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International Climate Policy and Regional Welfare Weights

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Abstract: We impute a global social welfare function that is consistent with the burden sharing in the Kyoto Protocol and in two proposals for a post-Kyoto treaty. The Kyoto Protocol favored the EU. The Frankel proposal for a post-Kyoto treaty continues the favorable treatment of the EU, while the EU proposal puts more weight on the wellbeing of other OECD countries at the expense of its own residents. Ignoring income differences, the EU proposal for a post-Kyoto treaty favors developing countries. However, if income differences are taken into account, the EU proposal is not at all generous to developing countries.

Key words: Climate policy, burden sharing, income inequality

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1. Introduction

Climate policy is a moral issue. If one does not care about the remote future, about faraway lands, or small risks with large consequences, then one does not care about climate change. Any statement about the desirability of certain cuts in greenhouse gas emissions is therewith an ethical judgment. Decisions about abatement targets reflect the costs of emission reduction and the dangers of climate change, but also the relative value placed on the costs posed on some people and dangers relieved from others. In this paper, we investigate the welfare functions that are implicit in stated emissions targets.

We approach this as follows. Assuming a global welfare function, we derive an equation for optimal greenhouse gas emission reduction per region. We populate this equation with emission scenarios, abatement cost estimates, estimates of the avoided impact of climate change, and assumptions about inequality aversion and time preference. We then assume that the stated emission reduction target is optimal, and solve the equation for the welfare weights in the welfare function. It is obvious that there are a large number of assumptions, so we conduct extensive sensitivity analyses.

Note that we assume that differences in marginal welfare in different regions are the reason for differentiation of the carbon tax. A global, uniform tax or a tradable permit scheme leading to a uniform global carbon price (Nordhaus, 2008) is the optimal policy instrument in a world where the economy works efficiently except for the carbon externality. It may not be the best solution when implemented in a second-best world. A factor that is important in this context is the limited feasibility of international income redistributions after a harmonized carbon price is applied (Laffont, 1988). Chichilnisky and Heal (1994) and Anthoff (2009) point out the significance of income allocation for efficiency of policy, arguing that a global uniform carbon tax is efficient only when lump-sum transfer of income is feasible. In practice, such perfect global transfer is difficult to be achieved for at least two reasons. The first is the sheer scale of economic gaps – income levels differ up to one hundred fold across countries, and any attempt to significantly alter the distributions would involve a considerable financial flow accompanying various distortions. The other is the absence of effective global institutions to manage redistributions – the effectiveness of foreign aid even at the current level, which is far less than 1% of income for developed nations, is questioned by some of the most serious observers in the field (Easterly, 2006; Collier, 2007).

As evidenced by the target allocations under the Kyoto Protocol,[4] most policymakers share the view that high- and low-income countries should carry different responsibilities with regard to reduction of greenhouse gas emissions. In other words, developed countries should bear high reduction costs relative to developing countries. This means that the negotiators implicitly assumed some country-specific marginal welfare to justify different carbon prices for different countries, resulting in their varied policy proposals. Eyckmans et al. (1993) estimated the revealed welfare weights for a hypothetical climate policy agreement, by reformulating and reinterpreting the weights as relative distribution of power leading to the agreement.[5] This paper applies the framework of Eyckmans et al. and performs a positive analysis of actual climate policy agreements and proposals, namely the retrospective Kyoto case and two proposals for a post-Kyoto agreement.

The paper is organized as follows. In Section 2 we describe our methodological approach, which is framed in the spirit of Eyckmans et al.'s (1993) with small modifications to fit our scope. Section 3 shows our results. Section 4 concludes.

2. Method

We consider a simple static model of greenhouse gas reduction in the spirit of Eyckmans et al. (1993). Here, n regions with different income levels reduce emissions of greenhouse gases. Emission reduction policy is chosen for each region. As greenhouse gas concentrations are uniform across all regions, the benefit of reduction for each region is a function of the global total amount of emission reduction, whereas the cost is incurred only by respective regions where emission reduction takes place. Let the costs of emission reduction be given by $C_i(R_i)$, where R_i is the (absolute amount of) emission reduction for region $i \in N = \{1,...,n\}$. The emission reduction R_i is also expressed as r_iE_i, where r_i and E_i are the proportional emission reduction and uncontrolled emissions, respectively.

[4] The Kyoto Protocol makes it clear that the signatories are subject to "common but differentiated responsibilities" (Article 10).

[5] Lange and Vogt (2003) address a similar question by framing the issue differently. They examine the possibility of cooperation in international environmental negotiations when parties have some preference for equity of all members.

