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Cost-Benefit Analysis, Incommensurability and Rough Equality¹

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ABSTRACT

A recurring question about cost-benefit analysis (CBA) concerns its scope. CBA is a decision-making method frequently employed in environmental policy-making, in which things which have no market price are treated *as if* they were commodities. They are given a monetary value, a form of price. But it is widely held that some things cannot be meaningfully priced, thus substantially limiting the scope of CBA. The aim of this paper is to test some aspects of this broad claim, focusing on problems of incomparability and incommensurability. In particular, the role of *rough equality* as a putative form of comparison is investigated. I argue that while an assessment of the full significance of rough equality for practical decision-making awaits resolution of a number of important technical questions, it does not provide a strong enough form of comparison to support CBA.

KEY WORDS

Environmental valuation, cost-benefit analysis, incomparability, incommensurability, commodification, rough equality

1. INTRODUCTION

Much political debate about the proper scope of the market has revolved around discussions of commodification. A number of writers have argued that when things which cannot be regarded as commodities are treated as such, either literally or rhetorically, the effect is at best misleading, at worst explicitly harmful (Nussbaum 1986; Stocker 1990; Anderson 1993; O'Neill 1993; Radin 1996; Holland 1997). It is often argued that attaching a monetary value, even if

‘merely’ for the purposes of exchange, involves the development of improper, ‘morally corrosive’ attitudes towards a thing:

If the value of some things is measured in terms of money, their value
will be corroded away/destroyed altogether (D)²

In this paper, I shall not be concerned with this value Destruction claim or with broader claims of ‘improper commodification’, but with a narrower incomparability/incommensurability claim:

The value of some things cannot be measured in terms of money (M)

The distinction here is not a sharp one; one notion which may cut across it is Raz’s (1986: Ch. 13) constitutive incommensurability. This involves the claim that, roughly, to put a price on certain things is to be incapable of standing in the appropriate relationship to that thing. Thus a refusal to attach a price or perform a monetary valuation is *constitutive* of a proper relationship with the thing.³ Since it bears at least as much on (D) as on (M), I shall not discuss constitutive incommensurability further.⁴

Insofar as exchange for some sum of money depends on the possibility of such measurements, and exchangeability for money is a necessary condition for something to be a commodity, then the truth of (M) implies that some things cannot be regarded as commodities. To treat them as such would not simply be harmful; it would be a plain mistake. On the other hand, although (M) is a sufficient condition for the improper commodification claim to hold, it is not necessary. So while (M) is in this sense narrower in its reach than the improper commodification claim, it is not contingent on empirical evidence. This may be an advantage because there are few detailed studies of the harmful effects of commodification, and those which exist are highly contested. For example, Kuttner’s (1999) book, although recent, relies on Titmuss’s (1970) classic study of blood donation. While Titmuss has been influential among sociologists, most market economists have found Arrow’s (1972) detailed critique more persuasive. This paper, then, explores the *possibility* of commodifying some things, rather than the social meaning of commodification. I shall focus on CBA but most of the arguments here apply equally to other forms of commodification.⁵ The question I seek to address is:

How does incomparability and/or incommensurability affect CBA?

While I shall define certain aspects of CBA more precisely in section 4, it is worth mentioning immediately that in what follows, CBA always involves an element of explicit monetary valuation. Vague references in policy discussion to weighing the ‘benefits’ against the ‘costs’ of some proposal often means nothing more than comparing the ‘pros’ against the ‘cons’. There is a middle ground here, at

least in principle – the explicit, consequentialist, non-iterative, *non-monetary* valuation of all the pros and cons, combined with some way of summing the values (Sen 2001 spells out the possibilities). But in practice monetary valuation is effectively universal in CBA, not least because, on the mainstream approach, money seems the only available ‘common measuring rod’. While monetary valuation solves some problems, it brings others, and it is widely recognised that the problems facing monetary valuation are particularly noticeable, and particularly acute, in environmental CBA.⁶ This prominence, along with the centrality of CBA for environmental policy-making, explains my focus on environmental examples.

In section 2 I shall distinguish commensurability from comparability, and the different comparative relations from each other. After discussing rough equality in more detail in section 3, and cardinal versus ordinal scales in section 4, I argue in section 5 that many of the problems faced by CBA are not those of incomparability, or incommensurability *per se*, but monetary incommensurability. Section 6 concludes with some remarks on substitutability.

2. INCOMMENSURABILITY AND INCOMPARABILITY

The terms ‘incommensurability’ and ‘incomparability’ are often confused. I shall follow Chang’s (1997) definitions, which look set to become standard, but it must be noted that in passages quoted from other writers, ‘incommensurability’ is often used to mean ‘incomparability’. I shall indicate this alternative usage in cases in passages where an argument hangs on the distinction. Things are incommensurable, then, when they cannot be precisely measured along some common cardinal scale of units of value, and incomparable when no positive value relation holds between them – they cannot even be ranked on an ordinal scale. Comparability is a necessary but not sufficient condition for commensurability.

