

Narita, Daiju; Tol, Richard S. J.; Anthoff, David

**Working Paper**

## International climate policy and regional welfare weights

ESRI Working Paper, No. 332

**Provided in Cooperation with:**

The Economic and Social Research Institute (ESRI), Dublin

*Suggested Citation:* Narita, Daiju; Tol, Richard S. J.; Anthoff, David (2009) : International climate policy and regional welfare weights, ESRI Working Paper, No. 332, The Economic and Social Research Institute (ESRI), Dublin

This Version is available at:

<https://hdl.handle.net/10419/50085>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

## International Climate Policy and Regional Welfare Weights

**Daiju Narita,<sup>1</sup> Richard S. J. Tol<sup>2,3</sup>, and David Anthoff<sup>2</sup>**

*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

*Corresponding Author:* Richard.Tol@esri.ie

---

<sup>1</sup> Kiel Institute for the World Economy, Kiel, Germany

<sup>2</sup> Economic and Social Research Institute, Dublin, Ireland

<sup>3</sup> Institute for Environmental Studies and Department of Spatial Economics, Vrije Universiteit, Amsterdam, The Netherlands

# **International Climate Policy and Regional Welfare Weights**

## **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,<sup>4</sup> 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.<sup>5</sup> 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  $i \in N = \{1, \dots, n\}$ . The emission reduction  $R_i$  is also expressed as  $r_i E_i$ , where  $r_i$  and  $E_i$  are the proportional emission reduction and uncontrolled emissions, respectively.

---

<sup>4</sup> The Kyoto Protocol makes it clear that the signatories are subject to “common but differentiated responsibilities” (Article 10).

<sup>5</sup> 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:

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

where  $\alpha_i$  is the unit cost parameter.

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

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

where  $\beta_i$  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

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

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  $\omega_i$ . With a uniform per-capita income  $y_i$  within each region  $i$ , the social welfare function  $W$  is expressed as:

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

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:

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

where  $\bar{Y}_i$  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:

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

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

Based on the formulation (8), we conduct a positive analysis for revealed welfare weights  $\omega$ . 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  $\alpha$  and  $\beta$  with the integrated assessment model FUND,<sup>6</sup> 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).<sup>7</sup> 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.<sup>8</sup>

<sup>6</sup> Detailed information about the model can be found at <http://www.fund-model.org>.

<sup>7</sup> Data from FUND fit well in regression with Equation (1), showing  $R^2 > 0.98$  for all regions.

<sup>8</sup> 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).<sup>9</sup>

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.  $\omega/y^\eta$ ) 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<sup>10</sup>, in the sense that these two regions gained the most in monetary terms. However, if we consider the pure welfare weight  $\omega$ , the USA appears as the most favored region. Phrased differently, if  $\eta=1$ , the distribution of emission abatement between the US and EU (West)<sup>11</sup> 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  $\eta=2$ , 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.

---

<sup>9</sup> 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.

<sup>10</sup> excluding the Eastern European members, Mexico and Turkey: henceforth, we refer to "OECD" as the set of regions excluding those members

<sup>11</sup> 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  $\omega$  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  $\eta$ . 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  $\eta$  with a mean of 1.49 and a standard deviation of 0.19. We use this to construct a probability density function of  $\omega$ . 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 disproportionately well by the EU proposal.



An alternative interpretation of the revealed marginal welfare values is that the equity-weighted marginal benefit of reduction ( $\sum_j (\omega_j / y_j^\eta) \beta_j$ ) 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,  $\sum_j (\omega_j / y_j^\eta) \beta_j$  is \$546 per ton (excluding sub-Saharan Africa, where emission reduction is zero, meaning the weight is positive infinity),<sup>12</sup> 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  $\omega_i=1$  for all regions, one can estimate the region-specific  $\eta_i$  with the regions' relative income to Western Europe's (the column " $\eta$  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.

---

<sup>12</sup> 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.

#### **Acknowledgements**

Financial support by the US Environmental Protection Agency and the German Research Foundation (the “Future Ocean” Cluster of Excellence program) is gratefully acknowledged.