Eyckmans et al. draw on empirical evidence about a relationship between the marginal abatement cost (*MC*) and fractional emission reduction (*r*): $MC \sim -\ln(1-r)$. Adopting the above relationship, $C(R_i)$ is expressed as:

(1) $$C_i(R_i) = \alpha_i E_i \left\{ \left(1 - \frac{R_i}{E_i}\right) \ln\left(1 - \frac{R_i}{E_i}\right) + \frac{R_i}{E_i} \right\} = \alpha_i E_i \{(1-r_i)\ln(1-r_i) + r_i\}$$

where α_i is the unit cost parameter.

Let the benefits of emission reduction B_i be a function of emission reduction $R=(R_1,\ldots,R_n)$ of all regions:

(2) $$B_i(R) = \beta_i \sum_j R_j = \beta_i \sum_j E_j r_j$$

where β_i is the unit benefit parameter.

We will analysis various potential global climate treaties, by assumption regions cooperate on emission reductions for those. Cooperative emission reduction follows from

(4) $$\max_{R_i} \sum_i B_i - C_i \Rightarrow R_i^C = E_i \left[1 - \exp\left(-\frac{\sum_i \beta_i}{\alpha_i} \right) \right] \text{ or } r_i^C = 1 - \exp\left(-\frac{\sum_i \beta_i}{\alpha_i} \right) \text{ for all } i \in N$$

Equation (4) is applicable if costs and benefits are evaluated on a monetary basis, in other words, differences in marginal utility across regions are ignored. A more general form of solutions can be obtained by taking account of a social welfare function. Let P_i denote the population size of region *i*. We consider a utilitarian social welfare function with some region-specific welfare weight ω_i. With a uniform per-capita income y_i within each region *i*, the social welfare function *W* is expressed as:

(5) $$W = \sum_i \omega_i P_i U(y_i)$$

where $U(y_i)$ is the utility function for the population of region *i*: $U(y) = y^{1-\eta}/(1-\eta)$ $(\eta \neq 1)$ or $\ln y$ $(\eta = 1)$.

Once a climate policy is in place, the costs and benefits of reduction are added to income:

(6) $$y_i = \frac{\overline{Y}_i - C_i(R_i) + B_i(R)}{P_i}$$

where $\overline{Y}_i$ is the baseline output without climate policy for region *i*.

Cooperative emission reduction is deduced from the maximization of social welfare (5).

The first-order conditions are:

$$(7) \qquad \sum_j \omega_j \frac{\partial U}{\partial y_j} MB_j = \omega_i \frac{\partial U}{\partial y_i} MC_i \text{ (for all } i\text{) This solves as}$$

$$(8)\ R_i^{C'} = E_i \left[1 - \exp\left(-\frac{\sum_j \frac{\omega_j}{y_j^\eta} \beta_j}{\frac{\omega_i}{y_i^\eta} \alpha_i} \right) \right] \text{ or } r_i^{C'} = 1 - \exp\left(-\frac{\sum_j \frac{\omega_j}{y_j^\eta} \beta_j}{\frac{\omega_i}{y_i^\eta} \alpha_i} \right) \text{ for all } i \in N$$

Based on the formulation (8), we conduct a positive analysis for revealed welfare weights ω. With levels of other parameters given, we estimate the levels of revealed welfare weights that respective policies or policy proposals imply.

To this end, we calibrate the parameters α and β with the integrated assessment model FUND,[6] which is described and applied by Tol (2002a, b). Table 1 shows the estimated figures we use in the analysis. FUND is a global model composed of 16 regions (this study uses the same regional categorization. See Appendix for a detailed list of countries) and has components calculating economic values of both mitigation costs and damage from climate change. FUND's output levels are set to be consistent with the IMAGE 100-year database (Batjes and Goldewijk, 1994), observational data compiled by the World Resources Institute (World Resources Institute, 2000), and socio-economic projections of the EMF14 Standardized Scenario.

As our analysis is static, we make the following additional assumptions in using data from the dynamic model FUND. Abatement costs are taken from a long-run relationship between mitigation costs and emission reduction (time-discounted average for the period 2010-2030).[7] For simplicity and clarity, we only focus on carbon dioxide as greenhouse gas. We consider two cases for abatement costs: regionally-heterogeneous marginal costs and globally uniform marginal costs (i.e., a perfect international emission trading is feasible). Unlike abatement costs, benefits of reduction are brought about over a long time horizon. Thus, the marginal benefits of reduction correspond to the time-discounted sum of marginal benefits for all years (whose absolute value equals the marginal social cost of carbon). We choose a 1%/year pure time preference rate (prtp) for our base case and examine alternative cases with 0%/year and 3%/year.[8]

[6] Detailed information about the model can be found at http://www.fund-model.org.
[7] Data from FUND fit well in regression with Equation (1), showing R^2>0.98 for all regions.
[8] While a number of important studies have been issued after the release of the Stern Review (2006), there is no consensus about the right level of the pure time preference rate yet.

