VARIETIES OF DISTRIBUTIVE JUSTICE IN CLIMATE CHANGE

An Editorial Comment

1. Introduction: An Aristotelian Framework

'Is this really just?' – We would be deluding ourselves in thinking that the concept of being just could be analysed in any simple unified manner. The nature of 'justice', 'fairness' or 'equity'[1] is complex and relative to the type of issue at stake. As it happens, the key equity issues in the climate change context are of a particular type: they are questions of distributing some homogeneous divisible quantity or other. This is fortunate, because we have a long standing general characterisation of a just solution for these distributive issues, summarised in Aristotle's dictum 'What is just is what is proportional, and what is unjust is what violates the proportion.'[2] The fairness of a distribution, in other words, is to be assessed in terms of a proportionality with some morally relevant quantifiable attribute ('differentiation parameter').

Obviously, Aristotle's answer is too general to provide practical solutions for actual distributive problems. And even if a particular differentiation parameter is agreed upon – such as the 'degree of responsibility' of the well-known Polluter Pays Principle – the question of how to 'operationalise' (measure) it is all but trivial, as is witnessed by Rosa and Ribeiro's interesting contribution in this issue.[3] Nonetheless, Aristotle's general characterisation of distributive justice ('justice = proportionality') is of crucial importance in providing a general conceptual framework for the equity issues arising in the context of climate change and the international regime emerging under the UN Framework Convention.[4] And while finding acceptable operationalisations of differentiation parameters will remain a critical task as concerns the practical implementation of equitable solutions, it is equally important not to lose sight of this 'bigger picture'. Measurements are indispensable in finding equitable solutions, yet they are at best meaningless and at worst counter-productive in the absence of a proper understanding of the larger issues at stake. This is why I propose to take this opportunity to complement Rosa and Ribeiro's contribution with a brief sketch of this general conceptual framework.

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2. Moral Ambiguity

In a first instance, one has to realise and keep in mind the potential of what has been referred to as 'moral ambiguity' – the possibility of the distributive problems being embedded in an 'ambiguous moral context'. To explain these terms, it may be helpful to turn to a slightly modified version of a set of hypothetical scenarios originally due to Amartya Sen.[5]

2.1. SHARING A CARROT

Assume a person is being asked by three boys *A*, *B*, and *C* to arbitrate who should get a carrot about which they are quarrelling. Consider four alternative scenarios.

Scenario I. It is known that boy *A* really enjoys eating carrots, while boys *B* and *C* do not actually like vegetables. It is clear to the arbitrator that *A* will get more happiness out of the carrot than the other two. The arbitrator knows nothing else about the three boys, and decides to give the carrot to *A*, in conformity with utilitarianism.

Scenario II. The arbitrator knows that boy *B* is much more deprived than the other two and has very little to eat and other sources of pleasure and that he is generally much less happy than the other two. Nothing else is known about the boys, including who appreciates carrots; the arbitrator decides, in this case, to give the carrot to *B* on grounds of leximin or difference principle.

Scenario III. The arbitrator gathers that boy *C* grew the carrot with his own labour starting from a seed belonging to no one, while the others not only did not contribute anything to this effort, but wanted to take the carrot away from him. She knows nothing else about the boys, for example, who is how well off, or who enjoys eating carrots more. In this case, the arbitrator decides to give the carrot to *C* because of his labour, or as part of an entitlement structure incorporating the right to what one has produced, or on libertarian grounds.

Scenario IV. Finally, the arbitrator knows nothing at all about the boys, bar the fact that they are three in number. In this case she decides to cut the carrot into three equally sized pieces, one for each of the boys, and she does so on egalitarian grounds.[6]

2.2. SYNCHRONIC AMBIGUITY

While Sen's original intention in putting forward this example was to illustrate the dependence of equity decisions on the prevailing informational context, it will be clear that, 'in reality', each of the boys would do anything to ensure that the arbitrator knows all the information about his preferred scenario. The arbitrator

would thus be confronted with having to make a decision in face of the combined information of the scenarios.[7] Now, the point about 'moral ambiguity' is that it is difficult to see why the reasoning given in any one of the four scenarios should be invalidated by the information provided in any of the other ones. The fact that, say, the utilitarian theory is deemed to be justifiably applicable (Scenario I) is independent of the fact that – given the information provided in the combined scenario – the distributive problem could with equal justification be resolved in terms of the Ralwsian difference principle, or for that matter, on libertarian or egalitarian grounds. In short, our arbitrator is faced with a 'morally ambiguous' distributive problem in that more than one theory/principle of justice may justifiably be applied (with potentially contradictory outcomes). It is in the possibility of this sort of synchronic ambiguity that moral contexts differ from physical states of affairs, for if two scientific theories lead to contradictory descriptions of the world at a given time, then one of them has to be wrong. In the context of moral decisions, things are not as simple and the key to resolving inconsistent conclusions is not to reject moral theories, but to try and find a morally acceptable compromise between them.