## References

- Anthoff, D., R.S.J. Tol, and G.W. Yohe, Discounting for climate change, *Economics: The Open Access, Open Assessment E-Journal* 3, 2009-24, 2009.
- Anthoff, D., "Optimal Global Dynamic Carbon Taxation." ESRI Working Paper No. 278, 2009.
- Anthoff, D., C. Hepburn, and R.S.J. Tol, Equity weighting and the marginal damage costs of climate change, *Ecological Economics* 68, 836-849, 2009.
- Batjes, J.J., and Goldewijk, C.G.M., The IMAGE 2 Hundred Year (1890-1990) Database of the Global Environment (HYDE), RIVM, Bilthoven, 1994.
- Chichilnisky, G. and G. Heal, Who should abate carbon emissions? An international viewpoint, *Economics Letters* 44, 443-439, 1994.
- Collier, P., *The bottom billion: why the poorest countries are failing and what can be done about it*, Oxford, UK: Oxford University Press, 2007.
- Dasgupta, P., Commentary: The Stern Review's Economics of Climate Change, *National Institute Economic Review* 199, 4-7, January 2007.
- Easterly, W., *The white man's burden: why the West's efforts to aid the Rest have done so much ill and so little good*, New York: The Penguin Press, 2006.
- Evans, D.J. and H. Sezer, Social discount rates for six major countries, *Applied Economics Letters* 11: 557-560, 2004.
- Evans, D.J. and H. Sezer, Social discount rates for member countries of the European Union, *Journal of Economic Studies* 32(1): 47-59, 2005.
- Eyckmans, J., S. Proost, and E. Schokkaert, Efficiency and distribution in greenhouse negotiations, *Kyklos*, 46 (3), 363-397, 1993.
- Frankel, J.A., *An Elaborated Global Climate Policy Architecture: Specific Formulas and Emission Targets for All Countries in All Decades*, NBER Working Paper 14876, April 2009.
- Laffont, J.-J., *Fundamentals of Public Economics*, Cambridge MA: The MIT Press, 1988.
- Lange, A., and C. Vogt, Cooperation in International Environmental Negotiations Due to a Preference for Equity, *Journal of Public Economics* 87: 2049-2067, 2003.
- Nordhaus, W., *A Question of Balance: Weighing the Options on Global Warming Policies*, New Haven, CT: Yale University Press, 2008.
- Stern, N., *The Economics of Climate Change: The Stern Review*, Cambridge University Press, 2006.
- Tol, R.S.J., Estimates of the damage costs of climate change, part 1: Benchmark estimates, *Environmental and Resource Economics* 21(2): 47-73, 2002a.

Tol, R.S.J., Estimates of the damage costs of climate change, part 2: Dynamic estimates, *Environmental and Resource Economics* 21(2): 135-160, 2002b.

World Resources Institute, World Resources Database 2000-2001, World Resources Institute, Washington DC, 2000.

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

Acronym	Name	$\alpha_i$	$\alpha_i$ (globally uniform marginal cost)	$\beta_i$
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 % <sup>1</sup>	(B) EU post-Kyoto proposal, <sup>2</sup> reduction from baseline %	(C) Frankel, <sup>3</sup> 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  $\log(\text{reduction target}) = \log(\text{emission target EU}_{2008}/\text{BAU EU}_{2008}) - 0.14 \cdot \log(\text{regional income per capita}_{t-1}/\text{EU income per capita}_{2007})$

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 ( $\omega_i/y_i^\eta$ ), $\omega_i$ with $\eta=0$	$\omega_i$ with $\eta=1$	$\omega_i$ with $\eta=2$	$\omega_i$ with $\eta=1$ and uniform marginal abatement cost	Marginal welfare ( $\omega_i/y_i^\eta$ ), $\omega_i$ with $\eta=0$	$\omega_i$ with $\eta=1$	$\omega_i$ with $\eta=2$	$\omega_i$ with $\eta=1$ and uniform marginal abatement cost	$E(\omega_i)$	$SD(\omega_i)$	$\eta$ 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	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	47	3.8	0.3	0.2	1.2	0.6	1.5
Central America	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	14	1.4	0.1	0.3	0.5	0.2	1.1
South America	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	4.5	0.5	0.1	0.4	0.2	0.1	0.7
South Asia	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	37	0.8	0.02	0.1	0.2	0.1	0.9
Southeast Asia	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	14	1.1	0.1	0.2	0.4	0.2	1.0
China plus	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	15	1.7	0.2	0.2	0.6	0.3	1.2
North Africa	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	24	1.1	0.1	0.1	0.3	0.2	1.0
Sub-Saharan Africa	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>
Small Island States	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	50	2.0	0.1	0.1	0.5	0.3	1.2

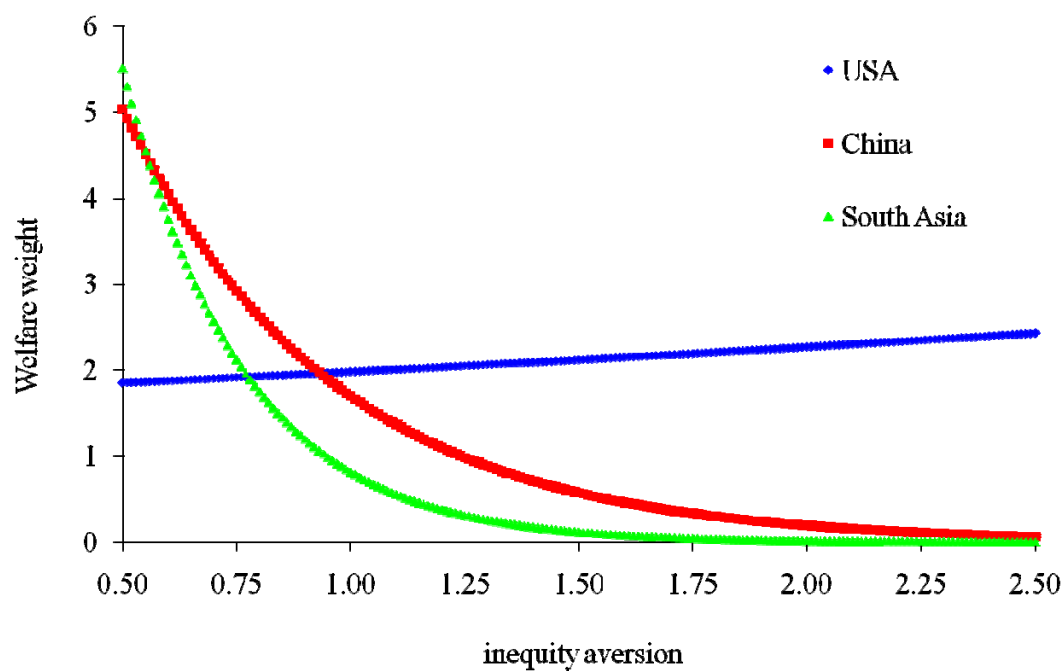
1. No emission reduction requirements, implying the equity weight is positive infinity