3. Results

Here we show our estimated regional welfare weights. We examine three policy examples. The first is the Kyoto Protocol (Case A), the second is the EU's post-Kyoto policy proposal (Case B). Finally, we consider a recent proposal by Frankel (2009), which specifies quantitative targets globally over a long time horizon (Case C).[9]

Table 2 summarizes the levels of emission reduction prescribed by each set of policy for individual regions. The Kyoto Protocol is effective from 2008 to 2012, whereas we evaluate post-Kyoto policies at the year 2020. The reference year of GDP per capita data, which are used for estimating the marginal utility, is thus 2010 (mid-year) for Case A and 2020 for Cases B and C. GDP per capita (based on GDP and population data) and emission data are taken from FUND's base (business-as-usual) run. For sensitivity analysis, we raise and lower the baseline for GDP and emissions by 10%.

Table 3 shows that, in the Kyoto case, marginal welfare (which is the welfare weight of each region times marginal utility of the region, i.e. ω/y^{η}) is lower in OECD economies than that in Western Europe (WEU) except for Australia and New Zealand's (ANZ). This means that the Kyoto Protocol favored Western Europe and Australasia over the rest of the OECD[10], in the sense that these two regions gained the most in monetary terms. However, if we consider the pure welfare weight ω, the USA appears as the most favored region. Phrased differently, if η=1, the distribution of emission abatement between the US and EU (West)[11] in the Kyoto Protocol is commensurate with their relative incomes; while the rest of the OECD was asked to take on a disproportionate burden. If η=2, the Kyoto Protocol placed a disproportionate burden on the wellbeing of all OECD regions compared to the USA. If income differences within the OECD do not play a role, then the Kyoto Protocol was very much an EU/Australasia treaty. If income differences do play a role, then the Kyoto Protocol was a US treaty. As the US was the first to abandon Kyoto, we tentatively conclude that income difference did not play a role within the OECD.

[9] Frankel proposes a formula to calculate countries' emission target, which consists of three factors, namely, the Progressive Reductions Factor (PRF), the Latecomer Catch-up Factor (LCF), the Gradual Equalization Factor (GEF). He assumes that the first factor primarily plays a role in the short term, and that the second and third factors gradually come as a factor in later periods. In our case (dealing with rather a short time horizon), only the PRF is considered – it makes the targets overall less stringent than EU proposal's.

[10] excluding the Eastern European members, Mexico and Turkey: henceforth, we refer to "OECD" as the set of regions excluding those members

[11] Henceforth, we refer to "EU (West)" as EU's Western European members (the members before 2004). Note that most countries in WEU (Western Europe) belong to the EU, and also that the Western members produce a dominant proportion of economic output in the EU and also perhaps possess dominant influence on EU's decision-making.

The EU is the self-proclaimed world leader on international climate policy. Table 3 reveals that, in monetary terms, the Kyoto Protocol strongly favors the EU (West) – and indeed, the EU is the only region that still takes the Kyoto Protocol seriously. The post-Kyoto policy proposed by the EU favors the other regions – except for Japan and South Korea. This is also true if we consider the cases with $\eta>0$. One interpretation is that the EU so dearly wants a global agreement that it discounts its own wellbeing.

The Frankel proposal is radically different. It rewards the EU (West) for its past efforts, and puts punitive targets on the rest of the OECD.

The countries of Central and Eastern Europe and the former Soviet Union are treated differently. The Kyoto Protocol handed them a generous deal in monetary terms, but this rapidly vanishes if corrected for income differences. The EU proposal for a post-Kyoto agreement is more generous to these countries. The former Soviet Union is treated more favorably than is Central and Eastern Europe. Frankel does not have targets for these countries.

The EU proposal for a post-Kyoto agreement also has targets for developing countries (with an exception for the least developed ones). When evaluated from a monetary perspective ($\eta=0$), the proposed targets appear to be very generous: The EU places between 4.5 and 47 times more weight on the welfare of poor people than on the welfare of its own residents. However, for $\eta>0$, this vanishes. While for $\eta=2$, the pure welfare weight ω tends to be greater than unity; for $\eta=2$, $\omega<1$. Figure 1 shows that the weights are indeed strongly sensitive to the elasticity of marginal utility (inequity aversion) in lower income regions such as China and South Asia.

Table 3 and Figure 1 suggest that the EU put either too much or too little weight on developing countries, depending on the value of η. In order to narrow down the conclusion, we follow Anthoff et al. (2009), who use data of Evans and Sezer (2004, 2005) to estimate a Normal probability distribution of η with a mean of 1.49 and a standard deviation of 0.19. We use this to construct a probability density function of ω. Figure 2 shows the probability distributions of welfare weight for three selected regions (USA, China and South Asia). As shown in Table 3, $E(\omega_i)$ are generally lower than 1 in low-income regions. This result hints at the EU proposal's relative toughness on developing regions. As before, the OECD regions and the former Soviet Union are treated disproportionally well by the EU proposal.

