weight is 56%. There are two alternatives to this weighting method, both of which have serious drawbacks. The first is to multiply the outcome of each combination of relevant and irrelevant characteristics by the number of individuals at that combination and to maximise:

$$\sum_y \min_z \frac{N_{yz}}{N} \cdot u(\phi, y, z)$$

However, this rule can make the most disadvantaged worse-off than they need be. It evaluates the status quo, shown in Table 1, at $22,635. Consider the alternative policy of reducing the income of others at the lowest educational level by $1,182, making them worst-off at this educational level. This money is not redistributed and no further income transfers take place. Because there are fewer others than blacks at the lowest educational

example, Roemer's policy marks a corner point of the set of opportunity-undominated policies (Figure 3). When, as we assumed for simplicity's sake, all policies have the same behavioural consequences, Roemer's functional selects at least one opportunity-optimal policy, but may also be indifferent between additional policies that are opportunity-dominated. Since his criterion only considers the lowest income at a given level of education, it may not be able to distinguish between policies that have the same effect on the most disadvantaged but have different effects for the second-most disadvantaged. A policy, for instance, that caps, on each educational level, incomes at the status quo's lowest income level, is opportunity-dominated by the status quo (shown in the upper part of Table 4). Yet, Roemer's criterion evaluates this policy at the exact same value of $25,233 as the status quo and would thus remain indifferent in a pairwise choice between the status quo and the capping policy. We will see in the following section that all policies maximising Roemer's functional may be both Pareto- and opportunity-dominated when policies have differential effects on behaviour.

Roemer accepts inequalities in as far as they contribute to the social objective expressed in his valuation formula. When all individual characteristics are considered relevant (or when all individuals have the same irrelevant characteristics), this criterion reverts to traditional utilitarianism. When, however, all individual characteristics are considered irrelevant (or all individuals have the same relevant characteristics), it prioritises the attainment of the worst-off. From this perspective, utilitarianism and priority of the worst-off appear to take extreme and opposite stances on moral relevance. Roemer's criterion, by contrast, aims at a more subtle account of morally acceptable inequalities.

level, the weight of this level is now diminished. As a result, the above criterion evaluates the policy at $25,122 and thus prefers it to the status quo, even though it is both opportunity- and Pareto-dominated by the status quo. The second alternative is to give equal weight to all relevant characteristics and to maximise:

$$\frac{1}{N} \cdot \sum_{y} \min_{z} u(\phi, y, z)$$

This version of the criterion no longer yields classical utilitarianism in the limiting case when all characteristics are judged relevant (or all individuals have identical irrelevant characteristics). If we consider transfers based on both race and education, this criterion equalises the income among individuals with the same education, but gives almost absolute priority to the rarest form of education (barring high redistributive costs). If we consider an educational level with many individuals (say, the 62 million individuals with a high-school degree) and another with few individuals (say, the 14 million individuals with an associate degree), then any transfer from the 62 million individuals to the 14 million individuals increases this functional, no matter how poorly off the 14 million are made. In the case of income transfers based on race alone, we find differences from the version in the main text of less than $1.

	High School No Degree	High School w/Degree	College No Degree	Associate Degree	Bachelor's or More	Total
	No response					
WHITE number ('000) income	23,816 $11,948	52,642 $19,934	31,574 $22,330	12,218 $28,769	39,338 $42,361	159,588 $25,421
BLACK number ('000) income	4,655 $11,948	7,581 $19,934	4,812 $22,330	1,401 $28,769	3,398 $42,361	21,847 $22,815
OTHER number ('000) income	1,299 $11,948	1,985 $19,934	1,541 $22,330	598 $28,769	3,093 $42,361	8,516 $27,915
TOTAL number ('000) income	29,770 $11,948	62,208 $19,934	37,927 $22,330	14,217 $28,769	45,829 $42,361	189,951 $25,233
	Whites from HS Degree to College without Degree					
WHITE number ('000) income	23,816 $11,948	**0** $19,934	**84,216** $22,330	12,218 $28,769	39,338 $42,361	159,588 $26,211
BLACK number ('000) income	4,655 $11,948	7,581 $19,934	4,812 $22,330	1,401 $28,769	3,398 $42,361	21,847 $22,815
OTHER number ('000) income	1,299 $11,948	1,985 $19,934	1,541 $22,330	598 $28,769	3,093 $42,361	8,516 $27,915
TOTAL number ('000) income	29,770 $11,948	9,566 $19,934	90,569 $22,330	14,217 $28,769	45,829 $42,361	189,951 $25,897