**Table 3** (continued)

Acronym	Name	(C) Frankel			
		Marginal welfare ( $\omega_i/y_i^\eta$ ), $\omega_i$ with $\eta=0$	$\omega_i$ with $\eta=1$	$\omega_i$ with $\eta=2$	$\omega_i$ with $\eta=1$ 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	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>
FSU	Former Soviet Union	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>
MDE	Middle East	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>
CAM	Central America	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>
LAM	South America	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>
SAS	South Asia	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>
SEA	Southeast Asia	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>
CHI	China plus	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>
NAF	North Africa	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>
SSA	Sub-Saharan Africa	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>
SIS	Small Island States	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>

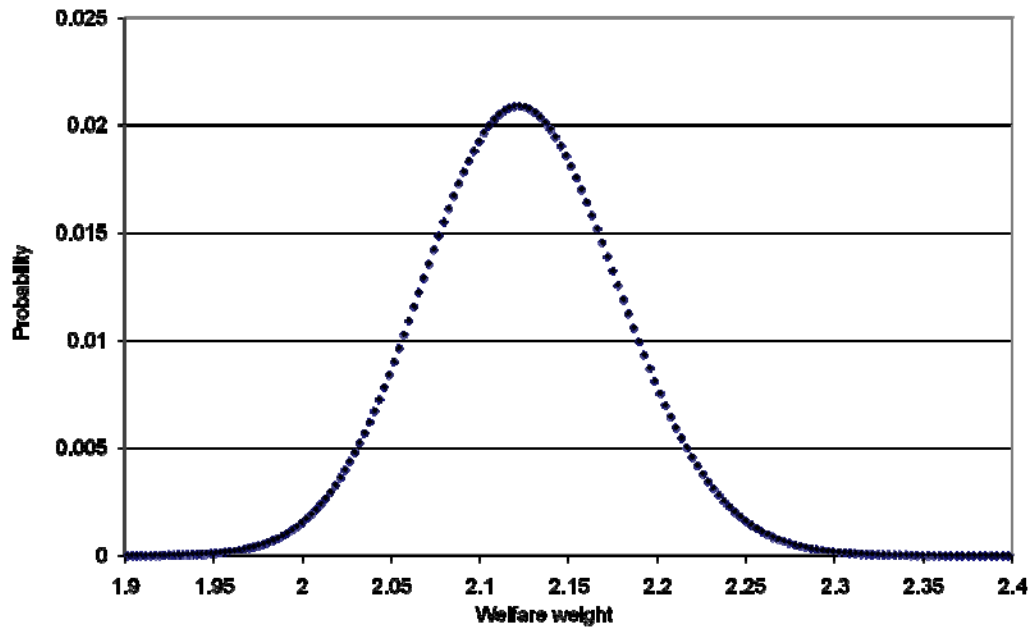


**Figure 1.** Relationship between the welfare weight ( $\omega_i$ ) and the elasticity of marginal utility (inequity aversion:  $\eta$ ) for selected regions in the EU post-Kyoto proposal case (Case B).