An alternative interpretation of the revealed marginal welfare values is that the equity-weighted marginal benefit of reduction ($\sum_j \left(\omega_j / y_j^{\eta}\right)\beta_j$) signifies the *revealed* marginal benefit of reduction for Western Europe, for which the weights are normalized. In case of the EU post-Kyoto proposal with prtp=1%/yr, $\sum_j \left(\omega_j / y_j^{\eta}\right)\beta_j$ is \$546 per ton (excluding sub-Saharan Africa, where emission reduction is zero, meaning the weight is positive infinity),[12] whereas the non-weighted social cost of carbon ($\sum_j \beta_j$) is \$32 per ton. In other words, in its own proposal, Western Europe magnifies in perception the benefit of climate mitigation by a factor of 17.

One can draw another insight. If one assumes that ω_i=1 for all regions, one can estimate the region-specific η_i with the regions' relative income to Western Europe's (the column "η *if* $\omega_i = \omega$" in Table 3). The estimates are below 2 for most regions, and some regions even show values below 1 (South America and South Asia). USA's light reduction burden and high income is translated into a negative inequity aversion.

While we interpret the different emission reduction targets as revealing negotiation power, it may of course also be that policy makers use different abatement costs than we do. Table 3 shows what happens if we assume that emission reduction costs are uniform across the world. To some approximation, this may be the result of vigorous international trade in emission allowances. Under these assumptions, the pure welfare weight of the EU (West) is always greater than that of any other region. The Kyoto Protocol served the EU best, as does the Frankel proposal and indeed the EU proposal for a post-Kyoto agreement.

Figure 3 shows the result of sensitivity analysis for Case B (the EU proposal case at 2020). It shows that while the absolute levels of weights differ significantly across cases, relative patterns across regions are well preserved with a given set of policy.

[12] It should be stressed that this number is evaluated from Western Europe's standpoint, as the weights are normalized as WEU=1. In other words, this number is meaningful only for Western Europe. For some other regions where weights are high, the perceived marginal benefit could be in fact much lower than the non-weighted social cost of carbon of \$32 per ton.

4. Concluding remarks

Many policymakers regard equity as an integral element of international climate change policy, and some economists have discussed climate policy from a normative standpoint (e.g., Stern, 2006). This study clarifies how international climate policy takes into account income inequality in target-setting of emission reduction. We took an approach similar to Eyckmans et al. (1993) and estimated the welfare weights of different world regions that are implied by policy agreement and proposals.

The following results emerge. The Kyoto Protocol favored the EU (as it was then). The Frankel proposal on burden sharing for a future treaty rewards the EU for taking the lead on climate change, while the EU proposal is very generous to other rich countries. Eastern Europe and the former Soviet Union did well under the Kyoto Protocol and would do well under the EU proposal for a post-Kyoto treaty *if evaluated in monetary terms*. If income differences are considered, these regions come out less well. The same is true for less developed countries. While the EU proposal for a post-Kyoto treaty appears generous in monetary terms, it is not at all in utility terms. In sum, (proposals for) burden sharing in international climate treaties do not display a concern for international equity; self-serving behavior is a more likely explanation.

This research should be extended in the following ways. Replication with alternative assumptions about the costs and benefits of greenhouse gas emission reduction would be welcome. Alternative social welfare functions should be investigated. Our static framework should be replaced with a dynamic one. Other proposals for targets and burden-sharing should be evaluated. All this is deferred to future research.

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Table 1. Parameter levels used for analysis (calibrated with the FUND model: prtp=1%/yr)

Acronym	Name	α_i	α_i (globally uniform marginal cost)	β_i
USA	USA	412.8	--	3.6
CAN	Canada	434.8	--	0.2
WEU	Western Europe	1092.0	--	5.7
JPK	Japan and South Korea	1056.7	--	-0.6
ANZ	Australia and New Zealand	362.1	--	0.1
EEU	Central and Eastern Europe	99.7	--	0.2
FSU	Former Soviet Union	26.1	--	2.2
MDE	Middle East	66.7	--	0.5
CAM	Central America	229.9	--	0.3
LAM	South America	740.8	--	0.4
SAS	South Asia	80.9	--	1.0
SEA	Southeast Asia	221.0	--	1.5
CHI	China plus	142.9	--	14.6
NAF	North Africa	127.8	--	1.4
SSA	Sub-Saharan Africa	232.4	--	1.3
SIS	Small Island States	65.2	--	0.2
World	World	--	112.1	32.4 (sum of the above)