Regarding comparability, five mutually exclusive value relationships have been suggested between two items x and y :

$$x B y \text{ or } y B x \text{ or } x E y \text{ or } x RE y \text{ or } x IC y \quad (C)$$

where B and E are the standard comparative relations ‘better than’ and ‘(precisely) equal in value to’, RE is ‘rough equality’ to be defined shortly, and IC is incomparability. To distinguish them from rough equality, B and E will be termed relations of *strict* comparability, and IC , *strict* incomparability. Most writers on incomparability have defended *either* the strict trichotomy thesis, which rules out $x RE y$ from (C) (Regan 1997), *or* denied that there can be any form of failure of strict comparability *apart* from rough equality, thus ruling out

x *IC* y from (C) (Griffin 1986; Griffin 1991; Chang 1997). With (C), I wish to leave both *RE* and *IC* as possibilities, rather than ruling one of them out on *a priori* conceptual grounds.

The type of items involved in (C) has not yet been specified. Qizilbash (2000) has helpfully distinguished comparability among substantive values in the abstract, quantities of values and options which realise values. It remains controversial whether all of these categories facilitate coherent comparisons, but for the purposes of the argument here, I need only entertain the possibility of comparisons between options. Broome writes of ‘options which realise values’ and Raz (1997: 273 n.2) ‘use[s] “option” to refer to an action that an agent is both able to perform and has an opportunity to perform’. I shall assume there is no substantive difference between the Broome and Raz usages. Moreover, I shall only be considering options which realise *prudential* values. The two restrictions – options and prudential values – together rule out many arguments which purport to demonstrate incomparability. But even over the shrunken domain of possible comparison which remains, one type of failure of strict comparability seems widespread. It is usually known as rough equality.⁷

Providing a definition of rough equality is not straightforward, given the persisting controversy over the notion. Chang (1997) maintains that rough equality is a *positive* value relation, that is, another relation which requires, or defines, comparability, in addition to *B* and *E*. She terms rough equality the relation of options being ‘on a par’, and points to examples such as that of Raz, where an agent must choose between a career as a lawyer (x) and one as a clarinettist (y). It may be that x and y are comparable, but neither is better than the other, ‘and yet a small improvement in one [a slightly improved legal career (x+)] does not make it better than the other’ (Chang 1997: 26). In this formulation Chang does not specify which relation holds between x+ and y; she simply denies the presence of *B*. Thus we appear to have $x+ B x$, $x RE y$, but *not* $x+ B y$. Griffin adopts a similar approach, implying variously that $x+ RE y$, or none of $x B y$, $y B x$ or $x E y$ is either definitely true or definitely false (1986: 96). In this paper I shall leave the exact formulation of rough equality open, since none of the arguments here turn on it, although I shall note that if the intransitivity of *RE* is asserted, then matters become much clearer.⁸

A plausible environmental example, adapted from one by Griffin (1986: Ch.6), involves a proposal to build a road which will necessitate the destruction of a beautiful copse. Suppose the agent is better off with the copse than the road. While it may be true that a sufficiently large level of compensation would *overcompensate* the agent for the loss of the copse, there may be a wide interval of compensation values which act as rough compensation. If x is the copse, y is some level of compensation (and the road), and y+ is a higher level of compensation (a small but significant increase), then we have:

$$y+ B y, y RE x, \text{ but } y+ RE x \quad (RE)$$

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This example is under-specified at present, and open to a number of replies, but I shall develop it later. For the moment, it is helpful to contrast it with strict comparability (transitive strict equality):

$$y + B y, y E x, \text{ so } y + B x \quad (E)$$

A reader not familiar with the literature on incomparability – and even one who is – may be tempted to ask at this point why rough equality is important to practical decision-making. Obviously, the argument runs, incomparability is troubling for decision-making, but why introduce a further category? Rough equality would seem to lie in a middle ground between comparability and incomparability, at best ill-defined, at worst non-existent, but in any case complicating the analysis. A full response to this argument is beyond the scope of this paper, although the idea of rough equality will be sketchily defended from two common attacks in the next section. But a principal motivation for studying rough equality can be stated immediately. In an important paper, Chang (1997) examines seven leading arguments for strict incomparability in the literature. She argues powerfully that none of these arguments succeed: they either disintegrate, or turn out to be arguments for noncomparability or rough equality. Although in what follows I shall continue to leave open the conceptual possibility of strict incomparability, distinct from rough equality, I am sympathetic to the claim that most arguments for strict incomparability fail. In other words, I anticipate, and accept, an appeal by cost-benefit analysts to rough equality as a means of overcoming allegations of incomparability. This raises the question of how CBA fares with rough equality, at best a ‘weaker’ degree of comparability. This is the subject of the rest of this paper.

3. ROUGH EQUALITY

Although its intuitive meaning is clear enough, the precise status of rough equality remains little understood. Rather than attempting to develop a formal account in the limited space available here, I shall try to improve the plausibility of rough equality by responding to two obvious criticisms which might be levelled against it. They are: rough equality is incoherent; even if it is coherent, rough equality can be treated in practical decision-making as strict equality.