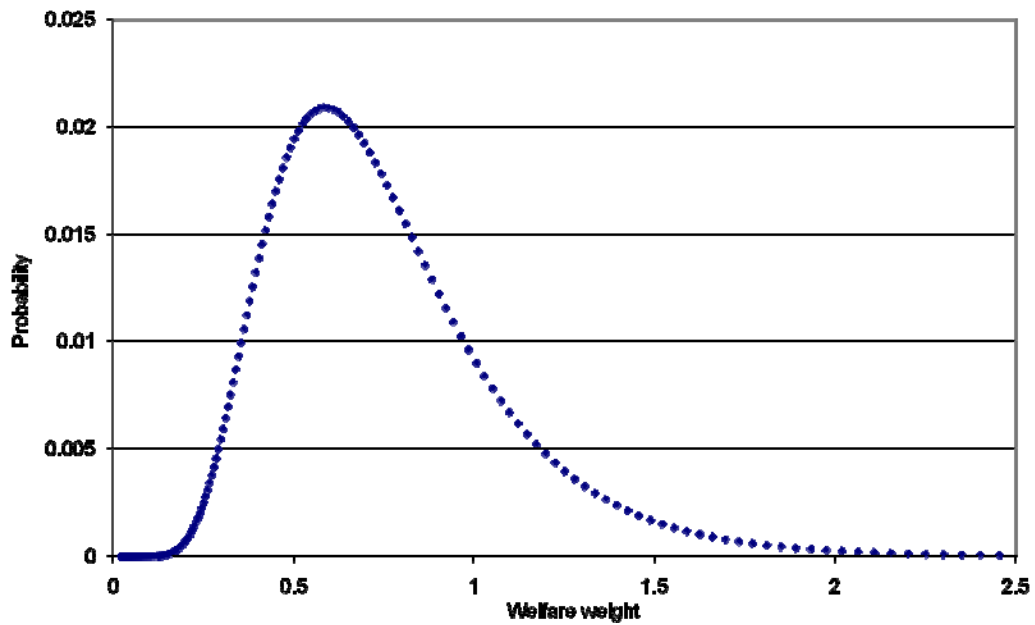


**Figure 2.** Probability distributions of welfare weights (with  $\eta$  according to Evans and Sezer) for selected regions in the EU post-Kyoto proposal case (Case B).

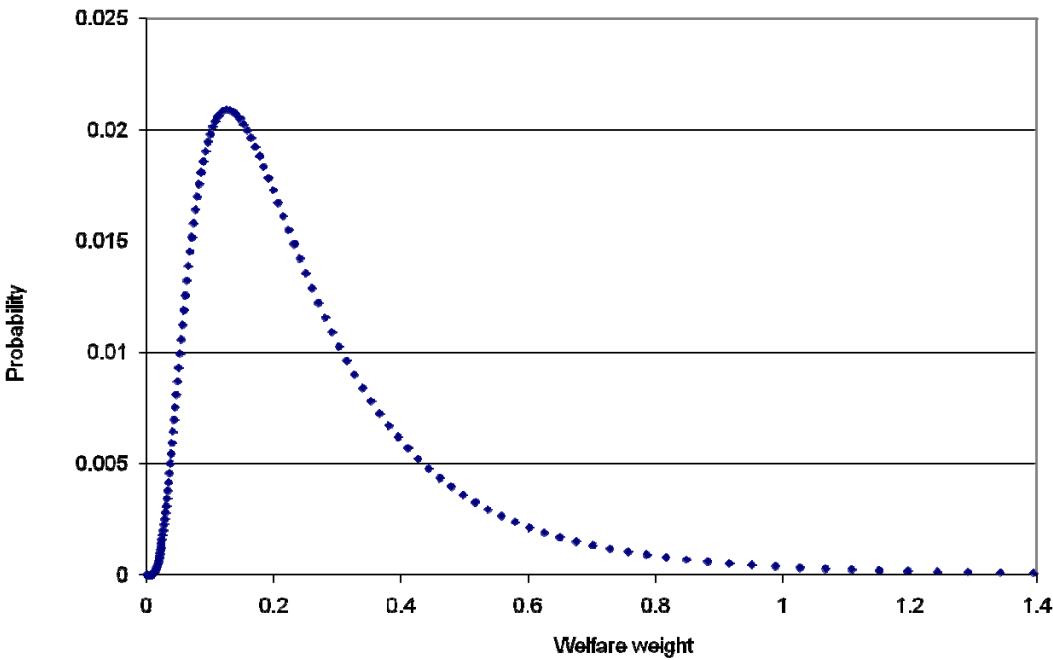
(a) USA



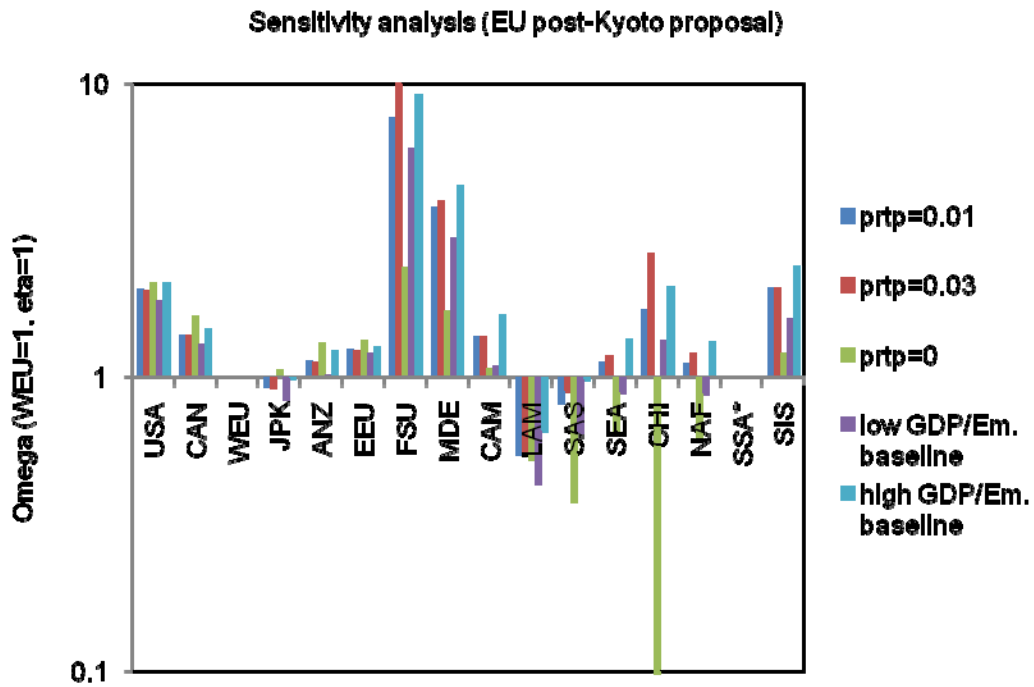
(b) China (CHI)