2.3. A PROCEDURALLY FAIR COMPROMISE

There may be many different ways in which such a compromise might be sought. One way which I believe to be particularly promising in the context of distributing homogeneous quantities is the 'preference score method',[8] where the compromise is achieved by forming a 'socially weighted' arithmetic mean of the base-proposals. Take the case of our combined Carrot Scenario. The idea is simple. Each of the boys gets a weighted average of the shares which he would be entitled to under each of the base distributions, as listed in Table I (the nomenclature corresponding to the Scenarios). Thus *A*'s preference score share would be:

$$PS_A = 100 \cdot w_I + 0 \cdot w_{II} + 0 \cdot w_{III} + 33\tfrac{1}{3} \cdot w_{IV} \,. \tag{1}$$

There is nothing new about the use of weighted arithmetic means (so-called 'mixed proposals'), the novelty in the preference score proposal lies in the procedure used to establish the weighting. Based on a well-known election procedure – originally (1781) recommended by Jean-Charles de Borda for use in elections to the French Royal Academy of Sciences – each of the Parties involved (our three boys) is asked to rank the distribution proposals in question (*I–IV*) according to moral preference/desirability, and to express this ranking in terms of a fixed set of preference scores: 0 for the least desirable, 1 for the next one up, 2 for the next, and so on – with the tie-break rule of dividing the sum of the relevant scores equally between indifferent options. In the preference score ranking represented in Table I, boy *A* not unrealistically regards the distribution proposals *II* and *III* – under which he does not get anything at all – as equally least appealing, which is why both of them get the tie-brake score of $0.5 = (0 + 1)/2$. The egalitarian base distribution *IV* is more appealing, but still not in the league of the utilitarian proposal, where

TABLE I

The carrot compromise

	The Base Distributions					*Preference Scores (PS)*			
	I	II	III	IV		I	II	III	IV
Boy *A*	100%	0	0	$33\frac{1}{3}$%	Boy *A*	3	$\frac{1}{2}$	$\frac{1}{2}$	2
Boy *B*	0	100%	0	$33\frac{1}{3}$%	Boy *B*	$\frac{1}{2}$	3	$\frac{1}{2}$	2
Boy *C*	0	0	100%	$33\frac{1}{3}$%	Boy *C*	$\frac{1}{2}$	$\frac{1}{2}$	3	2
					Total	*4*	*4*	*4*	*6*
	The Preference Score Distribution					w_I	w_{II}	w_{III}	w_{IV}
Boy *A*	$\mathbf{33\frac{1}{3}}$%								
Boy *B*	$\mathbf{33\frac{1}{3}}$%				*PS-weights*	$\frac{2}{9}$	$\frac{2}{9}$	$\frac{2}{9}$	$\frac{1}{3}$
Boy *C*	$\mathbf{33\frac{1}{3}}$%								

he gets all: Hence his score of 2 to the former, and the maximum score of 3 to the latter. Once all the Parties have revealed their (moral) preferences in terms of these preference scores, the scores for each proposal are added together to reflect its 'social desirability'. In our carrot sharing problem, these total scores are 4 for the first three base proposals, and 6 for number *IV*, the egalitarian one. The key to the preference score compromise is then simply to adopt aggregation weights proportional to these total scores, i.e., to stipulate that

$$w_I : w_{II} : w_{III} : w_{IV} = 4 : 4 : 4 : 6\,.^{9} \tag{2}$$

Given the symmetries involved in our carrot sharing example, it will not be surprising that the resulting preference score distribution is actually identical with the egalitarian proposal, by assigning precisely a third of the carrot to each of the three boys. However, this is rather a special case and it is quite easy to think of a situation in which the compromise is quite different from any of the base proposals. For example, we could have assumed in *Scenario I* that *C* alone dislikes vegetables, while both *A* and *B* love carrots equally. In this case the arbitrator would – on utilitarian grounds – be required to divide the carrot in equal parts between *A* and *B* (as suggested in Table II), and the resulting preference score distribution would now clearly favour boy *B* who is not only deprived but who also likes his carrots (Table II).

