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Knight, C., and Knight, R. (2012) Equality and information. *Ethical Perspectives*, 19 (3). pp. 469-499. ISSN 1370-0049

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Deposited on: 27 March 2013

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Equality and Information

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ABSTRACT. Traditional outcome-orientated egalitarian principles require access to information about the size of individual holdings. Recent egalitarian political theory has sought to accommodate considerations of responsibility. Such a move may seem problematic, in that a new informational burden is thereby introduced, with no apparent decrease in the existing burden. This article uses a simple model with simulated data to examine the extent to which outcome egalitarianism and responsibility-sensitive egalitarianism ('luck egalitarianism') can be accurately applied where information is incomplete or erroneous. It is found that, while outcome egalitarianism tends to be more accurately applied, its advantage is not overwhelming, and in many *prima facie* plausible circumstances luck egalitarianism would be more accurately applied. This suggests that luck egalitarianism cannot be rejected as utopian. Furthermore, while some argue that, in practice, luck egalitarianism is best realized indirectly, by securing equality of outcome, our evidence suggests that a luck egalitarian rule of regulation offers a far more accurate implementation of the luck egalitarian ideal than does an outcome egalitarian rule of regulation.

KEYWORDS: Distributive justice, egalitarianism, feasibility, luck, outcome, responsibility

I. INTRODUCTION

One of the most prominent developments in recent normative political theory has been the rise of responsibility. Writers such as Richard Arneson (1989), G. A. Cohen (1989) and John Roemer (1993; 1998) have argued that inequalities are only objectionable where persons are not responsible for them. Even equalities require justification: where responsibility is relevantly unequal, distributions must also be unequal. This responsibility-sensitive egalitarianism or *luck egalitarianism* seeks to

equalize or neutralize the effects of luck, understood as the inverse of responsibility (Hurley 2003).

Many political theorists have argued against this kind of position on normative grounds, and some have even appealed to metaphysical concerns.¹ But feasibility issues – those concerning the extent to which luck egalitarianism may actually be realizable – have received less attention. Where these issues are mentioned at all, it is often said to be extremely hard, or even impossible, to bring about a recognizably luck egalitarian distribution. Many maintain that we should either forget about luck egalitarianism altogether, or forget about it in practice, focusing instead on achieving its objectives indirectly – by equalizing outcomes, for instance. Such reactions are not really surprising, for the reference to responsibility makes *informational demands* that are not made by traditional outcome-orientated egalitarian principles. Furthermore, the informational demands that are made by such principles, including those concerning the size of individual holdings, are retained by luck egalitarianism. It may appear that existing problems are greatly amplified.

This contribution examines the feasibility of luck egalitarianism in circumstances of incomplete or erroneous information. Any other obstacles there may be to realizing the favoured distribution are set aside. To be sure, a government may not be able to deliver the appropriate resources and opportunities to the appropriate persons even when they have full information. But there is no obvious reason for thinking that this would be any more of a problem for luck egalitarianism than it would be for any distributive theory or principle that may require substantial redistribution.

Economists have, of course, been interested in problems presented by imperfect information scenarios for some time, the ‘optimal income tax problem’ being a classic example of this (Mirrlees 1971). The problem of interest here differs from this, and from mechanism design problems in general, in being concerned principally with the feasibility of two distributive principles *under given informational conditions*, and leaving aside the effects of different policies on agents’ willingness to reveal information.

Since we are concerned with this much simpler but (in this context) relatively neglected problem, we can focus on a basic model designed for this purpose, and leave aside the far more sophisticated models created for more complex problems.

Luck egalitarianism will be taken as a generic distributive principle, without specifying what it is that it actually distributes. It will, in section III onwards, be compared to its most obvious rival – a similarly generic form of outcome egalitarianism. In both cases it may be supposed that the thing being distributed is likely to be some form of welfare, resources, or capabilities (or a hybrid), but none of the argument would be undermined were the luck egalitarian concerned to distribute something else.

Our luck egalitarianism is in fact so generic that it need not really be luck egalitarianism at all. It could be replaced by many other forms of egalitarianism that rely upon information about holdings and one other personal characteristic that is considered relevant to redistribution by that theory or principle.² It is appropriate to focus on responsibility as it is a particularly significant characteristic, which is embodied in familiar accounts of justice. Evidently, nothing is presumed about what responsibility is, or how often it is present.

In another way, however, a certain conception of egalitarianism will be assumed. Specifically, the principle will be described as seeking to give each person the percentage of their current holding to which they are entitled. Where the relevant characteristic is responsibility, the objective is to give each person the percentage of their current holding for which they are deemed to be responsible. If they are responsible for more than they hold – that is, if they have thus far been unfairly denied that to which they are entitled – the percentage will be greater than one hundred. This is how luck egalitarianism is often conceived, and some other conceptions of it – for instance, the idea that persons receive a share of society's benefits that is proportionate to their individual responsibilities – may be more or less reducible to it. But there may be other conceptualizations of luck egalitarianism for which the approach of this paper is less applicable.

Other assumptions will be mentioned in due course. First, however, we must look at the kind of information-related objections to luck egalitarianism that may be raised. This will reveal two distinct kinds of reasons for thinking that our central question of the *direct practicality* of accounts of distributive justice – that is, their usefulness in designing policy to further their own ends – matters.

II. INFORMATIONAL OBJECTIONS TO LUCK EGALITARIANISM

The informational limitations that face luck egalitarianism have resulted in its proponents adopting rough-and-ready distributive strategies. This approach has come in for criticism. On reporting Arneson's (1989: 87) position that we should concentrate our efforts towards a luck egalitarian ideal even if it is not fully realizable, Marc Fleurbaey offers this commentary:

But this approximation method makes sense only if there is some continuity in the process, that ensures that any refinement of our knowledge of the outcome function and its arguments can lead the actual allocation of resources closer to equal opportunity. However, nothing is less plausible. The structure of the equal opportunity principle is such that, whenever there is some imperfection in the information about the outcome function or the observed variables, the allocation chosen to implement a gross equal opportunity can be quite far from the ideal allocation (1995, 43).

Fleurbaey glosses his criticism by noting that the discoveries of childhood events and genetic predispositions may increase and decrease a disadvantaged individual's compensation at various points of his or her life. This is correct, but the nature of his objection is not immediately clear. It will be illuminating to go through some possible interpretations.³

One objection suggested by Fleurbaey's comments on approximation is that, while errors in information and outcomes are *continuous* under some distributive principles, in the sense that small errors in information lead to small variations from the objective, those under luck egalitarianism

are discontinuous, with small errors in information leading to large variations from the objective. This is distinct from, though related to, the objection that, while some principles are *monotonic*, meaning that better information brings distributions closer to the target, luck egalitarianism is not, as better information may result in a greater divergence between objective and outcome.⁴

The continuity and monotonicity objections are both distinct from, but related to, a final objection that, though not too apparent in the previous quote from Fleurbaey, is more explicit elsewhere. It is, Fleurbaey holds, “unlikely that the result of a political selection of the factors for which individuals are held responsible would be even an approximate implementation” of luck egalitarianism (1995, 39). He even goes so far as to say that the position is “completely untractable [sic]” and its implementation “impossible” (1995, 43; 42). The claim seems to be that luck egalitarianism has poor *application accuracy*. Those attempting to apply luck egalitarianism end up with distributions that are far away from their ideal. Now this is true of many principles, at least where information is scarce. Thus the best construal of the accuracy objection is comparative: it is acknowledged that many principles experience application problems where relevant information is unavailable, but it is claimed that this problem is particularly severe for luck egalitarianism on account of its use of responsibility information.⁵ We can say that the accuracy objection is related to the continuity and monotonicity objections as luck egalitarianism’s (supposed) inaccuracy, relative to other principle, may be caused by its (supposed) discontinuity and non-monotonicity.