(c) South Asia (SAS)



**Figure 3.** Sensitivity analysis of welfare weights ( $\eta=1$ ) 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 the Grenadines, Tonga, Trinidad and Tobago, Tuvalu, Vanuatu, Virgin Islands

Year	Number	Title/Author(s) ESRI Authors/Co-authors <i>Italicised</i>
<b>2009</b>		
	331	A Hedonic Analysis of the Value of Parks and Green Spaces in the Dublin Area <i>Karen Mayor, Seán Lyons, David Duffy and Richard S.J. Tol</i>
	330	Measuring International Technology Spillovers and Progress Towards the European Research Area <i>Iulia Siedschlag</i>
	329	Climate Policy and Corporate Behaviour <i>Nicola Commins, Seán Lyons, Marc Schiffbauer, and Richard S.J. Tol</i>
	328	The Association Between Income Inequality and Mental Health: Social Cohesion or Social Infrastructure <i>Richard Layte and Bertrand Maitre</i>
	327	A Computational Theory of Exchange: Willingness to pay, willingness to accept and the endowment effect <i>Pete Lunn and Mary Lunn</i>
	326	Fiscal Policy for Recovery <i>John Fitz Gerald</i>
	325	The EU 20/20/2020 Targets: An Overview of the EMF22 Assessment Christoph Böhringer, Thomas F. Rutherford, and <i>Richard S.J. Tol</i>
	324	Counting Only the Hits? The Risk of Underestimating the Costs of Stringent Climate Policy Massimo Tavoni, <i>Richard S.J. Tol</i>
	323	International Cooperation on Climate Change Adaptation from an Economic Perspective Kelly C. de Bruin, Rob B. Dellink and <i>Richard S.J. Tol</i>
	322	What Role for Property Taxes in Ireland? <i>T. Callan, C. Keane and J.R. Walsh</i>

- 321 The Public-Private Sector Pay Gap in Ireland: What Lies Beneath?  
*Elish Kelly, Seamus McGuinness, Philip O'Connell*
- 320 A Code of Practice for Grocery Goods Undertakings and An Ombudsman: How to Do a Lot of Harm by Trying to Do a Little Good  
*Paul K Gorecki*
- 319 Negative Equity in the Irish Housing Market  
*David Duffy*
- 318 Estimating the Impact of Immigration on Wages in Ireland  
*Alan Barrett, Adele Bergin and Elish Kelly*
- 317 Assessing the Impact of Wage Bargaining and Worker Preferences on the Gender Pay Gap in Ireland Using the National Employment Survey 2003  
*Seamus McGuinness, Elish Kelly, Philip O'Connell, Tim Callan*
- 316 Mismatch in the Graduate Labour Market Among Immigrants and Second-Generation Ethnic Minority Groups  
*Delma Byrne and Seamus McGuinness*
- 315 Managing Housing Bubbles in Regional Economies under EMU: Ireland and Spain  
*Thomas Conefrey and John Fitz Gerald*
- 314 Job Mismatches and Labour Market Outcomes  
Kostas Mavromaras, *Seamus McGuinness*, Nigel O'Leary, Peter Sloane and Yin King Fok
- 313 Immigrants and Employer-provided Training  
*Alan Barrett, Séamus McGuinness, Martin O'Brien and Philip O'Connell*
- 312 Did the Celtic Tiger Decrease Socio-Economic Differentials in Perinatal Mortality in Ireland?  
*Richard Layte and Barbara Clyne*
- 311 Exploring International Differences in Rates of Return to Education: Evidence from EU SILC  
Maria A. Davia, *Seamus McGuinness* and *Philip, J. O'Connell*