Rough equality is incoherent

There is no conceptual space between strict comparability and strict incomparability, the argument runs. Rough equality is incoherent. However it is very easy to distinguish rough equality from any of the strict comparability relations once the intransitivity of rough equality is granted. This move appears to leave matters clear enough: there are transitive comparative relations, an intransitive compara-

tive relation (rough equality), and (perhaps) incomparability. But there is a potential difficulty. The difficulty arises only for those, like Broome, who hold that all comparative relations derived from monadic predicates are transitive as a ‘principle of logic’ (Broome 1997: 68):

Comparative relations are always transitive. (T)

If (T) is true, then rough equality is not a comparative relation because it is intransitive. If it is to be distinguished in kind from strict incomparability then there must be some general property of rough equality or incomparability which supports such a distinction. But since strict incomparability means no more than a substantive failure of comparability, it seems unlikely to have such general features. It is characterised by an *absence* of structural features. We must look to rough equality for such a feature. Broome (1999: 152) suggests one possibility:

If $x RE y$ and $y RE z$ then x and z must be relatively close in value. (N)

In contrast, if $x IC y$ and $y IC z$, no conclusion can be drawn: x and z may or may not be comparable. But arguably (N) is intuitively appealing only if $x RE y$ entails x and y are close in value. I see only two ways in which this latter claim can be true. The first, which invokes the ordinary meaning of ‘close in value’, is ruled out because it involves comparisons – one of the strict comparative relations applies, although it may not be known which one. The second way simply stipulates ‘closeness in value’ to be a new type of incomparability, distinct from other kinds. *RE* in turn remains mysterious. Thus it would seem (N) reveals nothing if rough equality is a form of incomparability. But if (N) is unrevealing or false and (T) is true there seems to be no feature of rough equality which distinguishes it from incomparability. Rough equality dissolves into strict incomparability.

In sum, if rough equality exists at all, it is implausible that it is a form of incomparability. If (T) is true, there is no obvious way to distinguish rough equality from incomparability. If (T) is false, rough equality is permitted an independent existence as a distinct kind of comparison, namely, a non-transitive one.

Rough equality may be treated in practical decisions as strict equality

Is there any practical difference between rough equality and strict equality? The test is whether one would choose differently, or for different reasons, knowing the options are roughly equal, vis-à-vis the case where they are equal in value. Broome claims that, setting aside intransitivity (he assumes ‘an isolated choice’), one would not. He writes of ‘incommensurate’ options, but this clearly refers to options which are either roughly equal or strictly incomparable, in the terminology adopted here.

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If you are faced with a choice between two options, and they are equally good, it does not matter which you choose. If they are incommensurate, it does matter. People often identify this as the practical importance of the distinction: one type of choice matters and the other does not. But actually this remark is a mere tautology. To say a choice between two options does not matter – literally, and not simply that it does not matter much – is simply to say the options are equally good, and to say it does matter is simply to say they are not equally good. I conclude that, when we think about an isolated choice between two options, there is nothing in practical decision-making that is different between the incommensurate case and the equality case. (Broome 1999: 155)

Broome's assertion that claims about 'mattering' are tautologies is understandable given that many such assertions are left hanging; in particular, there is no explanation of why, between strictly incomparable or roughly equal options, it matters which you choose. But it may still be false that claims about 'mattering' are mere tautologies. To explore this possibility, we must examine our intuitions about 'mattering' more closely. Consider the claim:

It matters whether you choose A or B. (1)

Now Broome is surely right that

$AE B \Rightarrow \neg (1)$

seems tautological on any teleological view. Many mixed teleological and deontological positions would endorse it too. But it is irrelevant to the incomparabilist's argument. The following claim of Broome is not:

$\neg (AE B) \Rightarrow (1)$ (2)

Teleological views have nothing to say when, as here, the relative value of the two options is unknown.⁹ Crucially, then, (2) is not tautological under Broome's teleological ethics and admits and requires a substantive defence, which obviously depends on the sense we attach to (1). Moreover if (1) retains anything like its meaning in natural language, (2) seems counter-intuitive, bearing in mind its contrapositive:

$\neg (1) \Rightarrow AE B$

There are many instances of trivial choices which do not matter, but which do not involve equally good alternatives. Thus the implicature between 'not mattering' and 'equally good' may not run in both directions; certainly it is not tautological. It is possible to argue that choices between incomparable options may or may not matter, or may be indeterminate in this respect, by appeal to a substantive notion of 'mattering'. Raz hints at such a notion, contrasting incomparability sharply with a *substantive* understanding of indifference (Raz 1986: 331-4). In any case, Broome's conclusion is invalid: there remains the

possibility that, with a substantive notion of ‘mattering’, choice between incomparable options matters in a way that choice between equally good options does not.

Indeed, we can look to practical reasons why incomparability often matters. Since Chang’s (1997) arguments against the practical occurrence of strict incomparability are powerful, the focus must be on rough equality. In the immediately preceding discussion, Broome set aside intransitive patterns of valuation by considering only an isolated choice. Broome later recognises the important practical implications of intransitivity, and a number of examples are presented in this paper which show how (intransitive) rough equality threatens CBA. To sum up, it is easy to demonstrate the practical significance of intransitive rough equality. But even if transitivity is not given up, Broome does not succeed in showing that strict incomparability or rough equality are irrelevant to practical decision-making. Moreover, there is a further difficulty with the proposal that we treat strictly incomparable or roughly equal options *as if* they are strictly equal in value, which applies regardless of our decision regarding transitivity.

It is unclear how such a proposal would be operationalised in, say, CBA. One interpretation of the proposal allows respondents to express rough equality or incomparability between options but these responses are treated *as if* they were judgements of strict equality. Setting aside the obvious political objections to this move – it is anti-democratic, patronising, and undermines trust in CBA – the recommendations of such a CBA would be particularly *ad hoc* in that different options could have yielded the same replies. And of course the infamous ‘benefit transfer’ would be disallowed.