Each of the above informational objections to luck egalitarianism comes in two varieties, each of which corresponds to a reason for thinking that the direct practicality of an account of justice matters. The first, which appears to be broadly favoured by Fleurbaey, might be called *practical-fundamental*. Here the idea is that we ought to reject luck egalitarianism as a political position on account of its unfeasibility. It is supported by the view that direct practicality matters because it is *a necessary*

condition for a worthwhile account of justice. Although, intuitively, an account of justice should not be disregarded on the ground that it is hard to realize its goals in practice, in extreme cases this might be the case. Consider, for instance, an account of justice that states that holdings must be perfectly equalized, and that the smallest divergence from this ideal is as great a wrong as the largest. Such a position requires, among other things, complete, flawless knowledge of every person's holdings, down to the last penny and slightest trinket. This position might sensibly be thought to be utopian in the pejorative sense of being so far removed from that which is realizable as to be an irrelevance (see Nagel 1991). The same might be true of luck egalitarianism, if it is the case that its informational demands are such that any attempt to apply it in foreseeable circumstances will no more yield luck egalitarian outcomes than random distributive decisions would. If luck egalitarian policy is utter guesswork, but outcome egalitarianism can be applied with some accuracy, that may provide a *prima facie* reason for egalitarians to favour the latter over the former. Even though it is not strictly speaking a *moral* reason, it may appear decisive.

Practical-fundamental objections may seem at odds with some recent arguments of Cohen's. It may be fruitful to briefly consider his influential resistance to the idea, which he associates with John Rawls (1999), that justice is constrained by practicality:

Facts about agent incapacity are (usually) the end of the matter with respect to rules of regulation, but not with respect to ultimate principles. It's futile to adopt a rule that no one can follow, but to say that it's futile to subscribe to a certain fundamental principle is a category mistake: unlike instituting a rule, subscribing to a principle is not an action but the having of a belief or attitude, and, not being an action, such subscribing cannot be futile (though it can, of course, be misguided) [... F]acts about capacity do not disqualify the principles that are here in dispute, that is, fundamental ones. They disqualify, at most, rules of regulation (Cohen 2008, 253-254).

Cohen's position is that barriers, including informational barriers, to agents' ability to effectively act on principles are no objection where those principles are fundamental: if this is correct, it would follow that the fundamental principles of luck egalitarianism cannot be challenged on informational grounds, as the practical-fundamental objections claim.

We do not here intend to take issue with the above position, to which we are sympathetic. Regardless of whether Cohen's position is true, one form of practical-fundamental objection may still have force. David Miller is not making an outlandish claim when he writes that "political philosophy is a branch of practical reason – it is thought whose final aim is to guide action, as opposed to having a merely speculative purpose" (2008, 44). Many – probably most – political philosophers would agree. Even if they were convinced that fundamental principles could not be shown to be mistaken or futile on practicality grounds, their level of interest in luck egalitarianism would drop close to zero if it was shown that it could not guide action – not even in the sense of providing a *pro tanto* reason for particular actions. We can distinguish stronger and weaker versions of the practical-fundamental objection: the strong version says that luck egalitarianism's (alleged) impracticality shows it to not to be worthwhile in the sense of being mistaken or futile; the weak version says that luck egalitarianism's (alleged) impracticality shows it to not be worthwhile in the sense of being speculative rather than (*pro tanto*) action guiding.

The second variety of informational objection is *purely practical*. In this case objectors make no grand claim about the political acceptability of luck egalitarianism or its interest to political philosophers. Rather, they maintain that, whatever luck egalitarianism's moral and political credentials, it is an error to use it directly in practice. It is instead best realized indirectly – that is, through the pursuit of some non-luck egalitarian principle. This objection is supported by the view that the direct practicality of an account of justice matters because it is *a key consideration in designing policy to achieve that account's objectives*. It is sometimes suggested, for instance, that such is the difficulty in distinguishing that which people are responsible for from that

which they are not, luck egalitarians should in practice all but forget about responsibility-justified inequalities, and instead pursue outcome equalities (Barry 2006, 97-98; Barry 2008, 146-148; see also Fox-Genovese 1995; Miller 1997, 229). The objection is not to luck egalitarianism *per se*, but to self-defeating ‘over-applications’ of luck egalitarian policy. Its positive implication is that policy may be best aimed at achieving equality of outcome, even if we endorse luck egalitarianism at the level of principle.

The obvious reply to the purely practical objection is that luck egalitarians do not typically intend their principles to be applied directly. Hence, even if the best way of achieving luck egalitarian goals was by using an applied version of outcome egalitarianism or some other rule of regulation, which would not be contrary to any of the central luck egalitarian claims. The reply is sound, but the purely practical objection remains interesting. This is because its success or failure will offer some guidance on how luck egalitarianism may best be applied. That is of note in its own right, since luck egalitarians typically intend their principles to have some practical bite, even if (as the above obvious reply suggests) this is only at the level of choosing between rules of regulation. And it may also bear in an indirect way on discussions about the moral credentials of luck egalitarianism. For instance, some critics of luck egalitarianism appear to assume that it would be applied in very direct fashion, amounting to an extension of existing conditional forms of welfare provision, with inevitably inegalitarian results (Wolff 1998; Anderson 1999). But if luck egalitarianism actually mandates an outcome egalitarian rule of regulation, this line of objection seems mis-directed. This example underscores the point that the most plausible form of the purely practical objection is not an objection to luck egalitarianism, but rather to the most direct way of applying it.

The next section addresses the practical-fundamental objection, and specifically, the objection of this sort that appeals to accuracy. In section IV the versions of the practical-fundamental objection that rely on continuity and monotonicity are examined. The purely practical version of the accuracy objection is tackled in section V.

III. ACCURACY

Suppose that Smith holds 20 units of advantage (U). S/he is responsible for 10 of those units, the remainder being attributed to, say, a high native talent that s/he has not fully utilized. Were resources equalized between Smith and every other member of society, each individual would hold 10U. In one scenario, informational limitations result in the Ministry of Distributive Justice *overestimating* Smith's advantage by 10%, and *underestimating* the contribution to his/her advantage for which s/he may be held responsible by 10% of that holding (i.e. his/her responsible contribution is estimated at 40%). The Ministry's two ministers agree that the evidence suggests that Smith holds 22U, and that this is too much, but disagree about how much should be taken away from him/her, and why it should be taken away. One minister, a luck egalitarian, states that Smith is entitled to 8.8U (40% of 22U, i.e. the underestimated responsible share of the overestimated holding), and therefore proposes to strip him/her of 13.2U, *actually* leaving him/her with 6.8U. The other minister, an outcome egalitarian, maintains that Smith is entitled to 10U, and therefore proposes to strip him/her of 12U, *actually* leaving him/her with 8U (since s/he really only held 20U, rather than 22U). With these informational imperfections there is less accuracy where luck egalitarianism is applied as it has left Smith 32% short of his/her luck egalitarian entitlement, whereas outcome egalitarianism left him/her 20% short of his/her outcome egalitarian entitlement.