TABLE 4. Responses to Income Cap

In the previous section, we pursued the same idea and constrained the utilitarian criterion to the set of opportunity-undominated policies. We found that this constraint was sufficient to reconcile utilitarian reasoning with priority of the worst-off in our income example. Roemer (1996, 1998) suggests that his criterion stands somewhere between utilitarianism and maximisation of the worst outcome. Yet, Figure 3 shows that his criterion occupies an extreme, rather than intermediate position in the space of opportunity policies, and lowers both the population average and the lowest overall income. Roemer burdens the concept of equal opportunity

with a foreign and controversial distributive principle and thus prevents us from exploring the consensus that is potentially generated by opportunity concerns.

The selection rule developed by Dirk Van de Gaer (1993) also blends the notion of absolute priority to the most worst-off with elements from utilitarianism. In our example, he first calculates the average income of each race, and then maximises the lowest of these averages. More generally, he selects a policy ϕ that maximises the objective:

$$\min_z \sum_y \frac{N_y}{N} \cdot u(\phi, y, z)$$

Again, we recover utilitarianism when all individual characteristics are relevant or all individuals have the same irrelevant characteristics. We recover maximisation of the lowest attainment level when all characteristics are irrelevant or all individual have the same relevant characteristics.

Van de Gaer's rule differs sharply from opportunity dominance in how it evaluates an individual's situation. It evaluates, for instance, the situation of a black individual with an associate degree not by this individual's own income level but by the average income of blacks across all educational levels. Although others with an associate degree receive a lower income than blacks with the same degree, Van de Gaer considers them advantaged *vis à vis* blacks, because their average group income is higher (Table 1). Opportunity dominance would welcome a transfer of \$1 from a black with an associate degree to an other with an associate degree and prefer it to the status quo; Van de Gaer's method would not. As a result, Van de Gaer's favoured policy does not dominate the status quo in opportunity and is also dominated by Roemer's policy as well as the policy that enjoys the joint support of opportunity-constrained utilitarianism and the lowest-income maximisation (Table 3 and Figure 2). By taxing others \$650, Van de Gaer's policy renders them worst-off at every level of education and punishes them for advancing on average to a higher educational level than blacks (the distribution of others' educational achievement first-order stochastically dominates that of blacks).[7]

[7] Van de Gaer in personal communication says he would restrict the applicability of his criterion to situations in which relevant characteristics are distributed independently of irrelevant characteristics. In our example, average income among individuals with the same irrelevant characteristics is equalised exactly if $31426+\phi_1 = 23306+\phi_2 = 30919+\phi_3$. Equivalently, we must have both $\phi_2 = 8120+\phi_1$ and $\min(-\frac{(N_1\cdot\rho+N_2)\cdot\phi_1+8120\cdot N_2}{N_3}, -\frac{(N_1\cdot\rho+N_2)\cdot\phi_1+8120\cdot N_2}{N_3\cdot\rho}) = 507+\phi_1$. This implies $\phi_1 \approx -1157$, $\phi_2 \approx 6963$ and $\phi_3 \approx -650$. If we redistribute income by both race and level of education, there exist infinitely many feasible policies that satisfy Van de Gaer's criterion. In some of these policies educated whites pay more than uneducated whites. Some of these policies are