Probably the better interpretation of the proposal is that it presumes a respondent, required to express a valuation (or minimally, a ranking using *B* or *E*), will report any judgement of rough equality or incomparability *as if* it were one of strict equality. The problem with this is that it presumes the respondent recognises an incomparable (either rough equality or strict incomparability) pair of options when presented with one. But in many cases incomparability is far from obvious. The respondent may fail to recognise a pair of incomparable options as just that; nor is there any reason, given such a failure, to expect she will treat the options as equally valuable. Rather, she might believe that, because the options are very different in kind (I am assuming the fact of incomparability makes this likely), they must be substantially different in value too. Arbitrary judgements that one option is better than the other might be the result.

Thus even if one would choose no differently, *knowing* the options are roughly equal, vis-à-vis the case where they are equal in value, this does not imply that the possibility of incomparability should be ignored in practice, when this knowledge may be absent.

4. CARDINAL AND ORDINAL SCALES

Cost-Benefit Analysis (CBA) usually begins with measurement of an agent's relative preferences for two options, a proposed 'project' and the 'status quo'. The scale of measurement is often money. CBA assumes that each agent can express a unique *valuation* of the project, a sum of money M . In practical CBA, valuation data is generated in many ways but it will be treated here as if it arose in response to a valuation question, such as those employed in contingent valuation (CV) surveys. If the question is a willingness-to-pay (WTP) question, then M may be taken to have the following meaning: if, whenever the project takes place, the agent pays M , then the agent will be indifferent between the project taking place and the status quo being maintained. 'Indifferent' in this context does not commit CBA to defining value according to some particular substantive account of utility or welfare. 'Indifferent' should be read as short for *indifferent with respect to prudential value* v . In what follows, I shall adopt an explicitly neutral, formal conception of prudential value v ¹⁰; it will be assumed that the respondent understands the valuation question; and mistakes are ruled out in the sense that answers are assumed to track prudential value accurately.¹¹

The definition of v in terms of ordinal preferences does not entail cardinality. In this paper, I shall leave the question of the cardinal measurability of v open as far as possible, although the impact of rough equality on CBA substantially depends on whether prudential value v is measurable on an ordinal or cardinal scale. This dependence will be discussed shortly, but first it must be asked whether CBA assumes cardinal or ordinal v .

Modern CBA arguably began with the development of the potential Pareto improvement criterion (or 'compensation principle') by Kaldor (1939) and Hicks (1940). This was specifically designed to avoid the need for cardinal measures of utility, and with them interpersonal comparisons of utility.¹² Under an *actual compensation* approach, all those who express a negative WTP (or positive WTA) are compensated so that they are no worse off. No interpersonal comparisons are required to demonstrate a Pareto improvement. The rationale for CBA here is just that of the Pareto criterion. But it is far from clear that this rationale can be extended to *potential* Pareto improvements (PPIs). This basic objection, as well as internal logical contradictions with the PPI test, have left it largely discredited.¹³ However, it might appear reasonable for a defender of CBA, in response to the theoretical criticisms made in this paper, to fall back on the original theoretical objective of CBA – and with it an ordinal scale which side-steps many of the threats posed by rough equality. In other words, if all CBA claims to do is identify PPIs, this may be at best a very limited goal, but CBA is not prevented from reaching it by the presence of rough equality.

The crucial problem with this response is that it dramatically undermines the applicability of CBA. A cost-benefit analysis which treats, say, WTP responses

as ordinal data, is almost impossible to conduct in practice, and even if it can be conducted, the fundamental ‘result’ from the analysis – the net benefit value of benefits minus costs – will be of extremely limited use. Treating data such as WTP responses as ordinal renders CBA non-operational because it rules out the most common mathematical tools for manipulating and interpreting the data. For example, the data cannot be multiplied by weights, so standard techniques of discounting or weighting in accordance with distributional concerns are unavailable. Since it is hard to imagine a CBA which would not in practice necessitate discounting, it is unsurprising that all the major textbooks on CBA treat valuations as cardinal.¹⁴ Moreover, an almost universal approach of CBA in practice is to compare projects and recommend the project which yields the greatest net benefit. So if project A has a net benefit of £10m. while B has a net benefit of £5m. then A should be pursued. But of course this attaches a cardinal interpretation to the net benefit measure which is unavailable if the valuation data is regarded as ordinal. With ordinal valuation data, only the sign of the net benefit measure has any significance (and arguably only then if compensation is actually paid), not its magnitude.¹⁵ In sum, once the possibility of actual compensation is ruled out, CBA must in practice adopt a cardinal scale of value.

But this creates a difficulty for CBA, because rough equality between the project and the status quo threatens any cardinal scale of value: ‘Rough equality ... does certainly create problems for a cardinal scale with units that can be added across the domain of values ... small variations in value will get lost’ (Griffin 1986: 97). Recall Griffin’s example of the road (the project) which will involve destroying a copse (the status quo). You find the options roughly equal in value and so express a WTP of zero to save the copse. The project is now changed: a railway line will be built in the same place as the road had been planned. Again you express a WTP of zero, *even though* you favour this project over the road. This latter preference is not tracked by the WTP measure. Rough equality also plays havoc with any attempt to infer ‘implicit valuations’ on the basis of WTPs expressed in another context. This point, and some other difficulties which rough equality poses for cardinal measurement of v , will be discussed in more detail later.