2.4. DIACHRONIC AMBIGUITY

The ease with which we were able to alter the particular shares of what is meant to be a fair (compromise) solution to our distributive problem should provide food for thought, in particular in the context of a distributive question which is meant

TABLE II

The carrot compromise. Mark two

	The Base Distributions					*Preference Scores (PS)*			
	I	II	III	IV		I	II	III	IV
Boy *A*	50%	0	0	$33\frac{1}{3}$%	Boy *A*	3	$\frac{1}{2}$	$\frac{1}{2}$	2
Boy *B*	50%	100%	0	$33\frac{1}{3}$%	Boy *B*	2	3	0	1
Boy *C*	0	0	100%	$33\frac{1}{3}$%	Boy *C*	$\frac{1}{2}$	$\frac{1}{2}$	3	2
					Total	$5\frac{1}{2}$	*4*	$3\frac{1}{2}$	*5*
	The Preference Score Distribution					w_I	w_{II}	w_{III}	w_{IV}
Boy *A*	**25%**								
Boy *B*	**47%**				*PS-weights*	**0.31**	**0.22**	**0.19**	**0.28**
Boy *C*	**29%**								

to recur periodically. After all, who is to legislate that boy *B* should not acquire a taste for carrots over time, or, indeed, that he is to remain at his current level of deprivation? The fact is, moral contexts can be 'diachronically ambiguous' – i.e., they can change over time in ways which lead to quite different solutions[10] – and it would be unwise to set in stone any particular distribution formula as the fair solution to all future distributions of the type in question.

2.5. ALLOCATING EMISSION PERMITS ('ASSIGNED AMOUNTS')

How does all this relate to the more real world of climate change negotiations? As witnessed at the Kyoto Session of the Conference of the Parties to the UN Framework Convention on Climate Change (1997), one of the key issues in these negotiations was – and will be – the allocation of 'assigned amounts' – national caps on greenhouse gas emissions. At Kyoto, this task was not of any significant moral complexity. The implicit understanding was that in the context of assigning industrialised country (Annex I) targets alone, 'grandfathering' – the allocation of permits in proportion to some antecedent emission baseline – is a fair starting point for the negotiations. However, it is quite clear that in allocating emission permits to all the Parties to the Convention, many developing countries would adopt quite a different stance, for they would argue that in this larger, economically less homogeneous context, permits must be fairly allocated on a 'per capita' basis – in proportion to population figures. Industrialised countries, by contrast, are likely to retain their view, which arguably[11] means that the global permit allocation problem is set against a morally ambiguous context. For the purposes of illustration, let us follow Bartsch and Müller's 'Global Compromise Scenario'[12] in assuming that the Parties convene in 2005 to decide on a global allocation of assigned amounts

and that it has been decided admit two distributions proposals for consideration: the grandfathering and the per capita distribution – proportional to 1995 population and emission figures, respectively (Table III). In view of the contradiction between these two proposals, the Parties decide to use the preference score method – if only to arrive at a reasonably fair starting point for their negotiations. For reasons of additional procedural fairness,[13] the individual scores are in this case multiplied with the population represented by the Parties in question at the time of the negotiations (in this case 2005, see Table IV), resulting in the (regionally aggregated) preference scores listed in Table IV. Given these specifications – and the assumption that Parties would probably prefer the proposal which ensures them the bigger share – we arrive at the following preference score emission allocation formula:

$$\textit{Per Capita} \cdot w_{pc} + \textit{Grandfathering} \cdot w_{gf} \tag{3}$$

$$w_{pc} : w_{gf} = 4.9\text{bn} : 1.6\text{bn} \; (= 0.75 : 0.25)\,. \tag{4}$$

In order to avoid misunderstandings one important caveat has to be emphasised: the point of this hypothetical example is *not* that a mixture of 'three-quarters per capita and one-quarter grandfathering' should be fixed indefinitely as the fair compromise solution. Quite the opposite: the choice of admissible base distributions and the determination of particular preference score weights must be left to the negotiating process at the time. The point here is merely to illustrate what a global preference score compromise allocation of emission permits might look like under the described circumstances. Nothing more and nothing less.

3. Harmonising Types of Justice: Emission Allocations vs. Burden Distribution

Up to this point, the focus has been exclusively on allocating emission permits. Climate change, however, engenders distributive questions which – although related – are quite distinct and should not be confused with permit allocations. One of them is, of course, the issue of 'burden sharing' or, to be more precise, the issue of distributing the different types (mitigation/adaptation) of prospective costs and benefits due to climate change effects. Even though the IPCC, in their Second Assessment Report, was at great pains to distinguish 'burden sharing' from 'emission allocation', there are unfortunately still many instances where the two notions are confounded. This is why it may prove useful to consider in slightly more detail the nature of the relations, both between the two concepts and with other equity related items.