However, this result is not recorded in all cases of informational imperfection. Suppose the Ministry *overestimates* by 10% *both* Smith's advantage and the contribution to it for which s/he may be held responsible. Here the luck egalitarian again believes Smith holds 22U, but that s/he is entitled to 13.2U (the now overestimated responsible share [60%] of the still overestimated holding). S/he will therefore decrease Smith's holding by 8.8U, *actually* leaving him/her with 11.2U – 12% more than s/he *actually* ought to be given on a luck egalitarian scheme. The outcome

egalitarian also believes that Smith holds 22U. As s/he holds that Smith is entitled to 10U, s/he would reduce his/her holding by 12U, actually leaving him/her with 8U – some 20% less than that specified by the outcome egalitarian ideal. In this case the outcome egalitarian inaccuracy is considerably more pronounced than the luck egalitarian inaccuracy.

Of course, the fact that there are *some* cases in which luck egalitarianism can be more accurately applied than outcome egalitarianism is hardly sufficient to address the practical-fundamental version of the accuracy objection. It might be thought that such cases are few and far between. But they are in fact rather common.

Let α be defined as the actual size of the individual's holding prior to redistribution, in terms of units of advantage (or U). γ is defined as the error in estimating the size of the holding as a fraction of the holding. ε is defined as the total holdings of U in society divided by the total number of persons (i.e. an equal share). β is defined as the actual responsibility as a fraction of the holding. δ is defined as the error in estimating responsibility as a fraction of the holding. α , β , and ε must be non-negative values, since it is impossible for a person to hold a negative amount of U, impossible for a person to be responsible for less than 0% of their holding, and impossible for society to hold a negative amount of U (or a negative amount of persons). The values of γ and δ can be positive, negative, or zero; a positive value denotes an information overestimate, a negative value denotes an underestimate, while zero indicates a correct estimate.

For simplicity, it may be assumed that the population is large enough for the effects of errors in information about an individual's holdings on decision makers' perceptions of the equal share to be negligible. For this reason γ and ε are independent variables. It is also assumed that decision makers have good information about the population size and total level of advantage but worse information about individual cases. This is therefore no variable for the error in estimating ε .

The formula for the percentage divergence of outcome egalitarianism from its ideal under informational constraints can be derived as follows.

Smith holds a units. The Ministry of Distributive Justice assume Smith's holding to be $a(1 + \gamma)$ units, where γ is the error in estimating the size of the holding as a fraction of that holding. The outcome egalitarian minister in the Ministry of Justice considers Smith, like all members of society, to be entitled to ϵ units. S/he therefore proposes to strip Smith of $a(1 + \gamma) - \epsilon$ units, leaving Smith with $a - a(1 + \gamma) + \epsilon = \epsilon - a\gamma$ units. In fact, Smith and all members of society should, according to outcome egalitarianism, each hold ϵ units, thus the estimation errors have resulted in Smith retaining $\epsilon - a\gamma - \epsilon = -a\gamma$ units too many (or being stripped of too many if this number is negative). So as a percentage of the units to which Smith is actually entitled under outcome egalitarianism this is

$$\frac{-100a\gamma}{\epsilon}$$

The formula for the percentage divergence of luck egalitarianism from its ideal under informational constraints can be derived as follows. Smith again holds a units. Smith is responsible for $a\beta$ units, where β is the fraction of the holding for which Smith is responsible. The Department of Justice again assume Smith's holding to be $a(1 + \gamma)$ units, where γ is the error in estimating the size of the holding as a fraction of that holding. The Department of Justice assume Smith to be responsible for a fraction $\beta + \delta$ of his/her holding, where δ is the error in estimating responsibility as a fraction of the holding. The Department of Justice's luck egalitarian minister assumes Smith to be responsible for, and therefore entitled to, $a(1 + \gamma)(\beta + \delta)$ units. Therefore s/he proposes to take away $a(1 + \gamma) - a(1 + \gamma)(\beta + \delta) = a(1 + \gamma)(1 - \beta - \delta)$ units, leaving Smith with $a - a(1 + \gamma)(1 - \beta - \delta) = a(\beta + \delta - \gamma + \gamma\beta + \gamma\delta)$ units. In fact, Smith should, according to luck egalitarianism, hold the $a\beta$ units for which s/he is actually responsible. Thus the estimation errors have resulted in Smith retaining $a(\beta + \delta - \gamma + \gamma\beta + \gamma\delta) - a\beta = a(\delta - \gamma + \gamma\beta + \gamma\delta)$ units too many (or being stripped of too many if this number is negative). So as a percentage of the units to which Smith is actually entitled under luck egalitarianism this is

$$\frac{100 \alpha (\delta + \gamma \beta + \gamma \delta - \gamma)}{\alpha \beta} = \frac{100 (\gamma \beta + \gamma \delta + \delta - \gamma)}{\beta}$$

The first italicized formula shows the percentage divergence of applied outcome egalitarianism from its ideal under informational constraints. The second is the counterpart formula for luck egalitarianism. Positive outputs from either of the italicized formulae denote instances of individuals receiving more than they ought to under the principle in question, while negative outputs denote instances of individuals receiving less than they ought to under the principle in question. Outputs of zero denote instances of individuals receiving the appropriate share of U. Our analysis will focus on the magnitude of the errors in estimating appropriate shares. The main point of interest is the tendency of application of the two egalitarian principles to result in distributions that diverge from their ideals. Whether a divergence of a given size is in one direction or the other is irrelevant to the question of application accuracy.

Both formulae tell us what we know already – that sometimes luck egalitarianism is more accurate than outcome egalitarianism and sometimes it is less accurate. To get any idea of how often luck egalitarianism is more accurate and how often it is less accurate it is necessary to enter values into the formulae. The findings where one such set of values are entered will be reported below. There is nothing particularly significant about these values, other than that they do not obviously appear to be biased in a way that favours one or other of the egalitarian principles (for more on the methodology and the full results see Appendices A and B). This rudimentary model is just a way for us to start to explore these complex issues, but it is instructive nevertheless.