Suppose, however, that v is treated as ordinally measurable. I have already argued that a mark of rough equality is intransitivity. Now whenever the ranking of the options with respect to v is intransitive, even an ordinal scale of measurement is impossible. However, since Griffin (1986: 97) seems to believe that intransitivity is very rare, this point will not be pressed further – prudential value v which is only ordinally measurable poses the more obvious practical challenges to CBA just discussed.

Given the practical and political difficulties associated with actual compensation, CBA in practice requires a cardinal scale. But cost-benefit analysts may not be troubled by rough equality, simply because they think it will be uncommon in practice. As just argued, only if the project and the status quo are roughly

equal, will rough equality threaten CBA. Surely the problem posed by rough equality is much broader? Indeed, rough equality was introduced in section 2 with an example where the project and the status quo were not roughly equal but strictly comparable, yet there *was* rough equality between the status quo and the *total bundle* of project and some compensation. This is a problem of incommensurability, which will now be explored in detail.

5. MONETARY COMMENSURABILITY

Suppose the two options, the project and the status quo, are comparable. CBA requires not merely comparability, but *monetary commensurability*: a unique monetary valuation M must exist – the difference in prudential value between the project and the status quo must be measurable in terms of money.

In the broader claims regarding improper commodification, the social meaning of money is prominent. Although the social meaning of monetary valuation will not be explored here, it does not follow that money is a neutral scale of valuation, just in the way that Celsius and Fahrenheit are two neutral scales of temperature. Remarkably, some cost-benefit analysts seem to believe that money is just that, and any cardinal ‘unit of account’ will do: ‘There is absolutely no need for money to be the numeraire (i.e., the unit of account) in such valuations. It could equally well be bushels of corn but money is convenient’ (Layard and Glaister 1994b: 2). Setting aside the question of the measurability of well-being – ordinal, interval, ratio or absolute scale? – Griffin also seems to think that money is neutral in the sense of it having no value *per se*, merely serving as a means to obtain certain valued things:

[I]t may be thought that there is something wrong simply in using money as the common measure for conflicting values. But I suspect that sometimes we object because we mistakenly think that to make money the common measure is to make it the supreme value. But it is not at all. People want money because it enables them to do or to have things ... So if one of the men who wants the bridge still prefers a certain amount of money to having the bridge, then he prefers having what the money will give him (greater convenience or comfort or beauty) to what the bridge will give him (greater convenience). The money drops away as unimportant; the trade-off is really between two non-monetary values. (Griffin 1977: 52)

Griffin is surely right in rejecting the inference from common measure to supreme value. More precisely, *if* a number, including money, serves as a *cardinal* measure, this does not pre-suppose a super-value.¹⁶ However this does not ensure money *can* always serve as a neutral scale to measure well-being. In particular, it does not follow that money ‘drops away’ so that incomparability, if present, must lie between non-monetary values. Thus there are two independ-

ent comparability problems, both of which entail there is no unique valuation M . The options themselves may be strictly incomparable or roughly equal, *or* they may be comparable, but the value difference cannot be measured using a monetary scale. The latter possibility is not usually regarded as an instance of incomparability, but of incommensurability – a problem of the *degree* of comparability of the options themselves. In contrast, Adler (1998: 1392) refers to the *incomparability* of money with the value difference between the options. This interpretation helps to emphasise that, *pace* Griffin, a substantive claim of strict comparability with money must be made, even if it is already established that the options are comparable with each other.¹⁷ Indeed, the question of monetary incommensurability is best isolated by assuming the options are strictly comparable, and this assumption will be maintained for the rest of this section.

Discontinuity and Substitutability

Returning to the earlier example, suppose the agent is better off with the copse than the road. Nevertheless, there may be no sum of money which compensates her for the loss of the copse. The most basic reason why this might be so is of course that v is not measurable along *any* cardinal scale. Since, as already noted, this possibility makes CBA difficult to justify in the absence of actual compensation, it will be ignored here. But to grant the possibility of cardinal measurement – the commensurability of the options – does not entail they are commensurable on a monetary scale. Broome puts the point memorably in connection with the value of life:

[I]magine trying to perform a compensation test with roses as the medium instead of money. People cannot be compensated with roses for any major loss. Therefore, according to this method, rather a lot of projects would have an infinite cost. Nevertheless many of them could still be improvements.... The point is that roses are an inadequate measure for big costs and benefits. Money is a more powerful measuring instrument, but even the measuring rod of money is not long enough to encompass life and death. (Broome 1999: 182)

Similarly, large environmental losses may not be commensurable with money. It is worth emphasising that this claim is not inconsistent with economic theory (although it may be inconsistent with the more red-blooded characterisation of *homo economicus* invoked by many cost-benefit analysts). It assumes neither that at some point money has zero marginal value to the agent, nor that the environmental loss has infinite value. For instance the agent may have the following prudential value function:

$$v = a - b/(c + Y) \quad (\text{F})$$

where Y is total income and a , b and c are positive constants. Although v always increases with Y , as Y tends to infinity, v tends to a . If the environmental feature is worth more than a , no amount of money can compensate for its loss. The situation is one of *discontinuity* between money and the prudential value difference between the options, rather than incomparability.