Van de Gaer's approach can perhaps best be interpreted as an attempt to evaluate the options available to individuals (Ooghe, Schokkaert and Van de Gaer 2003). Some inequalities may trouble us not because of the resulting outcomes as such, but because individuals had differential access to the most promising alternatives. From this perspective, Van de Gaer appears to infer an individual's options from the actual range of choices made by other individuals with the same irrelevant characteristics, e.g., race. He then determines the value of this 'opportunity set' by the average benefit that accrues from this range of choices and resolves to maximise this value. However, this technique does not apply when we consider factors as relevant that are not fully under an individual's control. In our example, it makes little sense to equate the value of a white person's opportunity set with the average income obtained by whites, since highest levels of educational attainment will not be attainable by whites who lack the required intellectual abilities. It is, of course, difficult to infer an individuals' option set and even harder to appraise its value (Weymark 2001). Were we able to solve this problem, we could straightforwardly define the values of option sets as the good to be distributed and thus incorporate the availability of options into the notion of opportunity dominance.

7. BEHAVIOURAL RESPONSES

We have so far worked under the simplifying assumption that individuals show no behavioural responses to policy interventions. In the example of lump-sum transfers based on race and education, we assumed that all individuals maintain their current level of education regardless of the transfer payments they make or receive. In reality, different taxation policies vary in their effect on high-school, college and university attendance, through different marginal returns to education. We will now discuss how to evaluate the behavioural responses evoked by policy instruments. In particular, we will address differences in the interpretation and applicability of opportunity-optimality and the 'Strong Pareto Principle' which requires us to make an individual better off if doing so makes nobody worse off ('Pareto-optimality', for short). The contrast between Pareto-optimality and opportunity principles becomes apparent when policies differentially affect the number of individuals with a particular relevant characteristic.

opportunity-dominated and some are not. Van de Gaer's criterion can easily be rendered Pareto-optimal by evaluating policies not only by their effect on the lowest average income but also by their effect on the second-lowest average income etc. We would then evaluate an individual's situation by the average income of individuals with the same irrelevant characteristics and then apply the leximin rule to this measure.

In such cases, Roemer's criterion stands in stark opposition to both opportunity- and Pareto-optimality. We return to the capping policy that fixes each educational category's income at its lowest income level in the status quo. We suppose that all whites with a high-school degree respond to this income by advancing to the next higher educational level, i.e., college attendance without a degree (shown in the lower part of Table 4). Through this educational advance, individuals increase their income from \$19,934 to \$22,330, leaving them still \$23,822 − \$22,330 = \$1,492 poorer than they were in the status quo with less education. By the lights of both Pareto- and, as we shall see, opportunity-optimality, the capping policy is therefore worse than the status quo. Yet, educationally advancing individuals shift their weight away from certified high-school attendance towards uncertified college attendance. Since the differential between the lowest income at these educational levels is positive (\$22,330 – \$19,934 = \$2,396), the shifted weights increase the value that Roemer's criterion ascribes to the capping policy. If all whites with a high-school degree were to proceed to the next higher educational level, they would shift a weight of 52,642/18,9951 = 27.7% and thereby increase the value of the capping policy by 27.7%. \$2,396 = \$664 above the status quo.

Roemer's criterion also opposes opportunity-dominance which, in this case, aligns itself with Pareto-dominance. In our hypothetical scenario, the capping policy prompts about 91 million people to attend college without earning a degree and gives them an income of \$22,300. In the status quo only about 38 million people attend college without earning a degree. About 2 million of these earn the same low income of \$22,330, while the remaining 36 million earn a substantially higher income. In other words, the status quo makes the 2 million most disadvantaged individuals in this educational tranche as well-off as the capping policy, but makes all remaining individuals in this tranche better off. On the level of uncertified college attendance, the conditional leximin ranking of section 5 therefore strictly prefers the status quo over the capping policy. Since the same is true of all other educational levels, the status quo opportunity-dominates the capping policy. Roemer's criterion has thus selected a policy that falls outside the set of opportunity-optimal candidates. *A fortiori*, this example thwarts any attempt to render Roemer's criterion Pareto- or opportunity-optimal in the presence of behavioural responses.[8]