The values used represented a society exhibiting the following features. One third of the population initially hold 5U, one third hold 10U, one third hold 15U. In addition, one third of the population is responsible for 50% of their individual initial holdings, one third is responsible for 100% of their holding, and one third is responsible for 150% of their

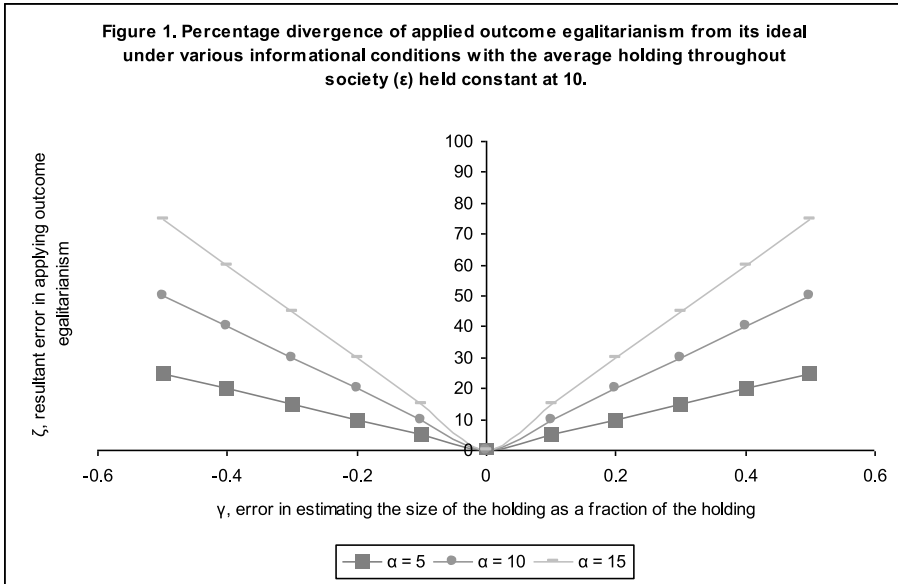
holding (and therefore are, on a luck egalitarian scheme, entitled to 50% more than they hold). Finally, the Ministry of Distributive Justice may overestimate or underestimate the initial holding or responsibility of any individual by 10, 20, 30, 40 or 50%, or may estimate correctly in both cases. Any individual is equally likely to be subject to any of these 121 combinations of holding and responsibility estimates.

Under these conditions, outcome egalitarianism has a mean divergence from its ideal of 27%. This compares favourably with luck egalitarianism's mean divergence from its ideal of 36%. But while this variation in application accuracy is important, it is hardly grounds for rejecting luck egalitarianism. It suggests that luck egalitarianism can be applied surprisingly accurately, given that it relies on potentially unreliable information about two variables rather than outcome egalitarianism's one. It is less accurate than outcome egalitarianism, but the space between the two is not insurmountable. Indeed, it is rather less than the doubled inaccuracy that one might, intuitively, expect from reliance on a second source of potentially inaccurate information. There are very many individual cases in which luck egalitarianism is more accurate, and in reasonably realistic circumstances (for instance, those in which there is less variation in, or better information about, responsibility) it will even be more accurate overall. The comparative performance of the two theories very much depends on the patterns of responsibility and accuracy of the information systems found in the society in question.

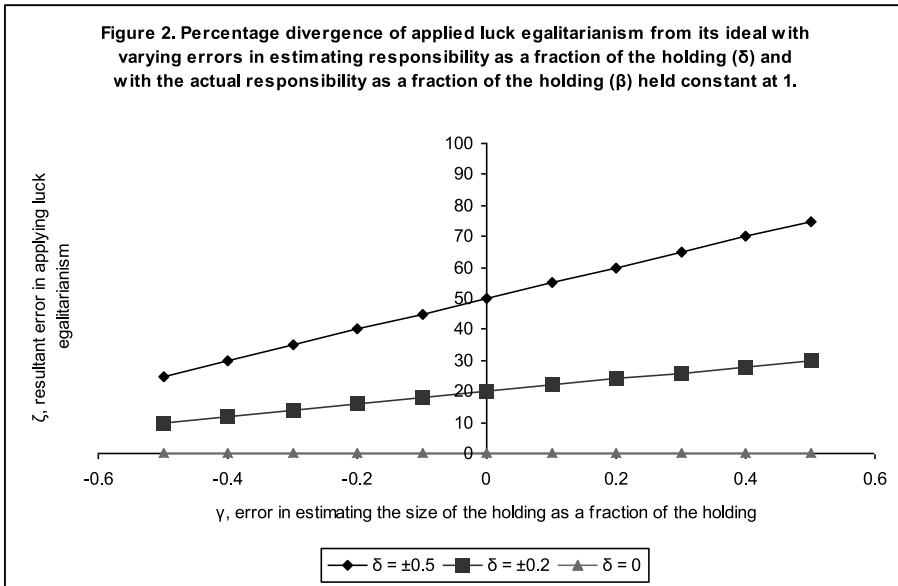
IV. CONTINUITY AND MONOTONY

Outcome egalitarianism is monotonic as an improvement in holding information necessarily results in an improvement in accuracy. It is continuous as small information errors result in small outcome errors, while large information errors result in large outcome errors. This is explained by the linear relationship between $|\gamma|$ and outcome egalitarianism, as γ is a factor of 100α γ . Increasing the holding error by a factor of n

necessarily increases the application accuracy by that factor. The monotonicity and continuity of outcome egalitarianism is illustrated by the strong correlation between the magnitude of the error in holding estimation and the degree of inaccuracy shown in Figure 1 (see also Table 1 in Appendix B).



Luck egalitarianism is, as suspected, non-monotonic, for an improvement in one kind of information sometimes results in larger outcome errors, while a deterioration in one kind of information sometimes results in more accuracy. It is discontinuous, for small information errors sometimes result in large outcome errors, and large information errors sometimes result in small outcome errors. Indeed, as Figure 2 shows, even where the holding estimate is spot on, the degree of application inaccuracy may be large (here, as much as 50% divergence from the luck egalitarian ideal), and where it is estimated very inaccurately the degree of application inaccuracy may be small or non-existent (see also Tables 2-4 in Appendix B).



Note that the δ term and the γ term have different signs, which leads the two errors to offset each other in some cases, making luck egalitarianism more accurately applied than outcome egalitarianism. For example, for all values of $|\delta|$ (assuming $|\delta| \leq \beta$ and $\delta + \beta \leq 2$) there exists some equal or larger value of $|\gamma|$ (i.e. an equivalent or even less accurate estimate) which enables luck egalitarianism to be applied with perfect accuracy (i.e. 0% error).

Proof 1: See Appendix C.

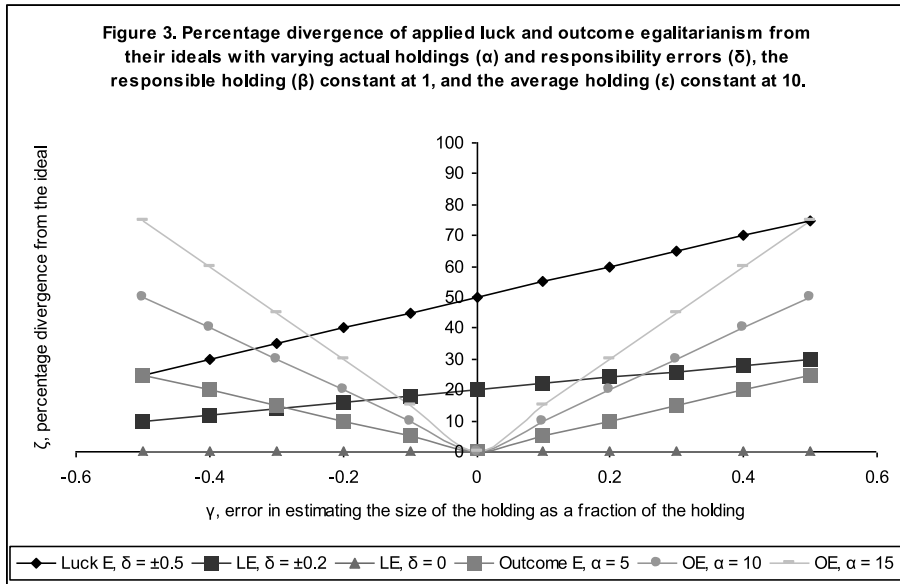
Luck egalitarianism is less accurately realized than outcome egalitarianism where information about responsibility is worse than information about initial holding ($|\delta| > |\gamma|$). This is because large $|\delta|$ makes $|100(\gamma\beta + \gamma\delta + \delta - \gamma)|$ large, and therefore luck egalitarianism inaccurate, whereas outcome egalitarianism is entirely independent of δ .