TABLE III

The World in 1995. Population, GDP, Human Development Index, and Energy Emissions

	Population		GDP (PPP)		GDP/cap.	HDI	Energy emissions		EE/cap.
	Million	%	Billion $	%	$		Mt CO_2e	%	t CO_2e
Annex I									
U.S.A.	271	4.8	7,206	21.5	26,573	0.94	5,348	22.7	19.7
Japan	125	2.2	2,743	8.2	21,930	0.94	1,143	4.8	9.1
EU	374	6.6	7,152	21.3	19,149	0.92	3,143	13.3	8.4
Rest of OECD [a]	63	1.1	1,338	3.9	21,238	0.95	913	3.9	14.5
EIT [b]	391	6.9	1,621	4.8	4,148	0.75	3,995	16.9	10.2
non-Annex I									
China	1,205	21.2	3,444	10.3	2,858	0.65	3,319	14.1	2.8
India	929	16.3	1,321	3.9	1,422	0.45	887	3.8	1.0
ANI [c]	414	7.3	2,426	7.2	5,860	0.74	1,172	5.0	2.8
MENA [d]	262	4.6	1,411	4.2	5,375	0.69	1,273	5.4	4.9
Latin America	408	7.2	2,609	7.8	6,387	0.82	1,066	4.5	2.6
Rest of World	1,245	21.9	2,311	6.9	1,856	0.46	1,342	5.7	1.1
World									
	5,687	100.0	33,582	100.0	5,905		23,600	100.0	4.1
	Source: UN			Source: UNDP				Source: FCCC and EIA	

[a] Canada, Australia, and New Zealand.
[b] Economies in transition.
[c] Asian newly industrialised.
[d] Middle East and North Africa.

TABLE IV
Emission allocation. Preference Scores (*PS*) and *PS*-shares

	Population 2005 (mil.) [a]	Preference Scores (mil.)		*PS*-shares (per cent)
		Per capita	Grandfathering	
U.S.A.	292	0	292	**9.2**
Japan	127	0	127	**2.8**
EU	378	0	378	**8.2**
Rest of OECD	68	0	68	**1.7**
EIT	391	0	391	**9.3**
China	1,304	1,304	0	**19.4**
India	1,082	1,082	0	**13.3**
ANI	473	473	0	**6.7**
MENA	335	0	335	**4.8**
Latin America	471	471	0	**6.5**
Rest of world	1,569	1,569	0	**17.9**
Total	*6,490*	*4,900*	*1,591*	***100.0***
		w_{pc}	w_{gf}	
PS-weights		**0.75**	**0.25**	

[a] UN medium population projection.
Source: Bartsch and Müller (2000, p. 262).

3.1. THE CAUSAL WEB

The fundamental items involved in the fairness of either allocating emissions or burden sharing are 'distributions' ('allocations'), best thought of as arrays of percentage numbers – say 'A' for emission allocations and 'B' for burden distributions.[14] In considering the nature of these emission allocations and burden distributions, we need to keep in mind their causal/generic nexus: every allocation of permits will generate costs and benefits for the parties involved (indeed even for those not taking on targets).[15] Emission allocations generate burden distributions. However, these costs and benefits – even if restricted to, say, the ones associated directly with mitigation and other efforts undertaken to remain within permitted emission levels – are not uniquely determined by the allocation.[16] Nor are cost/benefit distributions generated by unique permit allocations. One and the same emission permit allocation (say A_1 in Figure 1a) can give rise to different burden distributions (B_2 and B_3), determined by factors such as the choice of mitigation policies/instruments. And distinct allocations (e.g., A_1 and A_2) may give rise to one and the same burden distribution (B_2). Of course, depending on the specificity of the assumptions concerning the other determining factors, it is often possible – as suggested in Figure 1b – to narrow the potential multiplicity of burden

