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## Are the economic costs of (non-)stabilizing the atmosphere prohibitive? A response to Gerlagh and Papyrakis

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14 There is a widespread impression that the cost of climate policies could be so high that they would 15 jeopardize our current standard of living, and 16 would prevent countries in the South from devel-17 oping. For instance, Lindsey (2001), President 18 19 Bush's assistant on economic policy, stated that "the Kyoto protocol could damage our collective 20 prosperity and, in so doing, actually put our long-21 term environmental health at risk". 22

23 In a recent paper in Ecological Economics (Azar and Schneider, 2002), we put that view in doubt. 24 We show that the cost to achieve ambitious 25 climate targets tend to be minor compared with 26 27 overall economic development—even if top down energy-economy modelling approaches are used 28 (which tend to neglect a variety of factors that 29 30 would lower costs). In such models, the net present 31 value of the cost to stabilize the atmospheric concentration of CO<sub>2</sub> below 450 ppm may count 32 in trillions of dollars. 33

But in comparison with the overall growth in 34 35 world income, even net present value costs of tens of trillions would "only" amount to a few years 36 delay in achieving an already impressive growth in 37 income. In our paper, we estimated that global 38

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GDP will be ten times greater in April the year 39 2102 (with climate policies) rather than in the year 40 2100 (without climate policies, and assuming that 41 there will be no impacts from the resulting climate 42 change). 43 44

This does not mean, as we said in our paper, that the costs of stabilizing atmospheric CO<sub>2</sub> concentrations are negligible or unimportant, or that it will be easy to meet the climate targetsparticularly in the short-term. The key point is simply that the cost estimates have to be put in context. Our hope was, and still is, that a more balanced picture of the costs involved would lead to a more balanced debate and decision making process.

In a comment to our paper, Gerlagh and 54 Papyrakis (2003) seem not to disagree with our 55 observations and conclusions. Rather they take 56 the opportunity to venture a related point that also 57 deserves attention. They point to the fact that the 58 same kind of argument as we made regarding the 59 cost of abatement could also be made for the cost 60 of the expected climatic changes. But there are serious additional factors that make estimates of 62 the costs of climate change not equivalent to the 63 mitigation costs. 64

There are a few estimates of the global GDP loss 65 from climate change, and these typically suggest 66 that a doubling of atmospheric CO<sub>2</sub> equivalent 67

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concentrations would cost a few percent of global 68 GDP (at the time when the damage takes place), 69 see IPCC (2001) (chapter 19). In the words of 70 Gerlagh and Papyrakis: "The costs of uncon-71 strained climate change do not seem to threaten 72 future economic development and welfare. Un-73 constrained climate change leads to a welfare loss 74 equivalent to only a 1 year delay of economic 75 growth over a period of 100 years". 76

But is it really possible to copy our costabatement argument and use it analogously when
it comes to the cost of climate damages? We think
not.

There are several reasons for that. First, there 81 are huge difficulties in actually estimating the 82 value of environmental amenities and ecosystems 83 84 services. Second, there are equally large difficulties 85 in estimating the value of health and lives as a consequence of climatic changes. Third, there are 86 problems associated with the choice of discount 87 rate, in particular since the impacts of the next few 88 generations are expected to cause damage-in-89 90 cluding irreversible ecological losses-on far future generations. It is not all that clear that the 91 way our current generation makes trade-offs for 92 our own consumption, should imply that the 93 damage we cause for future generations should 94 95 be valued substantially less than the actual impact simple because future generations live in the future 96 (for more on the problems of discounting, valua-97 tion and uncertainty in the context of cost benefit 98 analysis of climate change, see Azar, 1998). 99

Some would say that these problems are man-100 101 ageable and that research on economic decision making and valuation would ultimately resolve 102 these problems. Others (including ourselves) 103 would argue that the difficulties stem from more 104 fundamental problems with valuing ecosystems, 105 106 health and human life in the same metric as we value TVs, cars and other gadgets, fun to play 107 with, but inessential when it comes to basic human 108 needs and human and ecosystems existence. Mone-109 tary estimates of the cost of climate change 110 provide only an incomplete picture of damages 111 112 climate change might cause. It is even likely that aggregating all costs and expressing them in 113 monetary terms could obscure rather than en-114 lighten the decision making process. For that 115

reason, other metrics or numeraires are needed 116 when assessing the impacts of climate change (see 117 table 1 from Schneider et al., 2000). 118