It is often supposed that if no amount of money can compensate for a loss, nothing else can serve as adequate compensation either. But since no assumption has been made that the loss has infinite value, this need not be so. Rather, the agent might accept the loss if, say, a new local hospital is built as compensation. The reason why, to continue Broome's analogy, the measuring rod of hospitals may be longer than the measuring rod of money, is that, *in practice*, no amount of money will normally put the agent in a position where she can order a new hospital. Money is used as a measure rather than roses or bushels of corn because, of course, it can be more widely substituted for things we value. But it cannot in practice be *universally* substituted. This assumption of *universal substitutability* raises a number of large questions, and I shall not pursue it here, although I return to it briefly in the conclusion.¹⁸

The obvious response to this argument, particularly when applied to the example of the copse, is that it is implausible that the copse is worth so much to the agent. Another type of breakdown of monetary commensurability is outlined below, one due to rough equality rather than discontinuity, which I suggest is more plausible for cases such as the copse. But it is easy to conceive of much more persuasive environmental examples involving discontinuity, as well as cases involving the valuation of life. Defenders of monetary commensurability have made various objections to such examples, raising a number of complex issues.

Risk and Implicit Valuations

Firstly, they can claim, as Griffin (1977: 53-4) does, that putative cases of monetary incommensurability arise from a mistaken characterisation of the choice at stake, or involve choices that will never occur in practical decision-making.

A common argument here is that realistic modelling involves choice between *risky* options, and that if purported examples of discontinuity or incomparability are re-interpreted to allow for risk, the problem disappears (Bailey 1998). For instance, if it is alleged that some environmental loss cannot be compensated by any sum of money, then a billion-to-one probability of this same loss is considered instead. It is highly implausible that such a low risk loss cannot be compensated, so the argument runs, and by means of a series of small increases in probability, the plausibility of compensation for a loss with realistic probabil-

ity (or even probability of one) is deduced. There are a number of complex issues involved in this slippery slope argument, so I will simply state three problems it faces. First, it can be run the other way. From the premise that no amount of money will compensate the certain loss, it can be deduced that no amount will compensate a very low risk loss. It is difficult to maintain that our raw intuitions about commensurability in the face of certain choices are any less reliable than those in the face of billion-to-one chances. Second, the slippery slope argument assumes transitivity of indifference: indifference between losses x and y , where x and y differ only by a small probability change, does not necessarily entail indifference between x and z . But as already noted, transitivity is not a neutral assumption in discussions of incomparability. For some of its advocates, rough equality is precisely an intransitive version of strict equality. Third, and relatedly, there need be no precise moment where transitivity breaks down, but vagueness.¹⁹

Another appeal to risk by defenders of monetary commensurability argues that since discontinuity implies that the agent's monetary valuation of (say) the status quo is infinite, and hence the project would not pass the benefit-cost test, then the discontinuity must be illusory because many projects involving alleged infinite losses clearly represent well-being improvements. The infinite losses arise, the argument continues, because of a mistaken focus on, say, death, rather than risk of death. Aside from question-begging, this argument fails. An 'infinite loss' is not an infinite loss of well-being but an infinite valuation. It means that no amount of monetary compensation would leave the agent indifferent between $(x, Y-M)$ and (s, Y) , where x is the project, s is the status quo, and Y is current income. This fact, without more, does not imply that, if the project goes ahead without compensation, the agent's well-being falls so far that they are left with a life not worth living, or anything like it. In (F), the loss of well-being may be no more than a . This is perhaps large, but certainly finite, so it may well be less than the benefits from the project. Thus, even on an extreme welfarist view which ignores distribution altogether, let alone non-welfarist theories, 'infinite losses' do not imply the project should be scrapped. Moreover, assuming that it is unknown before the CBA whether infinite valuations will be expressed, then a CBA may still be worth conducting.

An element of the above argument was the claim that many projects *do* go ahead, despite involving alleged infinite losses, such as loss of life. Sometimes cost-benefit analysts appeal to risk again, so that 'death is commuted to risk of death' (Broome 1999: 178). Broome (1999: 177-82) has demonstrated why this appeal is mistaken, but a separate claim appears to be at work in Griffin's famous example: 'The French government knows that a few people die in accidents every year solely because of the avenues of trees lining the roads; yet we do not think it monstrous that they have decided not to sacrifice such beauty' (Griffin 1977: 54).

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Setting aside all the arguments discussed above, the remaining claim here appears to be that because a project goes ahead (or avenues of trees are left standing), the status quo (lives) must have a finite valuation. But this is no more true than the claim, just rejected, that if the status quo has an infinite valuation it must *not* go ahead. All that can be said is that, *if CBA recommends a project*, then the status quo must have a finite valuation. This example is an instance of a more general claim about *implicit valuation*, an approach often invoked to suggest that the two options are commensurable on a monetary scale (see also Lukes 1996).