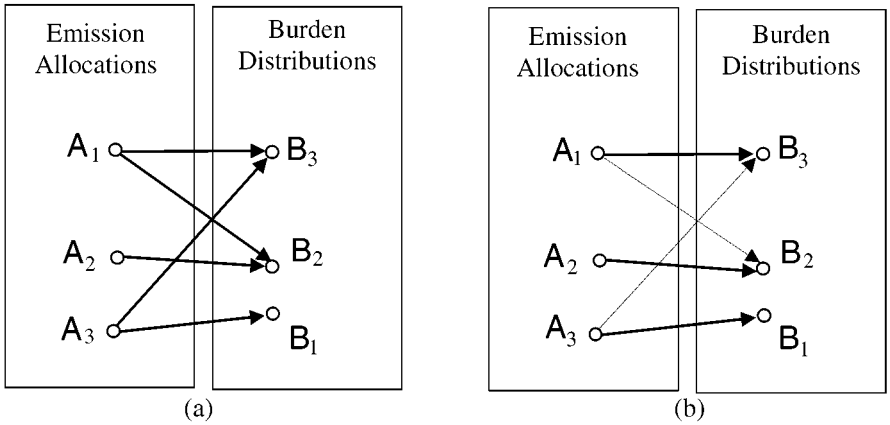

Figure 1. Allocating emission permits vs. burden sharing.

distributions generated by particular emission allocations. The point to remember is that the relation discussed here is *causal* in character, which is manifest in the temporal order between permit allocations and their cost/benefit effects.[17]

3.2. DIRECT JUSTIFICATIONS

While a grasp of the nature of these relations between permit allocations and burden distributions is of importance in understanding the variety of possible moral assessments, one should not overlook that – within the Aristotelian framework ('justice = proportionality') – all these assessments must ultimately be based on direct 'justificatory relations,' i.e., on the fact that a distribution is found to be proportional to some other, morally relevant one (a 'justifying baseline/distribution' J). Consider again the schematic example introduced in Figure 1. As shown in Figure 2, both emission allocations and burden distributions can be subjected to this sort of direct moral assessment. Thus, in assessing emission allocations, proportionality with a population baseline (J_{pop}) or an emission baseline (J_{emi}) may be put forward as appropriate 'direct' assessment criteria. Assuming the bold lines in Figure 2 signify proportionality, this means that A_1 is a 'per capita' and A_3 an '(emission-) grandfathering' permit allocation. Naturally, burden distributions can also be directly assessed. For example, they could be assessed in terms of a 'Polluter Pays' distribution of responsibilities (J_{pp} in Figure 2) operationalised by some emission baseline (such as *PP* in Table V)[18] or they could be judged with reference to an 'Ability-to-Pay' baseline, measured, say, in terms of GDP per capita (J_{atp1}, *ATP*1) or the so-called Human Development Indices (J_{atp2}, *ATP*2). The key difference between these relations and the causal relations considered in the preceding paragraph lies in the fact that justificatory relata are necessarily proportional,[19] while those of the causal nexus are in a pre-determined temporal order.[20]

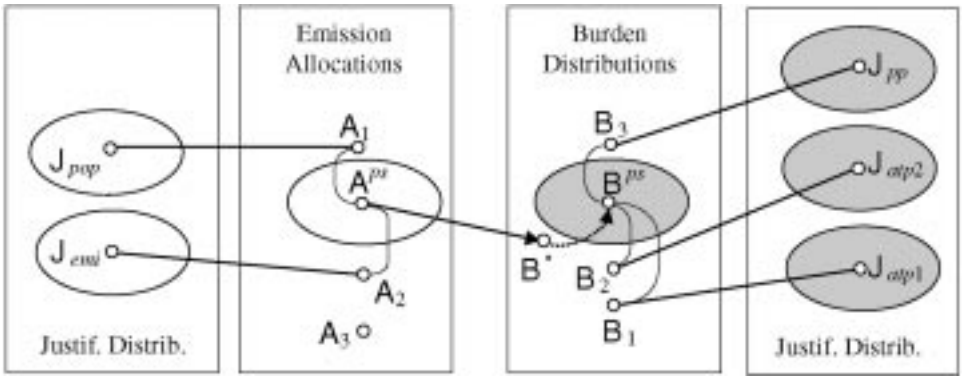

Figure 2. 'The Bigger Picture'. Harmony through side-payments.

The fact that allocating emission caps and sharing out the burden of climate change (mitigation/adaptation) are distinct moral problems becomes clear once it is realised that the latter can be legitimately assessed in terms which really have very little if anything to do with the origin of the costs and benefits to be distributed. International burden distributions – whatever their origin – are forms of international wealth re-distributions and, as such, they are liable to moral assessments in terms quite independent of their origin. This is the reason why a burden distribution involving a South-to-North resource transfer is highly unlikely to be acceptable no matter how fair the underlying emission allocation might be.