[8] Roemer's criterion thus prefers a Pareto-dominated policy. Ooghe, Schokkaert and Van de Gaer (2003) point out that Roemer's criterion satisfies the strong Pareto principle only when all individuals maintain the same relevant characteristics under any policy. The same authors also suggest that, for each relevant characteristic, we replace the minimum operator in Roemer's formula with some inequality measure, such as some suitable Atkinson measure, that puts a large weight on the worst-off individual with that characteristic, but which also increases monotonically with improvements in the income of the second-,

On this particular occasion, opportunity-optimality sided with Pareto-optimality. It is also generally true that both dominance relations run in the same direction, i.e., that one policy cannot Pareto-dominate another if the latter opportunity-dominates the former. The two principles are, however, logically independent and one principle may regard two policies as incomparable while the other expresses a strict preference.[9] Such situations can arise even for policies that influence behaviour through information and encouragement, but do not engage in income redistributions. Suppose the policy-maker thoroughly informs the most highly educated white individuals of the pathological link between exposure to stress and the increased likelihood of cardiac diseases. Let us hypothetically suppose that, with such information, all 39 million individuals in this category arrest their education at the level of an associate degree and drop to an income of $32,116. For simplicity's sake, we assume that all remaining

third- etc. most disadvantaged. By the same logic as above, averaging such inequality measures can lead to preference for some Pareto-dominated policy when we allow changes in individuals' relevant characteristics. Indeed, the comparisons of inequalities across groups of different sizes poses well-known difficulties for inequality measures (Sen 1973).

[9] We first claim that *ψ does not Pareto-dominate ϕ, neither in the strong nor in the weak sense, if ϕ opportunity-dominates ψ. Proof*: Suppose that ϕ opportunity-dominates ψ, while ψ Pareto-dominates ϕ in the strong sense, i.e. ψ is at least as good as ϕ for all individuals and better for some. For any individual n ($1 \leq n \leq N$), define $u(n) := u(\phi, y_n, z_n)$ and $v(n) := u(\psi, y_n, z_n)$. We will show (*) that, for all n ($1 \leq n \leq N$), there exist permutations σ, τ of $\{1, \ldots, N\}$ such that (i) $u \circ \sigma(1) \leq \ldots \leq u \circ \sigma(N)$, (ii) $v \circ \tau(1) \leq \ldots \leq v \circ \tau(N)$, and (iii) $\sigma(k) = \tau(k)$ and $u \circ \sigma(k) = v \circ \sigma(k) = u \circ \sigma(n)$ for all $1 \leq k \leq n$. We first show that the claim holds for $n = 1$. Let σ, τ be permutations that satisfy (i) and (ii). Let $j := \sigma(1)$ and $i := \tau(1)$. By opportunity-dominance, $u(j) \geq v(i)$. By Pareto-dominance, we have $v(i) \geq u(i)$ and, by (i), $v(i) \geq u(j)$. Hence, $v(i) = u(i) = u(j)$. Let σ' agree with σ except for interchanging the position of i and j (i.e., except for $\sigma'(1) := i$ and $\sigma'(\sigma^{-1}(i)) := j$). σ' and τ now satisfy conditions (i)–(iii). Assuming that the claim holds for n, we will now establish it for $n + 1 \leq N$. Let $i := \tau(n + 1)$ and $j := \sigma(n + 1)$ and assume that $u(j) > v(i)$. By Pareto-dominance, $u(j) > v(i) \geq u(i)$ and, by (i), there exists some $1 \leq k \leq n$ with $\sigma(k) = i$. By (iii), $\tau(k) = i$ and, since τ is a permutation, we cannot have $i = \tau(n + 1)$. By reductio, we conclude that $u(j) \leq v(i)$. Opportunity-dominance implies $u(j) \geq v(i)$. We thus obtain $u(j) = v(i)$ and, by Pareto-dominance and (i), $v(i) = u(i)$. Let σ' agree with σ except for interchanging the position of i and j (i.e., except for $\sigma'(n + 1) := i$ and $\sigma'(\sigma^{-1}(i)) := j$). σ' and τ now satisfy conditions (i)–(iii) of the claim. Having established claim (*), we note that it contradicts Pareto-dominance (and, for that matter, opportunity-dominance). Hence, our assumption is refuted and the proof completed. ■