Table 2. Descriptions of policy examples

Acronym	Name	Kyoto, reduction relative to 1990 %	(A) Kyoto, net reduction from baseline %[1]	(B) EU post-Kyoto proposal,[2] reduction from baseline %	(C) Frankel,[3] reduction from baseline % at 2020
USA	USA	7	34	53	14
CAN	Canada	6	32	51	9
WEU	Western Europe	8	12	39	12
JPK	Japan and South Korea	6 (Japan only)	28	57	17
ANZ	Australia and New Zealand	8% increase (Australia) 0 (New Zealand)	31	59	7
EEU	Central and Eastern Europe	8/6/5 (different by country)	29	43	--
FSU	Former Soviet Union	0	5	15	--
MDE	Middle East	--	--	15	--
CAM	Central America	--	--	15	--
LAM	South America	--	--	15	--
SAS	South Asia	--	--	15	--
SEA	Southeast Asia	--	--	15	--
CHI	China plus	--	--	15	--
NAF	North Africa	--	--	15	--
SSA	Sub-Saharan Africa	--	--	--	--
SIS	Small Island States	--	--	15	--

1. Baseline emissions estimated by FUND

2. Lower bound for reduction by developing countries. The EU proposal states the poorest nations should be exempt from emission reduction. Here, only Sub-Saharan Africa is considered the poorest.

3. After Frankel (2009). The formula is *log*(*reduction target*) = log (emission target EU_{2008}/BAU EU_{2008}) - 0.14*log(regional income per $capita_{t-1}$/EU income per $capita_{2007}$)
Emissions and income data are taken from FUND. We assume that the policy decision is made at the year 2010 (i.e., t-1=2010).

Table 3. Estimated welfare weights (normalized as WEU=1; prtp=1% per year)

Name	(A) Kyoto				(B) EU post-Kyoto proposal						
	Marginal welfare (ω_i/y_i^η), ω_i with η=0	ω_i with η=1	ω_i with η=2	ω_i with η=1 and uniform marginal abatement cost	Marginal welfare (ω_i/y_i^η), ω_i with η=0	ω_i with η=1	ω_i with η=2	ω_i with η=1 and uniform marginal abatement cost	E(ω_i))	SD(ω_i)	η if $\omega_i=\omega$
USA	0.8	1.0	1.1	0.4	1.7	2.0	2.3	0.8	2.1	0.1	-4.1
Canada	0.9	0.7	0.6	0.3	1.7	1.4	1.1	0.6	1.3	0.1	2.5
Western Europe	1	1	1	1	1	1	1	1	1	--	--
Japan and South Korea	0.4	0.6	1.0	0.6	0.6	0.9	1.4	0.9	1.1	0.1	1.2
Australia and New Zealand	1.1	0.7	0.5	0.2	1.7	1.1	0.8	0.4	0.9	0.1	1.3
Central and Eastern Europe	4.2	0.5	0.05	0.04	9.6	1.2	0.2	0.1	0.5	0.2	1.1
Former Soviet Union	63.2	4.7	0.4	0.3	86	7.7	0.7	0.2	2.6	1.3	1.8
Middle East	--[1]	--[1]	--[1]	--[1]	47	3.8	0.3	0.2	1.2	0.6	1.5
Central America	--[1]	--[1]	--[1]	--[1]	14	1.4	0.1	0.3	0.5	0.2	1.1
South America	--[1]	--[1]	--[1]	--[1]	4.5	0.5	0.1	0.4	0.2	0.1	0.7
South Asia	--[1]	--[1]	--[1]	--[1]	37	0.8	0.02	0.1	0.2	0.1	0.9
Southeast Asia	--[1]	--[1]	--[1]	--[1]	14	1.1	0.1	0.2	0.4	0.2	1.0
China plus	--[1]	--[1]	--[1]	--[1]	15	1.7	0.2	0.2	0.6	0.3	1.2
North Africa	--[1]	--[1]	--[1]	--[1]	24	1.1	0.1	0.1	0.3	0.2	1.0
Sub-Saharan Africa	--[1]	--[1]	--[1]	--[1]	--[1]	--[1]	--[1]	--[1]	--[1]	--[1]	--[1]
Small Island States	--[1]	--[1]	--[1]	--[1]	50	2.0	0.1	0.1	0.5	0.3	1.2

1. No emission reduction requirements, implying the equity weight is positive infinity

Table 3 (continued)

Acronym	Name	(C) Frankel			
		Marginal welfare (ω_i/y_i^{η}), ω_i with η=0	ω_i with η=1	ω_i with η=2	ω_i with η=1 and uniform marginal abatement cost
USA	USA	0.1	0.1	0.1	0.5
CAN	Canada	0.1	0.1	0.1	0.5
WEU	Western Europe	1	1	1	1
JPK	Japan and South Korea	0.03	0.05	0.1	0.5
ANZ	Australia and New Zealand	0.2	0.2	0.1	0.6
EEU	Central and Eastern Europe	--[1]	--[1]	--[1]	--[1]
FSU	Former Soviet Union	--[1]	--[1]	--[1]	--[1]
MDE	Middle East	--[1]	--[1]	--[1]	--[1]
CAM	Central America	--[1]	--[1]	--[1]	--[1]
LAM	South America	--[1]	--[1]	--[1]	--[1]
SAS	South Asia	--[1]	--[1]	--[1]	--[1]
SEA	Southeast Asia	--[1]	--[1]	--[1]	--[1]
CHI	China plus	--[1]	--[1]	--[1]	--[1]
NAF	North Africa	--[1]	--[1]	--[1]	--[1]
SSA	Sub-Saharan Africa	--[1]	--[1]	--[1]	--[1]
SIS	Small Island States	--[1]	--[1]	--[1]	--[1]