3.3. INDIRECT JUSTIFICATIONS

Having said this, it would be unwise to ignore the causal nexus between emission allocations and burden distributions, as this would mean ignoring the very real possibility of a clash between (potential) solutions of the two distributive problems. Take the case illustrated in Figure 2, where it is assumed that for each of the two problems there is consensus on a morally acceptable compromise solution, namely A^{ps}: the preference score mixture between Per Capita and Grandfathering on the emission side; and B^{ps}: essentially an equal mixture of Ability-to-Pay in GDP per capita terms and Polluter Pays – with a small portion of Ability to Pay in HDI terms (see Table V):

$$ATP1 \cdot w_{atp1} + ATP2 \cdot w_{atp2} + PP \cdot w_{pp} \tag{5}$$

$$w_{atp1} : w_{atp2} : w_{pp} = 0.47 : 0.09 : 0.44\,. \tag{6}$$

While this need not necessarily lead to a conflict, it is not difficult to see that – as suggested in Figure 2 – the equitable emission allocation A^{ps} might actually generate a burden distribution (B^{*}) which fails to live up to the assumed equity norms for sharing such burdens (by not being proportional to the relevant burden sharing compromise B^{ps}).

TABLE V

Burden sharing. Base Distributions, Preference Scores (*PS*), and *PS*-shares

	Base percentages and preference ranking* (in bold)			Population 2005** (millions)	Preference Scores (millions)			*PS*-shares (per cent)
	*ATP*1 [a]	*ATP*2 [b]	*PP* [c]		*ATP*1	*ATP*2	*PP*	
U.S.A.	22.8 **1**	11.3 **2**	25.6 **0**	292	292	584	0	**23.0**
Japan	18.8 **0**	11.3 **2**	11.8 **1**	127	0	254	127	**15.0**
EU	16.4 **0**	11.1 **1**	10.9 **2**	378	0	378	756	**13.5**
Rest of OECD	18.2 **1**	11.4 **2**	18.8 **0**	68	68	136	0	**17.9**
EIT	3.6 **2**	9.0 **1**	13.2 **0**	391	782	391	0	8.3
China	2.4 **2**	7.8 **0**	3.6 **1**	1,304	2608	0	1304	**3.5**
India	1.2 **2**	5.4 **0**	1.3 **1**	1,082	2164	0	1082	**1.6**
ANI	5.0 **1**	8.9 **0**	3.6 **2**	473	473	0	946	**4.8**
MENA	4.6 **2**	8.3 **0**	6.4 **1**	335	670	0	335	**5.7**
Latin America	5.5 **1**	9.9 **0**	3.4 **2**	471	471	0	942	**4.9**
Rest of world	1.6 **1**	5.5 **0**	1.4 **2**	1,569	1569	0	3138	**1.9**
			Total	*6490*	*9097*	*1743*	*8630*	***100.0***
					w_{atp1}	w_{atp2}	w_{pp}	
				PS-weights	**0.47**	**0.09**	**0.44**	

* 'The less, the better'.

** UN medium population projection.

[a] Measured by 1995 *GDP/cap.*

[b] Measured by 1995 *HDI.*

[c] Measured by 1995 *Emissions/cap.* See Table III.

Confronted with this sort of dilemma, the first reaction might not unreasonably be that one of the two competing types of fairness must go. And this might seem all the more appropriate as there is a very simple way of 'harmonising' the fairness of emission allocations with that of burden distributions, namely, by indirect justification, or in a sense more accurately, by indirect 'forcing'. The point is that the causal relations between emission allocations and burden distributions at the root of the incompatibility problem can actually be used as a tool for eradicating the dilemma, provided one is willing to give up one of the two consensus norms for direct assessment. This forcing of harmony can be carried out by adopting one of two maxims (definitions), namely

(i) if the emission allocation is fair, then the outcome is fair ('causal forcing');
(ii) if the outcome is fair, then the emission allocation is fair ('outcome forcing').

Causal forcing – adopting (i) – harmonises the dilemma by annulling the direct assessments of burden distributions, and outcome forcing – adopting (ii) – by rejecting the counter part (direct assessments of the emission allocations). While there could be cases in which this sort of Gordian knot solution might be inevitable, I believe they ought to be avoided whenever possible since they carry the obvious risk of antagonising those parties who feel strongly about the direct assessments which are being forced out. Indeed, I believe that in many, if not most cases there will be a viable alternative (as suggested by the broken arrow in Figure 2), namely, a mitigation of possible inequities in B^* through *side-payments*.[21]

3.4. FEASIBILITY

Of course, we cannot *a priori* exclude the possibility of an equitable emission allocation generating unfair burdens which not even side-payments could mitigate. For example, there seems to be a widely held belief in certain industrialised country quarters that the sort of equitable emission allocation contemplated by many developing country representatives (the per capita allocation) would simply put impossible demands on the industrialised world. And no one should in fairness be expected to perform the impossible, no matter how great their moral debt.[22] Yet is this really so?