- 310 Car Ownership and Mode of Transport to Work in Ireland  
*Nicola Commins and Anne Nolan*
- 309 Recent Trends in the Caesarean Section Rate in Ireland 1999-2006  
*Aolfe Brick and Richard Layte*
- 308 Price Inflation and Income Distribution  
*Anne Jennings, Seán Lyons and Richard S.J. Tol*
- 307 Overskilling Dynamics and Education Pathways  
Kostas Mavromaras, *Seamus McGuinness*, Yin King Fok
- 306 What Determines the Attractiveness of the European Union to the Location of R&D Multinational Firms?  
*Iulia Siedschlag, Donal Smith, Camelia Turcu, Xiaoheng Zhang*
- 305 Do Foreign Mergers and Acquisitions Boost Firm Productivity?  
*Marc Schiffbauer, Iulia Siedschlag, Frances Ruane*
- 304 Inclusion or Diversion in Higher Education in the Republic of Ireland?  
*Delma Byrne*
- 303 Welfare Regime and Social Class Variation in Poverty and Economic Vulnerability in Europe: An Analysis of EU-SILC  
Christopher T. Whelan and *Bertrand Maitre*
- 302 Understanding the Socio-Economic Distribution and Consequences of Patterns of Multiple Deprivation: An Application of Self-Organising Maps  
Christopher T. Whelan, Mario Lucchini, Maurizio Pisati and *Bertrand Maitre*
- 301 Estimating the Impact of Metro North  
*Edgar Morgenroth*
- 300 Explaining Structural Change in Cardiovascular Mortality in Ireland 1995-2005: A Time Series Analysis  
*Richard Layte, Sinead O'Hara and Kathleen Bennett*
- 299 EU Climate Change Policy 2013-2020: Using the Clean Development Mechanism More Effectively  
*Paul K Gorecki, Seán Lyons and Richard S.J. Tol*



- 298 Irish Public Capital Spending in a Recession  
*Edgar Morgenroth*
- 297 Exporting and Ownership Contributions to Irish Manufacturing Productivity Growth  
*Anne Marie Gleeson, Frances Ruane*
- 296 Eligibility for Free Primary Care and Avoidable Hospitalisations in Ireland  
*Anne Nolan*
- 295 Managing Household Waste in Ireland: Behavioural Parameters and Policy Options  
*John Curtis, Seán Lyons and Abigail O'Callaghan-Platt*
- 294 Labour Market Mismatch Among UK Graduates; An Analysis Using REFLEX Data  
*Seamus McGuinness and Peter J. Sloane*
- 293 Towards Regional Environmental Accounts for Ireland  
*Richard S.J. Tol, Nicola Commins, Niamh Crilly, Sean Lyons and Edgar Morgenroth*
- 292 EU Climate Change Policy 2013-2020: Thoughts on Property Rights and Market Choices  
*Paul K. Gorecki, Sean Lyons and Richard S.J. Tol*
- 291 Measuring House Price Change  
*David Duffy*
- 290 Intra-and Extra-Union Flexibility in Meeting the European Union's Emission Reduction Targets  
*Richard S.J. Tol*
- 289 The Determinants and Effects of Training at Work: Bringing the Workplace Back In  
*Philip J. O'Connell and Delma Byrne*
- 288 Climate Feedbacks on the Terrestrial Biosphere and the Economics of Climate Policy: An Application of *FUND*  
*Richard S.J. Tol*
- 287 The Behaviour of the Irish Economy: Insights from the HERMES macro-economic model  
*Adele Bergin, Thomas Conefrey, John FitzGerald and*

*Ide Kearney*

- 286 Mapping Patterns of Multiple Deprivation Using Self-Organising Maps: An Application to EU-SILC Data for Ireland  
*Maurizio Pisati, Christopher T. Whelan, Mario Lucchini and Bertrand Maitre*
- 285 The Feasibility of Low Concentration Targets: An Application of FUND  
*Richard S.J. Tol*
- 284 Policy Options to Reduce Ireland's GHG Emissions  
  
Instrument choice: the pros and cons of alternative policy instruments  
Thomas Legge and *Sue Scott*
- 283 Accounting for Taste: An Examination of Socioeconomic Gradients in Attendance at Arts Events  
*Pete Lunn and Elish Kelly*
- 282 The Economic Impact of Ocean Acidification on Coral Reefs  
Luke M. Brander, Katrin Rehdanz, *Richard S.J. Tol*, and Pieter J.H. van Beukering
- 281 Assessing the impact of biodiversity on tourism flows: A model for tourist behaviour and its policy implications  
Giulia Macagno, Maria Loureiro, Paulo A.L.D. Nunes and *Richard S.J. Tol*
- 280 Advertising to boost energy efficiency: the Power of One campaign and natural gas consumption  
*Seán Diffney, Seán Lyons and Laura Malaguzzi Valeri*
- 279 International Transmission of Business Cycles Between Ireland and its Trading Partners  
*Jean Goggin and Iulia Siedschlag*
- 278 Optimal Global Dynamic Carbon Taxation  
*David Anthoff*
- 277 Energy Use and Appliance Ownership in Ireland  
*Eimear Leahy and Seán Lyons*