Closely related to the concept of revealed preference, implicit valuations are derived as follows. Given the options are not incomparable, then we can rank them, and from such rankings infer (at least) upper and lower bounds on the monetary valuation of the option. For example, if a project goes ahead which is estimated to cause the loss of five lives per annum, but the project has net economic benefits of £2.5 million, then the lives are implicitly (*ex post*) valued at less than £500,000 each. Is there anything wrong here? For the moment, assume that the only benefit is £2.5m., and the only cost is five lives. Note immediately that implicit valuation *per se* is both pointless and harmless. By definition, implicit values can only be derived from a decision already made; the problems begin when the implicit values are assumed to be applicable to another decision, an approach often termed 'benefit transfer'. The first problem with this use of implicit valuation is straightforward: the earlier project may not have had the support of the affected community. So it cannot be used to claim support for another project affecting the same community – let alone a different one. Nor is there any reason why governments (or individual politicians, or government agencies) should feel bound by their predecessors' decisions. The second problem is revealed by the following claim of 'inconsistency':

Other things being equal, consistency of past decisions requires that these implicit values should have a broadly similar order of magnitude. However ... in the UK implicit values range from less than £1000 per life (from a decision not to legislate for the child-proofing of drug containers) to more than £20,000,000 per life (from high-rise apartment safety standards). (Jones-Lee 1994: 294)

The first phrase is crucial – things are almost never equal, and these same things are often ignored in CBA. As they vary from one context to another, they justify variation in the implicit valuations. For example, it is doubtful that the difficulty for the disabled in opening child-proof containers, as well as the minor inconvenience to millions of adults, was counted as a cost. The most misleading use of implicit valuation is when it is combined with the universal substitutability assumption. For example, the cost-benefit analyst might approach Griffin's avenues of trees example armed with the implicit valuation from elsewhere that lives are worth £500,000, and deduce a valuation of the trees of £500,000 times

the number of lives lost in accidents due to them. Although Griffin no doubt did not have such interpretative leaps in mind, leaps of this kind would be required to argue that the French government was acting on the basis of a monetary cost-benefit trade-off, which is what Griffin appeared to be claiming. Those who maintain that justified choice between options must involve comparison between them, may infer that, if its choice was justified, the French government was trading-off – it was judging the ‘tree option’ to be better than the ‘life-saving option’. But the additional assumption of universal substitutability is required to transform this ‘revealed preference’ type of claim into an implicit valuation.

Rough Equality

The discussion of monetary incommensurability so far has focused on cases of discontinuity, where money is strictly comparable with the prudential value difference between the options. Now it may be that the options themselves are strictly comparable, there is also no discontinuity, and yet there is no unique M . There may be instead *infinitely many* values of M , because the agent finds, say, the road and compensation of M , to be roughly equal in value to the copse, for a wide range of values of M (although without compensation, she would be strictly better off with the copse).²⁰

Since, by assumption, there is no discontinuity, there will be some level of compensation which leaves the agent better off than she would be if the copse had been kept. Thus one move open to the cost-benefit analyst is to treat the prudential value difference *as if* it were strictly equal in value to M^* , where M^* is defined as the smallest amount of money such that the agent values the money more highly than the value difference between the options i.e. M^* is the smallest amount of compensation such that the agent is better off with the road and compensation, than the copse. Adler (1998: 1394) notes this move and argues, rightly, that the problem with M^* is that it often fails to track well-being uniformly across agents.²¹ The net total of M^* for all affected agents may be positive (negative), even though total v is reduced (increased). Consider the simple case of two agents, such that the gain in v to one from the project is exactly balanced by the loss to the other. While total v is zero, total M^* may be non-zero, because the ‘band’ of ‘roughly equal’ valuations may be wider for one agent, so the absolute value of her M^* is greater.²²

Another obvious difficulty with this move is its *ad hoc* nature – M^* might with equal justification be defined in the example as the greatest amount of compensation such that the agent is still better off with the copse, than with the road and compensation.²³ Finally all such definitions of M^* assume that the region of rough equality has sharp boundaries, but as mentioned above, they may be vague.

6. CONCLUSION

It has been argued that rough equality troubles CBA in two ways. The project and the status quo may be roughly equal, or even if they are strictly comparable, rough equality between money and the value difference between the options may prevent monetary commensurability. Moreover other cardinal measures of value may work where money fails.

At various points it has been suggested that while money may not compensate a large environmental loss, other goods, such as hospitals, may do so. Only if it is assumed that money is substitutable for hospitals does this seem odd. But this suggestion can be pursued further. Perhaps in some cases only 'in-kind' compensation – environmental goods to replace environmental losses – will suffice. If money is just a means to an end then the meaning of a monetary valuation is unclear until the substitution possibilities of money have been specified in detail. The issues here are empirical, concerning what can be bought and sold in markets. It seems that the limits to further commodification may turn on what agents can buy and sell, or what they can conceive of buying and selling, at present. Future commodification may be defined by present commodification. At the very least, it seems clear that while the comparability of options may be determinable in isolation – in ignorance of the practical valuation or commodification context – this is not true for monetary commensurability.

NOTES

¹ For helpful comments on this paper and related questions, I am extremely grateful to Matthew Kramer, John O'Neill, Felix Rauschmayer and Adrian Walsh.

² For a careful discussion of (D), and the distinction between corrosion and destruction, see Walsh (2001).

³ Constitutive incommensurability is argued to be a feature of environmental valuation by O'Neill (1993).

⁴ Indeed O'Neill (1993: 120) notes that Raz (1986: 348-9) acknowledges that the very term 'incommensurability' may be misleading here.