The proposed preference score emission compromise – let alone a pure per capita allocation – is naturally more likely to have large-scale negative impacts on industrialised country economies if one rejects international flexibility mechanisms – indeed it is no wonder that many Kyoto Protocol critics make use of mitigation cost predictions from studies which exclude the use of these flexibilities.[23] Yet, the economic modelling of the 'Global Compromise Scenario'[24] – given by a global 14 per cent reduction of greenhouse gas emissions from business-as-usual in 2020 and a global allocation of assigned amounts in accordance with the preference score proposal A^{ps} (listed in Table IV) – indicates that equitable allocations of emission permits do not necessarily spell the end of Northern Prosperity as

TABLE VI

Global Compromise Scenario. 2020 resource transfers from emissions trading

	Billion 1995 $	% of BaU real income
Debits		
U.S.A.	–41.5	–0.35
Rest of OECD	–7.2	–0.43
MENA	–19.1	–1.01
Japan	–3.9	–0.05
EIT	–12.3	–0.66
EU	–8.1	–0.06
ANI	–0.2	–0.01
Credits		
Latin America	2.1	0.06
China	15.9	0.56
Rest of the world	40.7	1.99
India	33.5	3.75

Source: Bartsch and Müller (2000, p. 241).

we know it. Even with the usual modelling caveat, the projections of, say, the resource transfers from international trade in emission permits (Table VI) speak for themselves. Being smaller (in relative terms) than current OECD development assistance, these transfers are clearly neither crippling nor impossible. In short, the preference score solution cannot be rejected out of hand as leading to completely unacceptable economic consequences. It should also be kept in mind that, for all intents and purposes, least developed countries do not have any tradable emissions other than the legitimate surplus permits they derive from the per capita component of the preference score allocation. Without such surplus permits, they will simply find themselves excluded from most of sustainable development benefits which are meant to be one of the driving forces behind the international flexibility mechanisms.

4. Concluding Remarks

Recognising the possibility of moral ambiguity, the general architecture of the regime under the UNFCCC should *not* involve fixing legally binding distribution formulae for all eternity – whatever the modelling community might say.[25] Like everything in the world, moral contexts are likely to change and what is fair in the

present state of affairs may well be unfair under the as yet unknown – and even unforeseen – circumstances in fifty, one hundred, or a thousand years time. What the negotiation architecture does need is an effective and fair procedure to deal with the distributional disputes which may arise in morally ambiguous contexts. The preference score method is an example of what such a fair compromise procedure might look like, but there may be other ones.

Recognising the potential for conflict due to differences between the fairness of emission allocations and that of burden distributions, the architecture will have to incorporate an acceptable 'fairness harmonisation procedure'. The procedure which in my view is most likely to succeed in achieving acceptable results (ratifiable treaties) follows the 'natural' – i.e., causal/temporal – order inherent in the problem by initially choosing a fair emission allocation (compromise) and subsequently mitigating resulting burden sharing inequities through compensating side-payments, once the costs and benefits involved have actually occurred.

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Notes

[1] For the present purposes, I shall use these three terms interchangeably.

[2] Aristotle, *Nicomachean Ethic*s: Bk V: Ch.3.

[3] L. P. Rosa and S. K. Ribeiro (2000), 'The Present, Past and Future Contributions to Global Warming of CO_2 Emissions from Fuels: A Key for Negotiation in the Climate Convention', *Clim. Change* **48**, 289–307.

[4] While many of the views put forward in the following analysis were already implicitly or explicitly expressed in the excellent Chapter on Equity in the IPCC's Second Assessment Report (SAR), one of the main differences is this treatment of Aristotle's characterisation as a 'meta-principle', characterising the general nature of distributive justice for the issues at hand. Given the spatial constraints, I would like to refer to the SAR for a bibliographical list on the subject matter and apologise to all the authors who deserve to be mentioned in this context.

[5] Amartya Sen (1984), *Resources, Values and Development*, Oxford: Basil Blackwell, p. 290.

[6] Scenarios I–III are almost verbatim Amartya Sen's. In his original example, however, the bone of contention was a bamboo flute, which meant that the fourth scenario was not really an option, although one could have introduced a time-share arrangement based on egalitarian grounds.