Second, we show the logical independence of Pareto- and opportunity dominance. Consider one relevant factor Y with values y_1, y_2 and one irrelevant factor Z with values z_1, z_2. Let there be three individuals 1, 2, 3 and define the following three policies: Under ϕ_1, 1 has characteristics (y_1, z_1), 2 has (y_2, z_1), 3 has (y_2, z_2), $u(\phi_1, y_1, z_1) = 1$, $u(\phi_1, y_2, z_1) = 1$ and $u(\phi_1, y_2, z_2) = 3$. Under ϕ_2, 1 has characteristics (y_1, z_1), 2 has (y_2, z_1), 3 has (y_1, z_2), $u(\phi_2, y_1, z_1) = 1$, $u(\phi_2, y_2, z_1) = 1$, and $u(\phi_2, y_1, z_2) = 2$. Under ϕ_3, 1 has characteristics (y_1, z_2), 2 has (y_2, z_1), 3 has (y_1, z_1), $u(\phi_3, y_1, z_1) = 1$, $u(\phi_3, y_2, z_1) = 0$, and $u(\phi_3, y_1, z_2) = 2$. With these definitions, ϕ_1 Pareto-dominates (but does not opportunity-dominate) ϕ_2 and ϕ_2 opportunity-dominates (but does not Pareto-dominate) ϕ_3.

individuals show no behavioural changes and earn the same income as in the status quo of Table 1. Thus, the information policy has no effect on the 14 million individuals who hold an associate degree in the status quo. The first, second, . . . , and 14 million-th most disadvantaged individual on this educational level is therefore equally well-off under either policy. However, the 14 million and first individual (roughly speaking) with an associate degree under the information policy has no counterpart in the status quo. It is therefore not clear on what basis we can compare these policies and, according to our definition of opportunity-dominance, the policies remain incomparable. At the same time, Pareto-optimality strictly prefers the status quo over the information policy because some whites drop to a lower income level while everyone else is unaffected.

The divergence of the opportunity- and the Pareto-principle stems to a large extent from the good we are considering for redistribution. Income is not a comprehensive measure of an individual's well-being. Instead, people also value leisure, health and even some relevant characteristics, such as education, in their own right. The decreases in income that result from individuals' responses to the information policy are accompanied by benefits that are not reflected in monetary earnings. In fact, such additional benefits partly account for the behavioural responses to a policy. If individuals voluntarily drop to a lower level of education and income, they presumably maximise their well-being (if they are well informed and rational). While one would surely want to increase an individual's well-being if this can be done at nobody's expense, a decrease in monetary earnings without any offsetting increases is not a sufficient reason to reject the information policy. In general terms, the Pareto principle loses much of its cogency when applied to units of some commodity rather than to some comprehensive measure of well-being. In so far as opportunities are concerned, the weakness of the Pareto principle is its exclusive focus on individuals' outcomes regardless of the relevant characteristics that lead to these outcomes. Opportunity dominance instead evaluates the effect of policies conditional on relevant characteristics which may include individuals' choices in response to policy interventions. Opportunity principles are thus concerned with individuals' outcomes only in as far as they reflect unfair advantages and disadvantages.

8. CONCLUSION

Our purpose was to help structure the political debate in which the goal of equal opportunity receives continued support, but is given conflicting interpretations. We held that some notion of moral relevance or of just and unjust inequalities lies at the heart of any concrete opportunity principle. One's concrete notion of moral relevance and one's stance on the influence of irrelevant on relevant factors will depend both on societal context

and on the good to be allocated. Starting from this generic definition of equal opportunity, we have then introduced opportunity dominance as a criterion that prioritises the most disadvantaged.

These opportunity principles aim to mitigate the differential effects of irrelevant factors, but remain agnostic about the appropriate influence of relevant factors. They thus avoid commitments to controversial distributive principles about how relevant characteristics ought to be rewarded. We have shown by example what benefits such impartiality may bring. On the basis of some shared conception of moral relevance, we have illustrated the ability of opportunity principles to arbitrate certain philosophical differences about distributive justice, to the point that these disagreements become smaller, or even disappear.

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