Figure 1. Relationship between the welfare weight (ω_i) and the elasticity of marginal utility (inequity aversion: η) for selected regions in the EU post-Kyoto proposal case (Case B).

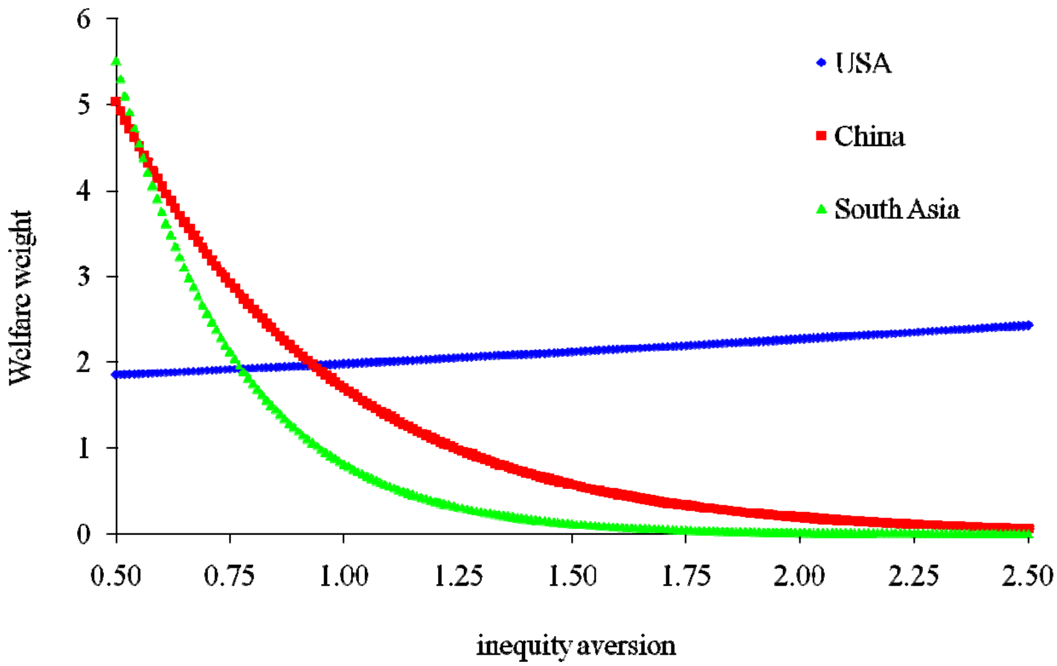
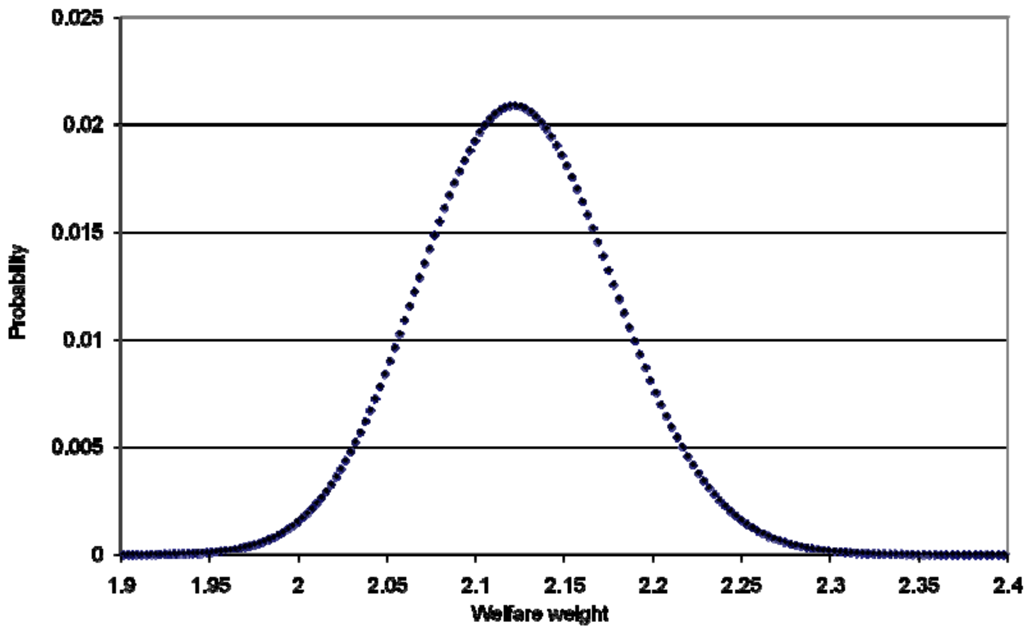
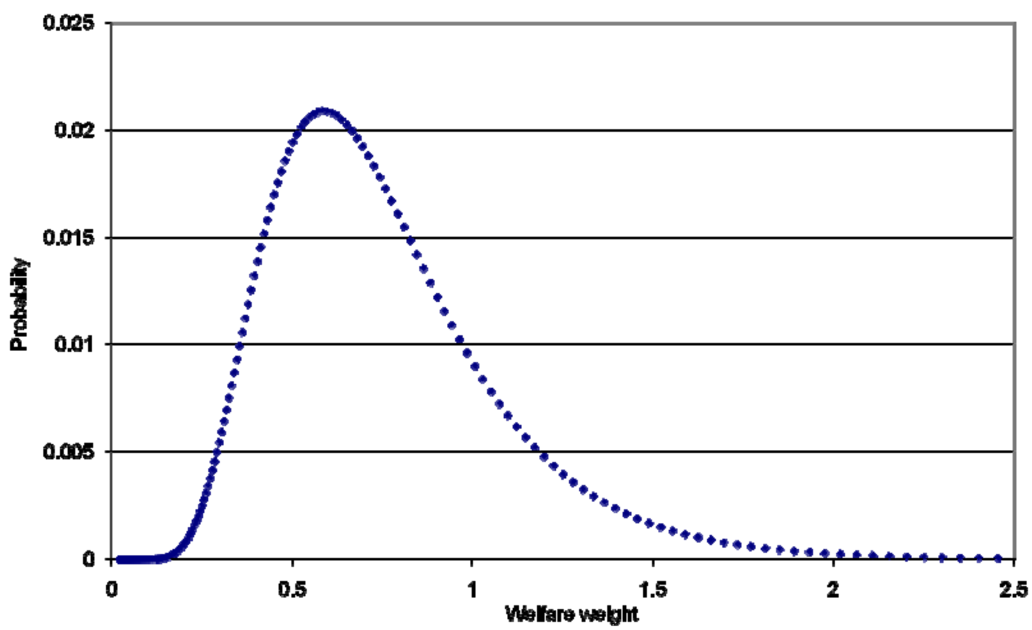