Gerlagh and Papyrakis express this lack of 119 comparability or fungibility as poor substitutabil-120 ity, and conclude: "When poor substitutability 121 prevails in the long run, that is, when the 122 compensation for the loss of environmental ame-123 nities by providing more man made goods, cannot 124 go on perpetually, then the choice for an abate-125 ment level cannot be based on a cost-benefit 126 analysis that treats both costs and benefits on an 127 equal footing". The key aim of the paper by 128 Gerlagh and Papyrakis seems to be to spell out 129 this view. There is no disagreement between us on 130 this point. 131

So one may wonder if there really is any 132 disagreement? Gerlagh and Papyrakis again: 133 "When long-term perfect substitutability holds, it 134 is unconvincing to downplay the cost of abatement 135 measures, since costs of unconstrained climate 136 change can be downplayed as well". Here we 137 disagree. 138

For them, it seems as if it is only the question of 139 substitutability that matters. One key problem 140 with this argument is that it does not consider 141 the distribution of damages. A caricature of a 142 neoclassical economist would argue that the level 143 of abatement of CO<sub>2</sub> emissions should increase 144 from zero, but only until the marginal cost of 145 abatement is lower than the marginal cost of the 146 emissions. But what if damages from the emissions 147 would affect primarily poor countries such as Mali 148 and Bangladesh? The caricature economist would 149 then argue that by not abating we would save 150 enough money so that we can compensate the 151 poor. 152

It is our view that such compensation is difficult 153 to carry out, both in practice and in theory. What 154 we in practice would end up with is, in this 155 scenario, that rich countries emit, poor countries 156 get hurt and economics suggest that this is optimal 157 since the rich has the potential to compensate the 158 poor. It would be unfortunate if economics would 159 be the tool that some use to justify, without closer 160 scrutiny, such an outcome. Instead, the distribu-161 tion of impacts is a key concern when it comes to 162

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the climate change debate, and economics mustconsider that as well, as suggested on Table 1.

Uncertainty in the estimates of climate change 165 and climate impacts is very large, and is at least as 166 important a reason to avoid equivalences of fairly 167 constrained cost estimates with a very wide range 168 of possible benefits. Nordhaus (1994) conducted a 169 decision analytic survey in which the respondents 170 elicited damage estimates ranging from a small 171 172 GDP gain from climate change to a dramatic loss of tens of a percent (see figure 1 from Rough-173 garden and Schneider, 1999, based on the data of 174 Nordhaus, 1994). If above median damages on 175 figure 1 would materialize, then climatic changes 176 would fundamentally disrupt human societies-to 177 say nothing about natural systems-rather than 178 179 adding only minor deviations to a smooth development path. 180

181 Of course, there is also some probability that 182 aggressive near-term climate abatement policies 183 would be disruptive for our societies, in particular 184 if the rate of emission abatement is very fast. It 185 could lead to inflation, unemployment, social 186 protests by coal miners and truck drivers etc. But 187 if we start to abate now, we will learn about how

> Table 1 The "Five Numeraires"

The five numeraires\* (vulnerabilities to climate changes)

• Market impacts	(\$ per ton c)
Human lives lost	(Persons per ton C)
<ul> <li>Biodiversity loss</li> </ul>	(Species per ton C)
<ul> <li>Distributional impacts</li> </ul>	(Income redistribution per ton C)
<ul> <li>Quality of life</li> </ul>	(Loss of heritage sites; forced
	migration; disturbed cultural
	amenities; etc per ton C)

\*Disaggregate by value differences—provide traceable account of re-aggregations to make value differences transparent. It is essential for analysis of costs of climate change impacts or mitigation strategies to consider explicitly alternative numeraires and to be as clear as possible which are being used and what is omitted. Moreover, before any aggregation is attempted, e.g. cost-benefit optimization strategies authors should first disaggregate costs and benefits into several numeraires and then provide a "traceable account" (see Moss and Schneider, 2000) of how they were re-aggregated. Such transparency is essential given the normative nature of the valuation of various consequences characterized by the five numeraires. to be fairer and more cost effective in climate 188 policies. An orderly transition to decarbonized 189 energy systems at, say, 1 or 2% reductions of CO<sub>2</sub> 190 emissions per year, could put us on a track to 191 avoid serious climatic effects without serious social 192 effects. 193

If on the other hand, we do not take the risk of 194 climate change seriously and are unlucky and end 195 up on the wrong half of the damage curves, then 196 rapid and potentially irreversible climatic impacts 197 could well become unavoidable. Thus, we do not 198 see costs and benefits in a symmetrical cost-benefit 199 logic, but rather as an equity problem and a risk 200 management dilemma. 201

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