2008

- 276 Discounting for Climate Change  
*David Anthoff, Richard S.J. Tol and Gary W. Yohe*
- 275 Projecting the Future Numbers of Migrant Workers in the Health  
and Social Care Sectors in Ireland  
*Alan Barrett and Anna Rust*
- 274 Economic Costs of Extratropical Storms under Climate Change:  
An application of FUND  
*Daiju Narita, Richard S.J. Tol, David Anthoff*
- 273 The Macro-Economic Impact of Changing the Rate of  
Corporation Tax  
*Thomas Conefrey and John D. Fitz Gerald*
- 272 The Games We Used to Play  
An Application of Survival Analysis to the Sporting Life-course  
*Pete Lunn*
- 271 Exploring the Economic Geography of Ireland  
*Edgar Morgenroth*
- 270 Benchmarking, Social Partnership and Higher Remuneration:  
Wage Settling Institutions and the Public-Private Sector Wage  
Gap in Ireland  
*Elish Kelly, Seamus McGuinness, Philip O'Connell*
- 269 A Dynamic Analysis of Household Car Ownership in Ireland  
*Anne Nolan*
- 268 The Determinants of Mode of Transport to Work in the Greater  
Dublin Area  
*Nicola Commins and Anne Nolan*
- 267 Resonances from *Economic Development* for Current Economic  
Policymaking  
*Frances Ruane*
- 266 The Impact of Wage Bargaining Regime on Firm-Level  
Competitiveness and Wage Inequality: The Case of Ireland  
*Seamus McGuinness, Elish Kelly and Philip O'Connell*
- 265 Poverty in Ireland in Comparative European Perspective  
*Christopher T. Whelan and Bertrand Maitre*

- 264 A Hedonic Analysis of the Value of Rail Transport in the Greater Dublin Area  
*Karen Mayor, Seán Lyons, David Duffy and Richard S.J. Tol*
- 263 Comparing Poverty Indicators in an Enlarged EU  
*Christopher T. Whelan and Bertrand Maitre*
- 262 Fuel Poverty in Ireland: Extent, Affected Groups and Policy Issues  
*Sue Scott, Seán Lyons, Claire Keane, Donal McCarthy and Richard S.J. Tol*
- 261 The Misperception of Inflation by Irish Consumers  
*David Duffy and Pete Lunn*
- 260 The Direct Impact of Climate Change on Regional Labour Productivity  
Tord Kjellstrom, R Sari Kovats, Simon J. Lloyd, Tom Holt, *Richard S.J. Tol*
- 259 Damage Costs of Climate Change through Intensification of Tropical Cyclone Activities: An Application of FUND  
Daiju Narita, *Richard S. J. Tol* and *David Anthoff*
- 258 Are Over-educated People Insiders or Outsiders? A Case of Job Search Methods and Over-education in UK  
Aleksander Kucel, *Delma Byrne*
- 257 Metrics for Aggregating the Climate Effect of Different Emissions: A Unifying Framework  
*Richard S.J. Tol*, Terje K. Berntsen, Brian C. O'Neill, Jan S. Fuglestedt, Keith P. Shine, Yves Balkanski and Laszlo Makra
- 256 Intra-Union Flexibility of Non-ETS Emission Reduction Obligations in the European Union  
*Richard S.J. Tol*
- 255 The Economic Impact of Climate Change  
*Richard S.J. Tol*
- 254 Measuring International Inequity Aversion  
*Richard S.J. Tol*

- 253 Using a Census to Assess the Reliability of a National Household Survey for Migration Research: The Case of Ireland  
*Alan Barrett and Elish Kelly*
- 252 Risk Aversion, Time Preference, and the Social Cost of Carbon  
*David Anthoff, Richard S.J. Tol and Gary W. Yohe*
- 251 The Impact of a Carbon Tax on Economic Growth and Carbon Dioxide Emissions in Ireland  
*Thomas Conefrey, John D. Fitz Gerald, Laura Malaguzzi Valeri and Richard S.J. Tol*
- 250 The Distributional Implications of a Carbon Tax in Ireland  
*Tim Callan, Sean Lyons, Susan Scott, Richard S.J. Tol and Stefano Verde*
- 249 Measuring Material Deprivation in the Enlarged EU  
*Christopher T. Whelan, Brian Nolan and Bertrand Maître*
- 248 Marginal Abatement Costs on Carbon-Dioxide Emissions: A Meta-Analysis  
Onno Kuik, Luke Brander and *Richard S.J. Tol*
- 247 Incorporating GHG Emission Costs in the Economic Appraisal of Projects Supported by State Development Agencies  
*Richard S.J. Tol and Seán Lyons*
- 246 A Carbon Tax for Ireland  
*Richard S.J. Tol, Tim Callan, Thomas Conefrey, John D. Fitz Gerald, Seán Lyons, Laura Malaguzzi Valeri and Susan Scott*
- 245 Non-cash Benefits and the Distribution of Economic Welfare  
*Tim Callan and Claire Keane*
- 244 Scenarios of Carbon Dioxide Emissions from Aviation  
*Karen Mayor and Richard S.J. Tol*
- 243 The Effect of the Euro on Export Patterns: Empirical Evidence from Industry Data  
*Gavin Murphy and Iulia Siedschlag*
- 242 The Economic Returns to Field of Study and Competencies Among Higher Education Graduates in Ireland  
*Elish Kelly, Philip O'Connell and Emer Smyth*
- 241 European Climate Policy and Aviation Emissions