The opposite is true where the information about initial holdings is worse than the information about responsibility ($|\delta| < |\gamma|$). This is

because, although large $|\gamma|$ always makes $|100\alpha\gamma|$ large and therefore makes outcome egalitarianism less accurate, large $|\gamma|$ does not necessarily increase $|100(\gamma\beta + \gamma\delta + \delta - \gamma)|$, as the $-\gamma$ term compensates for the $\gamma\beta$ term. Tables 2-4 all hold examples of less accurate holding information (larger $|\gamma|$) leading luck egalitarianism to be more accurately applied.

Luck egalitarianism tends to be less well applied than outcome egalitarianism where there are small errors in holding information, but copes better than outcome egalitarianism where there are large errors. This is explained by the linear relationship between outcome egalitarianism's accuracy and the error in the holding estimate, and luck egalitarianism's reliance on a further information source. As already noted, small $|\gamma|$ automatically makes $|100\alpha\gamma|$ small, and therefore makes outcome egalitarianism accurate; likewise, large $|\gamma|$ automatically makes $|100\alpha\gamma|$ large, and therefore makes outcome egalitarianism inaccurate. But as large $|\gamma|$ does not necessarily increase $|100(\gamma\beta + \gamma\delta + \delta - \gamma)|$, luck egalitarianism's accuracy often increases with the size of holding errors. Figure 3, which combines Figures 1 and 2, illustrates this point. In particular, the left side of the graph shows lines for outcome egalitarianism and luck egalitarianism heading in opposite directions. While outcome egalitarianism here (predictably) decreases in application accuracy as holding estimates worsen, increased holding *underestimates* result in *increased* application accuracy for luck egalitarianism in two out of the three scenarios shown for it.

There is no cause for thinking that either the discontinuity or the non-monotonicity can themselves count decisively against luck egalitarianism. What we are interested in is approximating an egalitarian ideal as closely as possible; how exactly an approximation is brought about, be it with or without continuity or monotonicity, is of at most secondary interest. An improvement in holding information will necessarily result in an improvement in application accuracy under outcome egalitarianism, but equally,



a less accurate estimate will necessarily result in a decrease in accuracy. Sometimes luck egalitarianism’s more variable character will result in more accuracy, as when a large responsibility overestimate cancels out a large holding underestimate. Even when the overestimate or underestimate are not of the same magnitude, the smaller one still diminishes the scale of the inaccuracy under luck egalitarianism, while outcome egalitarianism is just stuck with a big overestimate or underestimate.

This is, of course, a double-edged sword. Sometimes luck egalitarianism’s use of two kinds of information means that one error compounds another. Let γ and δ_1 both be underestimates, where $\beta > |\delta_1| \approx |\gamma|$ and $\gamma > -1$, and define ζ_1 to be the resultant error in applying luck egalitarianism. Then replacing δ_1 with a larger responsibility underestimate δ_2 [where $|\delta_2| > |\delta_1|$] will always result in a larger error in applying luck egalitarianism, e.g. $|\zeta_2| > |\zeta_1|$.

Proof 2: See Appendix C.

This result also holds if γ , δ_1 and δ_2 are all overestimates.

Proof 3: See Appendix C.

The relative accuracy of the two forms of egalitarianism suggests that, in our simulated society, this latter phenomenon is a little more pervasive than the cancelling out effect. But information patterns in a particular society may be such that the cancelling out effect is more prominent. In that case, and if we otherwise have nothing to choose between luck egalitarianism and outcome egalitarianism, the discontinuity and non-monotonicity is preferable, for it takes us closer to egalitarian justice. Alternatively, the information patterns in the society in question might usually involve responsibility errors exacerbating holding errors, in which case outcome egalitarianism would be clearly superior to luck egalitarianism as regards application. In either case, continuity and monotonicity are really only relevant insofar as they influence application accuracy; in our main example, the far higher degrees of continuity and monotonicity under outcome egalitarianism translate into a small accuracy advantage.

V. LUCK EGALITARIANISM BY OUTCOME EGALITARIAN MEANS

Although the above model is designed to assess the direct practicality of two forms of egalitarianism, rather than the performance of different approaches to realizing luck egalitarianism, purely practical objections to luck egalitarianism can take little succour from our findings. We have seen that outcome egalitarian policies are not, on the available evidence, tremendously more likely to realize outcome egalitarian results than luck egalitarian policies are to bring about luck egalitarian results. For outcome egalitarian policy to be better for luck egalitarianism than avowedly luck egalitarian policy, as one form of purely practical objection endorsed by Nicholas Barry (2006; 2008) and others suggests, one would expect greater dominance of the former over the latter when both are in their own backyard, so to speak. The evidence thus far suggests that over-application of luck egalitarianism is not the all pervasive problem the purely-practical objector takes it to be. Indeed, ‘under-application’ of luck

egalitarianism – a failure to fully account for variations in responsibility – is equally prevalent in the results of our model.

These informal observations are supported by a simple extension of the model that allows us to see how well outcome egalitarianism could be expected to do as a rule of regulation for achieving *luck* egalitarian ends. The formula for the percentage divergence of outcome egalitarianism from the luck egalitarianism ideal under informational constraints can be derived as follows. Smith again holds α units. The Department of Justice again assume Smith's holding to be $\alpha (1 + \gamma)$ units, where γ is the error in estimating the size of the holding as a fraction of that holding. The outcome egalitarian minister in the Ministry of Justice considers Smith, like all members of society, to be entitled to ε units. S/he therefore proposes to strip Smith of $\alpha (1 + \gamma) - \varepsilon$ units, leaving Smith with $\alpha - \alpha (1 + \gamma) + \varepsilon = \varepsilon - \alpha \gamma$ units. In fact, Smith should, according to luck egalitarianism, hold the $\alpha \beta$ units for which s/he is actually responsible, where β is the fraction of the holding for which Smith is responsible. Thus Smith has retained $\varepsilon - \alpha \gamma - \alpha \beta$ units too many (or too few if this number is negative) compared to the luck egalitarianism ideal due to the application of outcome egalitarianism. So as a percentage of the units to which Smith is actually entitled under luck egalitarianism this is

$$\frac{100 (\varepsilon - \alpha \gamma - \alpha \beta)}{\alpha \beta}$$

It will be recalled that luck egalitarianism's mean divergence from its ideal, under the conditions described in section III, was 36%. Under the same conditions outcome egalitarianism has a divergence from the luck egalitarian ideal of 83% (for full results see Tables 5 to 7 in Appendix B). This strongly suggests that, contrary to the purely practical objection, luck egalitarianism is much more accurately realized where the rule of regulation is luck egalitarian than where the rule is outcome egalitarianism. Indeed, the gap between luck egalitarianism's ability to realize its ideal and outcome egalitarianism's ability to realize the luck egalitarian ideal

(47 percentage points) is far greater than the gap between luck egalitarianism’s ability to achieve its ideal and outcome egalitarianism’s ability to achieve its ideal (9 percentage points). For *prima facie* outcome egalitarian policy to be a better route to luck egalitarianism than *prima facie* luck egalitarian policy, informational conditions would have to be vastly less favourable for the latter than the conditions explored here.