[7] It is reasonable to assume that *A*, *B*, and *C* would prefer Scenario I, II, and III respectively. Note also that the scenario descriptions do not contradict one-another, i.e., that the information contained in them can obtain simultaneously.

[8] Benito Müller (1998), *Justice in Global Warming Negotiations: How to Achieve a Procedurally Fair Compromise*, Oxford: OIES (2nd revised edn., 1999).

[9] Note that since the weights are meant to add up to 1, this condition is sufficient to fix the preference score weights as listed in Table I.

[10] Indeed, the change in question can be more fundamental than the one exemplified in our 'Mark Two' Scenario. After all, there is no logical reason why the boys and the arbitrator could not decide to adopt the rather Puritan view that utilitarian considerations are applicable only to little boys and not to grown men. If this were so, then the reasoning adopted in Scenario I would cease to be valid after the boys have reached maturity, which, in turn, would mean the removal of Base distribution No. I from the compromise scenario.

[11] See Müller (1999), pp. 7–9. As Jaap Jansen has rightly pointed out to me in a letter, the existence and nature of moral ambiguity may well depend on the 'existential impact' of the object to be distributed. If a Party requires a certain minimum amount merely to survive, then it would seem that this claim has moral precedence over other allocation claims. However, this does not necessarily mean that the resulting context is free of moral ambiguity. After all, it is not impossible that the 'cake' to be distributed is itself bigger than the sum-total of these existential minimum quotas.

[12] U. Bartsch and B. Müller (2000), *Fossil Fuels in a Changing Climate: Impacts of the Kyoto Protocol and Developing Country Participation*, Oxford University Press, Oxford, pp. 226–266.

[13] See Müller (1999), pp. 23–24.

[14] Thus, in the emission allocation $\mathsf{A} = \langle a_1, a_2, a_3, \ldots \rangle$, '$a_2$' designates the percentage of emission permits going to the second Party, relative to some presupposed enumeration.

[15] Given that emission allocations can result in both costs and benefits, it would probably be more appropriate to use both cost and benefit distributions in this context, as opposed to single 'burden' distributions. But for the present purposes, it will be sufficient to focus on the latter.

[16] They depend, in particular, on the parties' choice of instruments for implementation, a fact which, incidentally, may complicate an 'outcome based' evaluation of permit allocations.

[17] In physics, causal relations are usually conceived of as connecting 'point-events,' i.e., physical causes and effects are assumed to be neither spatially nor temporally extended. This, of course, ensures a much simpler account than if one has to allow extended causes/effects as in the case discussed here. For the present purposes, however, an intuitive grasp of the ideas in question will have to suffice.

[18] The fact that the *PP* parameter in Table V is measured in 1995 emissions per capita is purely a matter of convenience and not meant to prejudge the issue of whether this is an adequate operationalisation of the degrees of responsibility involved.

[19] Although it is not impossible for an emission allocation to give rise to a proportional burden distribution, this would generally be purely coincidental.

[20] While it is in practice usual to refer to past baselines, there is no reason why – in principle – a direct assessment of either an emission allocation or a burden distribution could not be in terms of a projected future baseline.

[21] Note, incidentally, the crucial role of the causal nexus between emission allocations and burden distribution in this method. Any emission allocation will, over time, generate a particular burden distribution (B^*) which one can then try to transform into an equitable distribution through side-payments. Potential burden distributions, however, are not tied to particular emission allocations. And even if they were, it is difficult to see how in the light of the causal nexus, the 'counter part' to the suggested side-payment method, i.e., a 'side-transfer of emission permits' might actually work.

[22] It would indeed seem unfair to expect a murderer to bring back to life his victim, let alone to square the circle. And one reason why notions such as that of 'per capita convergence' may well have a powerful intuitive appeal is the idea that it embodies a transition from 'bad' to 'good' under which the 'bad guys' (industrialised countries) promise to reform themselves without being asked to perform the impossible. But are they really asked to perform the impossible to begin with?

[23] Such as the one undertaken by Wharton Econometric Forecasting Associates (WEFA), 1998 – 'Global Warming: The High Cost of the Kyoto Protocol' – which has figured prominently in Kyoto Protocol hearings in the U.S. Congress.

[24] Bartsch and Müller (2000), pp. 226–279.

[25] For modelling purposes, it would naturally be much more desirable if these formulae were specified once and for all, for it would drastically cut down on the number of scenarios needed to be taken into consideration. Having said this, in view of the fact that economic prediction for the said 'distant' future is pretty uncertain as it is, the lack of specified distribution formulae might not be that tragic after all.

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