*Karen Mayor and Richard S.J. Tol*

- 240 Aviation and the Environment in the Context of the EU-US Open Skies Agreement  
*Karen Mayor and Richard S.J. Tol*
- 239 Yuppie Kvetch? Work-life Conflict and Social Class in Western Europe  
*Frances McGinnity and Emma Calvert*
- 238 Immigrants and Welfare Programmes: Exploring the Interactions between Immigrant Characteristics, Immigrant Welfare Dependence and Welfare Policy  
*Alan Barrett and Yvonne McCarthy*
- 237 How Local is Hospital Treatment? An Exploratory Analysis of Public/Private Variation in Location of Treatment in Irish Acute Public Hospitals  
*Jacqueline O'Reilly and Miriam M. Wiley*
- 236 The Immigrant Earnings Disadvantage Across the Earnings and Skills Distributions: The Case of Immigrants from the EU's New Member States in Ireland  
*Alan Barrett, Seamus McGuinness and Martin O'Brien*
- 235 Europeanisation of Inequality and European Reference Groups  
*Christopher T. Whelan and Bertrand Maitre*
- 234 Managing Capital Flows: Experiences from Central and Eastern Europe  
*Jürgen von Hagen and Iulia Siedschlag*
- 233 ICT Diffusion, Innovation Systems, Globalisation and Regional Economic Dynamics: Theory and Empirical Evidence  
Charlie Karlsson, Gunther Maier, Michaela Trippl, *Iulia Siedschlag*, Robert Owen and *Gavin Murphy*
- 232 Welfare and Competition Effects of Electricity Interconnection between Great Britain and Ireland  
*Laura Malaguzzi Valeri*
- 231 Is FDI into China Crowding Out the FDI into the European Union?  
*Laura Resmini and Iulia Siedschlag*

230	Estimating the Economic Cost of Disability in Ireland John Cullinan, Brenda Gannon and <i>Seán Lyons</i>
229	Controlling the Cost of Controlling the Climate: The Irish Government's Climate Change Strategy Colm McCarthy, <i>Sue Scott</i>
228	The Impact of Climate Change on the Balanced-Growth-Equivalent: An Application of <i>FUND</i> <i>David Anthoff, Richard S.J. Tol</i>
227	Changing Returns to Education During a Boom? The Case of Ireland <i>Seamus McGuinness, Frances McGinnity, Philip O'Connell</i>
226	'New' and 'Old' Social Risks: Life Cycle and Social Class Perspectives on Social Exclusion in Ireland <i>Christopher T. Whelan and Bertrand Maitre</i>
225	The Climate Preferences of Irish Tourists by Purpose of Travel <i>Seán Lyons, Karen Mayor and Richard S.J. Tol</i>
224	A Hirsch Measure for the Quality of Research Supervision, and an Illustration with Trade Economists <i>Frances P. Ruane and Richard S.J. Tol</i>
223	Environmental Accounts for the Republic of Ireland: 1990-2005 <i>Seán Lyons, Karen Mayor and Richard S.J. Tol</i>
<b>2007</b>	
222	Assessing Vulnerability of Selected Sectors under Environmental Tax Reform: The issue of pricing power <i>J. Fitz Gerald, M. Keeney and S. Scott</i>
221	Climate Policy Versus Development Aid <i>Richard S.J. Tol</i>
220	Exports and Productivity – Comparable Evidence for 14 Countries <i>The International Study Group on Exports and Productivity</i>
219	Energy-Using Appliances and Energy-Saving Features: Determinants of Ownership in Ireland Joe O'Doherty, <i>Seán Lyons</i> and <i>Richard S.J. Tol</i>

- 218 The Public/Private Mix in Irish Acute Public Hospitals: Trends and Implications  
*Jacqueline O'Reilly and Miriam M. Wiley*
- 217 Regret About the Timing of First Sexual Intercourse: The Role of Age and Context  
*Richard Layte, Hannah McGee*
- 216 Determinants of Water Connection Type and Ownership of Water-Using Appliances in Ireland  
*Joe O'Doherty, Seán Lyons and Richard S.J. Tol*
- 215 Unemployment – Stage or Stigma?  
Being Unemployed During an Economic Boom  
*Emer Smyth*
- 214 The Value of Lost Load  
*Richard S.J. Tol*
- 213 Adolescents' Educational Attainment and School Experiences in Contemporary Ireland  
*Merike Darmody, Selina McCoy, Emer Smyth*
- 212 Acting Up or Opting Out? Truancy in Irish Secondary Schools  
*Merike Darmody, Emer Smyth and Selina McCoy*
- 211 Where do MNEs Expand Production: Location Choices of the Pharmaceutical Industry in Europe after 1992  
*Frances P. Ruane, Xiaoheng Zhang*
- 210 Holiday Destinations: Understanding the Travel Choices of Irish Tourists  
*Seán Lyons, Karen Mayor and Richard S.J. Tol*
- 209 The Effectiveness of Competition Policy and the Price-Cost Margin: Evidence from Panel Data  
*Patrick McCloughan, Seán Lyons and William Batt*
- 208 Tax Structure and Female Labour Market Participation: Evidence from Ireland  
*Tim Callan, A. Van Soest, J.R. Walsh*