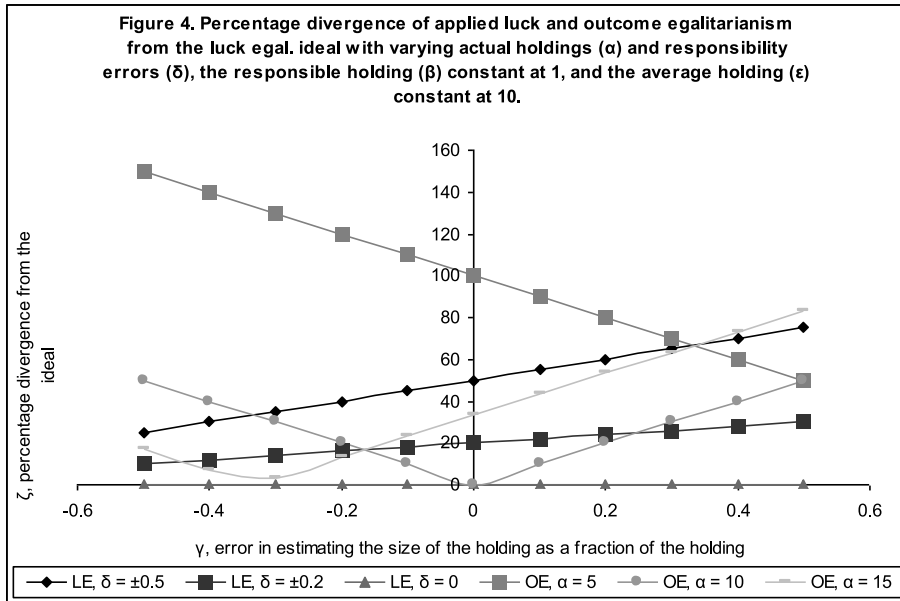


Figure 4 provides a graphical representation of some of the results. It is identical to Figure 3, except that the lines representing outcome egalitarian attempts to realize its ideal are replaced by lines representing how close outcome egalitarian policy comes to realizing the luck egalitarian ideal (and consequently, the y axis has been rescaled). As will by now be familiar, luck egalitarian policy tends to fare worse where responsibility errors, δ , are large. But at its most inaccurate (in this case, where the largest responsibility error is combined with the largest positive holding error, γ), luck egalitarian policy is only around half as inaccurate as outcome egalitarian policy is at its most inaccurate. This extreme inaccuracy can be

explained by the fact that, while outcome egalitarian policy is insulated from responsibility considerations where it is pursuing its own ideal (as in Figure 3), where it is used as a means of achieving luck egalitarianism its accuracy is influenced by the extent to which it tracks individuals' actual responsibility, β . But of course, unlike luck egalitarian policy, it makes no attempt to do so, so it will much more often be wildly inaccurate, as in the upper left quarter of Figure 4.

VI. CONCLUSION

We have seen, in general terms, how well luck egalitarianism negotiates various informational obstacles that may seem to be in the way of it being a feasible distributive theory. It should be reiterated that its actual performance is subject to informational conditions. Where conditions have been specified this has been done in what seem to be the fairest ways possible. Luck egalitarianism and outcome egalitarianism have been compared in circumstances where they face identical informational conditions. The informational inaccuracies presumed for the 'headline' mean divergence figures of 36% for luck egalitarianism, 27% for outcome egalitarianism, and 83% for outcome egalitarianism when used as a method for realizing luck egalitarianism were equal for outcome information and responsibility information, and the ranges of the inaccuracies seemed as good as any.

The only obvious way of setting 'better' conditions than those of the crude but instructive model presented here is by entering into empirical territory. It is highly likely that real world results will differ from any of our simulations, but assuming that we make allowance for new methods of gathering responsibility information, it is hard to say whether they will benefit or disadvantage luck egalitarianism's accuracy. If we drop that assumption, outcome egalitarianism is likely to be benefited, and luck egalitarianism disadvantaged, simply because real world governments do not routinely gather responsibility information in the way they gather

outcome information (via proxies for advantage such as income and wealth). The fact that governments are presently outcome-orientated would be rather flimsy grounds on which to reject responsibility sensitivity. In any case, when it comes to application accuracy, as much else, true generality is shown only by the formulae.

With the stipulated conditions, luck egalitarianism did not fare as well as outcome egalitarianism at realizing their respective ideals, but the difference was not great. Luck egalitarianism's reference to responsibility information introduced a new source of error that often increased application inaccuracy. But on other occasions errors in responsibility information pulled in the opposite direction to errors in holding information, so that under luck egalitarianism responsibility errors cancelled out the effects of holding errors, while outcome egalitarianism was stuck with the unmitigated effects of the holding errors.

We must also remind ourselves that the arguments about practicality are only part of the story. For luck egalitarianism to be rejected solely or principally on the grounds of the inaccuracy of its application, its disadvantage on this score would have to be quite overwhelming. A practical-fundamental objection of this sort requires luck egalitarianism to be outright unfeasible. The kind of small overall disadvantage we have seen it actually has may be seen to give it an advantage, for the presumption has tended to be that outcome egalitarianism is far superior in this regard. Contrary to such expectations, it appears that luck egalitarianism would actually outperform outcome egalitarianism under many viable social arrangements. Moral arguments in support of luck egalitarianism may be more widely entertained once it is clear that the theory is not utopian in the pejorative sense of describing "a form of collective life that humans, or most humans, could not lead and could not come to be able to lead through any feasible process of social and mental development" (Nagel 1991, 6).

We also found that luck egalitarianism appears to be a much better rule of regulation for achieving luck egalitarian outcomes than is outcome egalitarianism. In other words, on the available evidence, the purely

practical objection appears unsound. We must, of course, reiterate that the available evidence is limited, consisting in simulations rather than empirical data, as was the case when considering the practical-fundamental objection. But the results of the simulations are far more pronounced in this case, so we have much stronger evidence for the claim that luck egalitarianism is a better means to luck egalitarian ends than is outcome egalitarianism than we do for the claim that outcome egalitarianism can be more easily realized than luck egalitarianism.⁶

APPENDIX A: METHOD

Tables relevant to the discussion of the accuracy, continuity, and monotonicity of applying outcome egalitarianism and luck egalitarianism are presented in Appendix B. Table 1 was devised using the first of the formulae presented in section III, while Tables 2-4 were devised using the second. Tables 5-7 were devised using the formula presented in section V. In all three cases the values used are those mentioned shortly after the presentation of the formulae in section III. Negative percentage divergence figures (representing underestimates of entitlements) have been converted to positives for presentation in the tables and in Figures 1-4, since our concern is the absolute size of the errors in appropriate share estimates.