⁵ Very few economists appear to have criticised applications of commodification other than CBA, but a fine exception is Dorman (1996).

⁶ For example, environmental examples – rather than, say, illustrations from the burgeoning health literature – very much dominate discussions of incommensurability in the important recent collection of Adler and Posner (2001).

⁷ First given this name by Griffin (1986), although a similar concept is to be found in Parfit (1984).

⁸ There has been much debate (Qizilbash 1999; Broome 2000; Griffin 2000; Qizilbash 2000) on the transitivity or otherwise of the *RE* relation.

⁹ I follow Broome's (1999: 155) definition: 'Teleology is the view that how one ought to act is determined by the goodness of the available options'.

¹⁰ Although for ease of expression, I shall continue to use terms such as ‘prefer’ and ‘better off’, defined in the natural way over v .

¹¹ In order to move swiftly to problems of incomparability and incommensurability, I shall set aside all kinds of other difficulties which may prevent CBA from getting started: the valuation question may remain altogether mysterious to the agent (for a little known discussion see Sen 1995); prudential value as defined seems empty and may not exist; there may be technical difficulties such as divergence between willingness-to-accept compensation (WTA) and WTP measures, baseline dependence or the Boadway paradox (Boadway 1982).

¹² Cooter and Rappoport (1984) provide a good historical account of the context in which the compensation principle arose.

¹³ This ‘basic objection’ has been made by countless critics ever since the PPI test was first proposed (the classic discussion is Little 1950), while an exhaustive technical exposition of the internal logical difficulties with the PPI test is Chipman and Moore (1978). All these problems are endorsed by standard CBA texts such as Layard and Glaister (1994a) and Pearce and Nash (1981). The only prominent dissenter is Mishan (1977).

¹⁴ ‘[However] there is no ethical justification for the Hicks-Kaldor criterion; where compensation will not be paid there seems no alternative to interpersonal comparisons of the value of each person’s gains and losses’ (Layard and Glaister 1994b: 6). The alternative to such explicit interpersonal comparisons by means of weighting each individual’s valuation (the route also favoured by Pearce and Nash 1981) is to consider the unweighted sum of individual valuations and address distributional concerns by means of fiscal policy. This latter approach may appear to be simply that recommended by the ordinalists, but its leading advocate (Harberger 1971) does not defend it on ordinalist grounds, and makes no reference to the PPI test. Rather, his defence turns on whether the marginal utility of income is constant across individuals – an improper question if interpersonal comparisons are eschewed.

¹⁵ If the distribution is known to take a specific (highly unlikely) form then it may be possible to argue for the superiority of project A even on an ordinal interpretation. In my example, suppose it is known that all the gainers from project A are gainers under project B, and vice versa; also, the losers under both projects are identical. If it is further known that all the gainers are at least as well off under A (each gainer’s WTP for A is greater than or equal to her WTP for B), while all the losers are at least as worse off under B, then it would be possible to argue that A is superior. The gainers could fully compensate the losers and still each be at least as well off under A.

¹⁶ Thus I reject the assumption that cardinal commensurability requires a super-value (e.g. the strong commensurability of O’Neill 1993).

¹⁷ Once this point is acknowledged, then whether the problem is labelled one of monetary incommensurability, or incomparability with respect to money, is largely a matter of semantics. ‘Largely’ because a couple of (generally plausible) assumptions are required to ensure that two options are commensurable on a money scale, if and only if there exists a sum of money which is comparable with the value difference between the options. For commensurability entails that there always exists a sum of money which is exactly equal in value to this value difference, not merely comparable with it. But assuming arbitrarily small changes in compensation or payment are conceivable, and all such changes cause a change in v , then commensurability should follow from comparability as defined here.

¹⁸ A reader of an earlier draft argued that the hospital example is false: he claimed that if large enough, a sum of money could be sufficient to establish and sustain a hospital. But my argument here does not rest on the enormous cost of hospitals. Rather, unless we are sure that money can bribe the planning authorities and secure the services of medical experts who may believe that the town in question does not need a new hospital, money alone does not guarantee the ability to buy a hospital.

¹⁹ For discussion of the relationship between rough equality and vagueness, see Broome (1997; 2000) and Qizilbash (2000).

²⁰ This is the same example as that specified by the relations at (RE). Ready et. al. (1995) provide empirical evidence of behaviour by contingent valuation survey respondents consistent with this example. Ready et. al. struggle to explain this behaviour in a way consistent with neoclassical theory; they adopt an epistemic approach, focusing on respondents' uncertainty about the good being valued. Still, they are forced to insist on dubious distinctions, such as one between survey responses of 'maybe yes' and 'maybe no'. See Aldred (1997).

²¹ Adler discusses a slightly different tracking problem.

²² While the ordinal interpretation of CBA – that all it claims to do is identify PPIs – has been rejected earlier, an anonymous referee was keen that the M^* move should be shown to be faulty even under 'ordinal CBA'. But since rough equality renders M undefined for some agents, total net benefit, and hence the presence of a PPI, is indeterminate. This does not appear to provide any basis for rejecting the M^* move. However an ordinal, but interpersonally comparable, measure of v *would* provide such a basis.

²³ In the environmental context, one might appeal to the precautionary principle to justify the original formulation of M^* stated above: that adopts the greatest measure of loss to losers, and the smallest measure of gain to winners.

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