Figure 2. Probability distributions of welfare weights (with η according to Evans and Sezer) for selected regions in the EU post-Kyoto proposal case (Case B).

(a) USA



(b) China (CHI)



(c) South Asia (SAS)

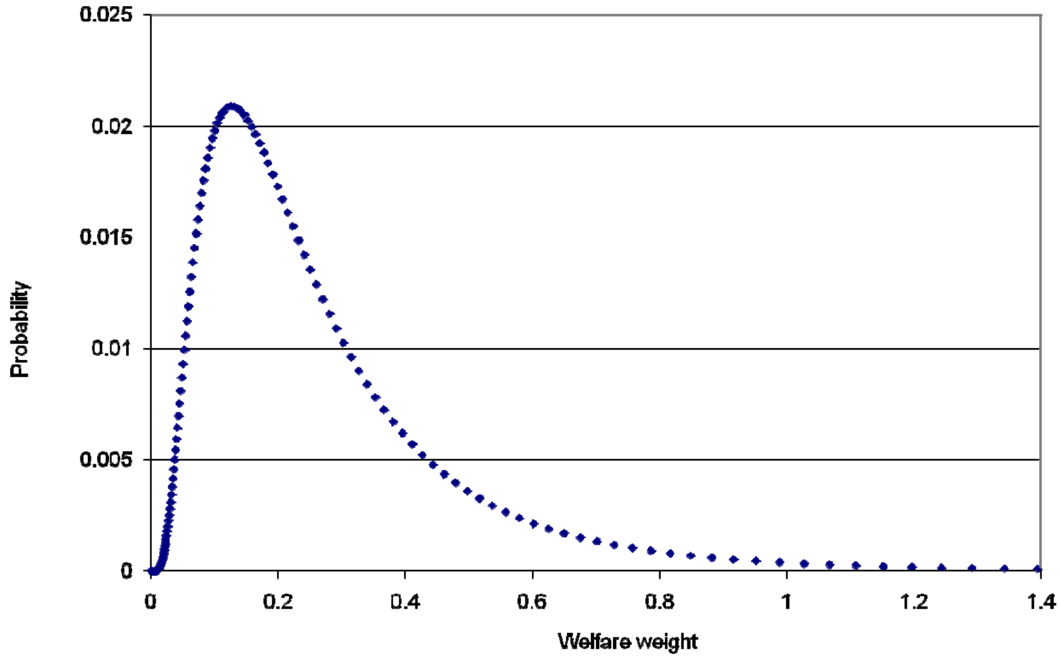
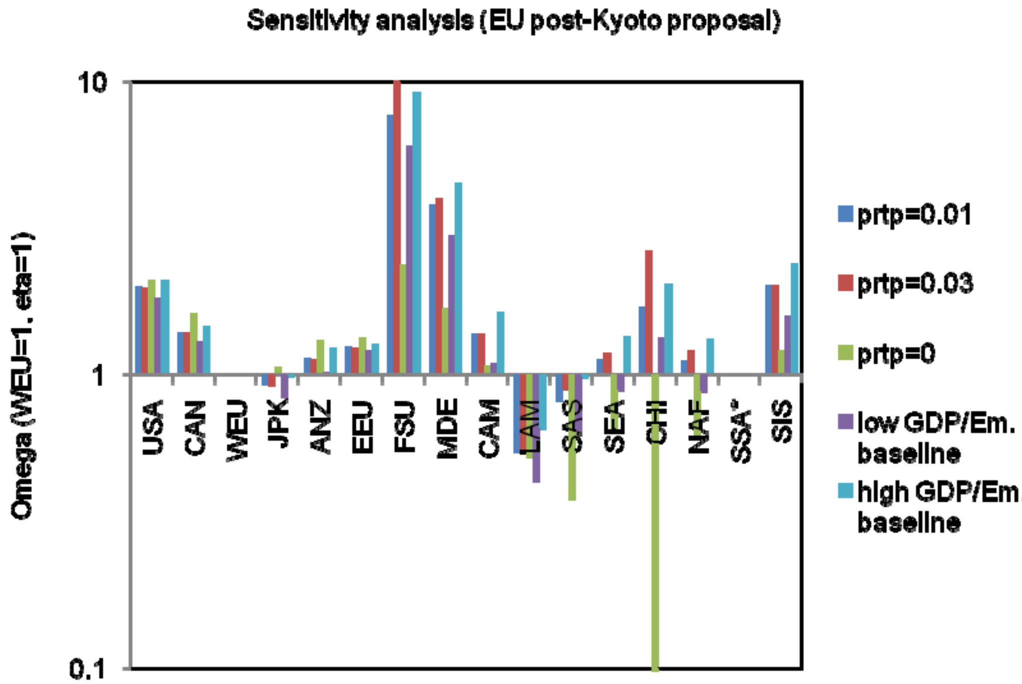


Figure 3. Sensitivity analysis of welfare weights (η=1) for the EU post-Kyoto proposal case (Case B).



* SSA (Sub-Saharan Africa)d does not have emission targets (in this sense, the weights are positive infinity).

Appendix. Regional categories used for analysis

Acronym	**Name**	**Countries**
USA	USA	United States of America
CAN	Canada	Canada
WEU	Western Europe	Andorra, Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Malta, Monaco, Netherlands, Norway, Portugal, San Marino, Spain, Sweden, Switzerland, United Kingdom
JPK	Japan and South Korea	Japan, South Korea
ANZ	Australia and New Zealand	Australia, New Zealand
EEU	Central and Eastern Europe	Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Hungary, FYR Macedonia, Poland, Romania, Slovakia, Slovenia, Yugoslavia
FSU	Former Soviet Union	Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan
MDE	Middle East	Bahrain, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, United Arab Emirates, West Bank and Gaza, Yemen
CAM	Central America	Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama
SAM	South America	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela
SAS	South Asia	Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka
SEA	Southeast Asia	Brunei, Cambodia, East Timor, Indonesia, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Singapore, Taiwan, Thailand, Vietnam
CHI	China plus	China, Hong Kong, North Korea, Macau, Mongolia
NAF	North Africa	Algeria, Egypt, Libya, Morocco, Tunisia, Western Sahara
SSA	Sub-Saharan Africa	Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Congo-Brazzaville, Congo-Kinshasa, Cote d'Ivoire, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea- Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mauritania, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe
SIS	Small Island States	Antigua and Barbuda, Aruba, Bahamas, Barbados, Bermuda, Comoros, Cuba, Dominica, Dominican Republic, Fiji, French Polynesia, Grenada, Guadeloupe, Haiti, Jamaica, Kiribati, Maldives, Marshall Islands, Martinique, Mauritius, Micronesia, Nauru, Netherlands Antilles, New Caledonia, Palau, Puerto Rico, Reunion, Samoa, Sao Tome and Principe, Seychelles, Solomon Islands, St Kitts and Nevis, St Lucia, St Vincent and Grenadines, Tonga, Trinidad and Tobago, Tuvalu, Vanuatu, Virgin Islands

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