The figures mentioned already for mean divergence from luck and outcome egalitarian ideals (36%, 27%, and 83%) have been arrived at using the following simple method. For outcome egalitarianism, sum the percentage divergence for each informational scenario found in Table 1 and divide this by 33 (the number of scenarios). For luck egalitarianism, sum the percentage divergence for each informational scenario described in Tables 2-4 and divide this by 363 (the number of scenarios). For outcome egalitarianism as a luck egalitarian rule of regulation, sum the percentage divergence for each informational scenario described in Tables 5-7 and divide this by 99 (the number of scenarios).

Note that the 121 informational scenarios are fully represented in Tables 2-4 (each of which describes the treatment of those at one of the three levels of responsibility) but that these reduce to 33 scenarios for the purposes of Tables 1, 5, 6, and 7 as responsibility considerations are discounted by outcome egalitarianism (even when it is being used as a means to luck egalitarian ends).

APPENDIX B: TABLES

TABLE 1. *Percentage divergence of applied outcome egalitarianism from its ideal under various informational conditions with ϵ held constant at 10*

	$\gamma = -0.5$	$\gamma = -0.4$	$\gamma = -0.3$	$\gamma = -0.2$	$\gamma = -0.1$	$\gamma = 0$	$\gamma = 0.1$	$\gamma = 0.2$	$\gamma = 0.3$	$\gamma = 0.4$	$\gamma = 0.5$
$\alpha = 5$	25	20	15	10	5	0	5	10	15	20	25
$\alpha = 10$	50	40	30	20	10	0	10	20	30	40	50
$\alpha = 15$	75	60	45	30	15	0	15	30	45	60	75

TABLE 2. *Percentage divergence of applied luck egalitarianism from its ideal under various informational conditions with β held constant at 0.5*

	$\gamma = -0.5$	$\gamma = -0.4$	$\gamma = -0.3$	$\gamma = -0.2$	$\gamma = -0.1$	$\gamma = 0$	$\gamma = 0.1$	$\gamma = 0.2$	$\gamma = 0.3$	$\gamma = 0.4$	$\gamma = 0.5$
$\delta = -0.5$	0	20	40	60	80	100	120	140	160	180	200
$\delta = -0.4$	10	8	26	44	62	80	98	116	134	152	170
$\delta = -0.3$	20	4	12	28	44	60	76	92	108	124	140
$\delta = -0.2$	30	16	2	12	26	40	54	68	82	96	110
$\delta = -0.1$	40	28	16	4	8	20	32	44	56	68	80
$\delta = 0$	50	40	30	20	10	0	10	20	30	40	50

	$\gamma = -0.5$	$\gamma = -0.4$	$\gamma = -0.3$	$\gamma = -0.2$	$\gamma = -0.1$	$\gamma = 0$	$\gamma = 0.1$	$\gamma = 0.2$	$\gamma = 0.3$	$\gamma = 0.4$	$\gamma = 0.5$
$\delta = 0.1$	60	52	44	36	28	20	12	4	4	12	20
$\delta = 0.2$	70	64	58	52	46	40	34	28	22	16	10
$\delta = 0.3$	80	76	72	68	64	60	56	52	48	44	40
$\delta = 0.4$	90	88	86	84	82	80	78	76	74	72	70
$\delta = 0.5$	100	100	100	100	100	100	100	100	100	100	100

TABLE 3. *Percentage divergence of applied luck egalitarianism from its ideal under various informational conditions with β held constant at 1*

	$\gamma = -0.5$	$\gamma = -0.4$	$\gamma = -0.3$	$\gamma = -0.2$	$\gamma = -0.1$	$\gamma = 0$	$\gamma = 0.1$	$\gamma = 0.2$	$\gamma = 0.3$	$\gamma = 0.4$	$\gamma = 0.5$
$\delta = -0.5$	25	30	35	40	45	50	55	60	65	70	75
$\delta = -0.4$	20	24	28	32	36	40	44	48	52	56	60
$\delta = -0.3$	15	18	21	24	27	30	33	36	39	42	45
$\delta = -0.2$	10	12	14	16	18	20	22	24	26	28	30
$\delta = -0.1$	5	6	7	8	9	10	11	12	13	14	15
$\delta = 0$	0	0	0	0	0	0	0	0	0	0	0
$\delta = 0.1$	5	6	7	8	9	10	11	12	13	14	15
$\delta = 0.2$	10	12	14	16	18	20	22	24	26	28	30
$\delta = 0.3$	15	18	21	24	27	30	33	36	39	42	45
$\delta = 0.4$	20	24	28	32	36	40	44	48	52	56	60
$\delta = 0.5$	25	30	35	40	45	50	55	60	65	70	75

TABLE 4. *Percentage divergence of applied luck egalitarianism from its ideal under various informational conditions with β held constant at 1.5*

	$\gamma = -0.5$	$\gamma = -0.4$	$\gamma = -0.3$	$\gamma = -0.2$	$\gamma = -0.1$	$\gamma = 0$	$\gamma = 0.1$	$\gamma = 0.2$	$\gamma = 0.3$	$\gamma = 0.4$	$\gamma = 0.5$
$\delta = -0.5$	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3	33.3
$\delta = -0.4$	30	29.3	28.7	28	27.3	26.7	26	25.3	24.7	24	23.3
$\delta = -0.3$	26.7	25.3	24	22.7	21.3	20	18.7	17.3	16	14.7	13.3
$\delta = -0.2$	23.3	21.3	19.3	17.3	15.3	13.3	11.3	9.3	7.3	5.3	3.3
$\delta = -0.1$	20	17.3	14.7	12	9.3	6.7	4	1.3	1.3	4	6.7
$\delta = 0$	16.7	13.3	10	6.7	3.3	0	3.3	6.7	10	13.3	16.7
$\delta = 0.1$	13.3	9.3	5.3	1.3	2.7	6.7	10.7	14.7	18.7	22.7	26.7
$\delta = 0.2$	10	5.3	0.7	4	8.7	13.3	18	22.7	27.3	32	36.7
$\delta = 0.3$	6.7	1.3	4	9.3	14.7	20	25.3	30.7	36	41.3	46.7
$\delta = 0.4$	3.3	2.7	8.7	14.7	20.7	26.7	32.7	38.7	44.7	50.7	56.7
$\delta = 0.5$	0	6.7	13.3	20	26.7	33.3	40	46.7	53.3	60	66.7

TABLE 5. *Percentage divergence of applied outcome egalitarianism from the luck egalitarian ideal under various informational conditions with ε held constant at 10 and β held constant at 0.5*

	$\gamma = -0.5$	$\gamma = -0.4$	$\gamma = -0.3$	$\gamma = -0.2$	$\gamma = -0.1$	$\gamma = 0$	$\gamma = 0.1$	$\gamma = 0.2$	$\gamma = 0.3$	$\gamma = 0.4$	$\gamma = 0.5$
$\alpha = 5$	400	380	360	340	320	300	280	260	240	220	200
$\alpha = 10$	200	180	160	140	120	100	80	60	40	20	0
$\alpha = 15$	133.3	113.3	93.3	73.3	53.3	33.3	13.3	6.7	26.7	46.7	66.7

TABLE 6. *Percentage divergence of applied outcome egalitarianism from the luck egalitarian ideal under various informational conditions with ϵ held constant at 10 and β held constant at 1.0*

	$\gamma = -0.5$	$\gamma = -0.4$	$\gamma = -0.3$	$\gamma = -0.2$	$\gamma = -0.1$	$\gamma = 0$	$\gamma = 0.1$	$\gamma = 0.2$	$\gamma = 0.3$	$\gamma = 0.4$	$\gamma = 0.5$
$\alpha = 5$	150	140	130	120	110	100	90	80	70	60	50
$\alpha = 10$	50	40	30	20	10	0	10	20	30	40	50
$\alpha = 15$	16.7	6.7	3.3	13.3	23.3	33.3	43.3	53.3	63.3	73.3	83.3

TABLE 7. *Percentage divergence of applied outcome egalitarianism from the luck egalitarian ideal under various informational conditions with ϵ held constant at 10 and β held constant at 1.5*

	$\gamma = -0.5$	$\gamma = -0.4$	$\gamma = -0.3$	$\gamma = -0.2$	$\gamma = -0.1$	$\gamma = 0$	$\gamma = 0.1$	$\gamma = 0.2$	$\gamma = 0.3$	$\gamma = 0.4$	$\gamma = 0.5$
$\alpha = 5$	66.7	60	53.3	46.7	40	33.3	26.7	20	13.3	6.7	0
$\alpha = 10$	0	6.7	13.3	20	26.7	33.3	40	46.7	53.3	60	66.7
$\alpha = 15$	22.2	28.9	35.6	42.2	48.9	55.6	62.2	68.9	75.6	82.2	88.9

APPENDIX C: PROOFS

PROOF 1: If luck egalitarianism can be applied without any errors, then

$$0 = \frac{100(\gamma\beta + \gamma\delta + \delta - \gamma)}{\beta}$$

therefore it follows that

$$0 = \gamma\beta + \gamma\delta + \delta - \gamma$$

$$\gamma - \gamma\beta - \gamma\delta = \delta$$

then if $\beta + \delta = 1$ it follows that $\delta = 0$ so the theorem holds.

If $\beta + \delta \neq 1$ it follows that

$$\gamma(1 - \beta - \delta) = \delta$$

$$\gamma = \frac{\delta}{1 - \beta - \delta} = \frac{\delta}{1 - (\beta + \delta)}$$

By the first half of the assumption, $|\delta| \leq \beta$ so it follows that

$$-\delta \leq \beta$$

$$0 \leq \beta + \delta$$

Using this, and the second half of the assumption, $0 \leq \beta + \delta \leq 2$ and so it follows that

$$-2 \leq -(\beta + \delta) \leq 0$$

$$-1 \leq 1 - (\beta + \delta) \leq 1$$

$$-1 \leq \frac{\delta}{\gamma} \leq 1$$

$$\delta < |\gamma|$$

Hence the stated result.

PROOF 2: Assume that $\delta_2 < \delta_1 < \gamma < 0$. Define ζ_1 to be the resultant error in applying luck egalitarianism. So

$$\zeta_1 = \frac{100(\gamma\beta + \gamma\delta_1 + \delta_1 - \gamma)}{\beta}$$

Note that $\zeta_1 < 0$ since β is positive, $\gamma\beta + \gamma\delta_1 < 0$ and $\delta_1 - \gamma \leq 0$ from the stated assumptions.

Since $\delta_2 < \delta_1$, there exists some $\gamma > 0$ such that $\delta_2 = \delta_1 - \gamma$. It follows that

$$\zeta_2 = \frac{100 (\gamma \beta + \gamma \delta_2 + \delta_2 - \gamma)}{\beta}$$

$$\zeta_2 = \frac{100 (\gamma \beta + \gamma \delta_1 - \gamma \eta + \delta_1 - \eta - \gamma)}{\beta}$$

$$\zeta_2 = \zeta_1 - \frac{\eta (\gamma + 1)}{\beta}$$

So since η and $(\gamma + 1)$ are both positive, $|\zeta_2| > |\zeta_1|$.

PROOF 3: Assume that $0 < \gamma < \delta_1 < \delta_2$. Define ζ_1 to be the resultant error in applying luck egalitarianism. So

$$\zeta_1 = \frac{100 (\gamma \beta + \gamma \delta_1 + \delta_1 - \gamma)}{\beta}$$

Note that $\zeta_1 > 0$ since $\beta, \gamma\beta, \gamma\delta_1 > 0$ and $\delta_1 - \gamma \approx 0$ from the stated assumptions.

Since $\delta_2 > \delta_1$, there exists some $\eta > 0$ such that $\delta_2 + \delta_1 = \eta$. It follows that

$$\zeta_2 = \frac{100 (\gamma \beta + \gamma \delta_2 + \delta_2 - \gamma)}{\beta}$$

$$\zeta_2 = \frac{100 (\gamma \beta + \gamma \delta_1 + \gamma \eta + \delta_1 + \eta - \gamma)}{\beta}$$

$$\zeta_2 = \zeta_1 + \frac{\eta (\gamma + 1)}{\beta}$$

So since η and $(\gamma + 1)$ are both positive, $\zeta_2 > \zeta_1$.

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NOTES

1. Fleurbaey (1995); Wolff (1998); Anderson (1999); Hurley (2003); Scheffler (2003); Scheffler (2005). For responses, see Arneson (2000a; 2000b); Knight (2009).
2. For general characterization of distributive mechanisms that distinguish relevant and irrelevant characteristics, see Bossert (1995); Bossert and Fleurbaey (1996). For an explicitly luck egalitarian model, see Roemer (1993; 1998).
3. There is a construal of the objection other than those mentioned in the text. It places the emphasis on the specific contention that continual *improvement* in the quality of the information about each individual is required in order for the theory in question to be fair or useful in practice. But there is no reason to believe that a theory and/or its application is mistaken if, at different temporal points, they make, on the evidence available at each time, recommendations that point in different directions as regards persons' transfer statuses. Such a theory simply recognizes that the important thing so far as distributive justice is concerned is not to pretend that everything is and always has been perfect, but rather to do the very best we can, even when this involves U-turns.
4. On the non-monotonic nature of the relationship between the degree of responsibility assigned to people and the amount of luck egalitarian redistribution, see Cappelen and Tungodden (2006).
5. The objection may reach beyond attempts to apply luck egalitarianism that rely on fine-grained personal responsibility information. Even Roemer's scheme, which approximates personal responsibility from information about individuals' 'types' (e.g. black male steelworker), has been criticized as impracticable on account of the large number of types involved (Solow 1995; see also Roemer 1995).
6. We thank Alan Hamlin, Hugh Lazenby, Peter Vallentyne, and two referees for their helpful comments. This research was supported by the Arts and Humanities Research Council and the British Academy.

