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The trade-off between intra- and intergenerational equity in climate policy ☆

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ABSTRACT

This paper focuses on two equity dimensions of climate policy, intra- and intergenerational, and analyzes the implications of equity preferences on climate policy, and on the production and consumption patterns in rich and poor countries. We develop a dynamic two-region model, in which each region suffers from global warming, but also has an inequality aversion over current consumption allocations. Inequality aversion generally lifts the consumption path of the poor region, while the rich region must take a greater share of the climate burden. Furthermore, with inequality aversion, the optimal climate policy generally leads to higher investment in clean capital in the North and in dirty capital in the South, thereby allowing the South to pollute more and develop faster. The optimal policy may even require the poor region to increase emissions relative to the uncoordinated Business-as-Usual case. Introducing local pollution and transfers confirm the main results.

1. Introduction

While most scientists and politicians have recognized climate change as a threat to the future for many years, there is still an ongoing debate as to what to do about it. Researchers may not agree on the optimal emissions reductions even if they agree on the natural science background, the impacts and the costs of abating greenhouse gas emissions. One important reason is that optimal emission reductions depend on equity issues, and our discounting of future climate impacts is particularly important. However, ethical issues have not been fully explored in economic analyses, as greenhouse gas abatement not only affects the welfare distribution between present and future generations, but also the distribution within a generation, such as between rich and poor countries. These two equity dimensions are important when studying optimal emissions reductions, and as we explain below, they may work in different directions.

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The purpose of our study is to investigate the trade-off between the two dimensions of equity in climate policy. We ask the following question: How should we design climate policies when people have preferences for both equity dimensions, and what are the implications for emissions and energy investments?

These dimensions of equity can be referred to as *intra-* and *intergenerational*. The first is primarily about how we should distribute the burdens within a generation, either within the generation living today or within future generations, see Kverndokk and Rose (2008). Two examples of this can be: who would suffer from climate change (inaction), and how should the burdens of mitigation (action) be distributed? In the years to come, the world may face large climatic changes, such as increased temperatures, sea level rise, changed wind and precipitation patterns, and more extreme weather (IPCC, 2013). However, the associated damages will not be evenly distributed among countries or within a given country. Studies by Tol et al. (2000), Tol (2002a,b) and Yohe et al. (2007) show that some sectors will lose from climate change while others will benefit. Poorer countries are likely facing relatively stronger negative impacts than richer countries. In addition, several studies suggest that the costs of action will vary across countries and sectors, and that abatement is generally more expensive in more energy efficient economies (IPCC, 2007). Policy instruments implemented to reduce greenhouse gas emissions will impose different burdens on people, and economic instruments such as carbon taxes will often be regressive, so that the poorest will face the highest burden (see, e.g., Bye et al., 2002).

While intragenerational equity is important, most of the equity debate related to climate change in the economic literature has been on intergenerational issues. This debate has focused on the size of emissions reductions to aim for, and on what should be the upper limit on the atmospheric greenhouse gas concentration or the global mean temperature. These questions also affect the distribution of burdens between the current generation and future generations, as the costs of mitigation are borne by the current generation, while future generations benefit from it. According to the literature, there are several reasons for extensive mitigation today, such as attitudes toward risk and concerns about catastrophic events (Weitzman, 2007a). However, most of the discussions have been about the appropriate discount rate for climate policy decisions, as the optimal abatement level is very sensitive to this parameter (Nordhaus, 2007; Weitzman, 2007b; Dasgupta, 2008), which again represents ethical choices.[1] Intergenerational aspects of climate change have also been studied by John and Pecchenino with coauthors (John and Pecchenino, 1994; John et al., 1995) who focus on the tradeoff between economic growth and environmental quality.

Most studies treat intra- or intergenerational equity separately. However, choices that affect intergenerational distribution also affect the intragenerational distribution between rich and poor countries. As Heal (2009) points out, there are at least two ways in which preferences for equality affect the choice of climate action. First, if we believe that consumption increases over time, a high elasticity of marginal utility of consumption leads to less aggressive action. The reason is that this makes future generations richer, and if we care about inequality between the present and future generations, we place a lower value on the future rich (intergenerational equity). There is, however, an additional effect. The poor countries are likely to suffer the most from climate change. Hence, if we put a low weight on future outcomes, climate change is more likely to occur and hit poor countries hard (intragenerational equity). Consequently, the gap between the welfare levels of the rich and the poor may be wider, and based on the latter effect, stronger preferences for equality should go in the direction of more action to prevent climate change.

These two effects of inequality aversion work in different directions, and the impacts of stronger preferences for equity on the level of greenhouse gas abatement are ambiguous. However, global models used to determine the optimal level of greenhouse gas emissions focus on the first effect (intergenerational), implying that stronger preferences for equality induce low abatement (see e.g., Nordhaus and Boyer, 2000).[2]

Schelling (1992) suggested one solution to this by arguing that the best way to reduce the impacts of global warming is development of the poor region. The developed world is not as vulnerable to climate change due to their high level of economic development. We therefore can reduce the vulnerability of poorer countries by letting them develop. The result may then be that the world is not hit as hard by climate change, while economic differences between regions are reduced. Apart from Schelling, few economists have discussed the linkages between the two equity dimensions. However, recently, Baumgärtner et al. (2012) provided a general discussion about the trade-offs between inter- and intragenerational equity in economic analysis, while Glotzbach and Baumgärtner (2012) analyze the relationship between these two aspects in ecosystem management. We are not aware of any studies of optimal climate policy that take both types of inequality aversion into account when investigating the impacts on emissions and investments in clean and dirty capital. Our paper aims to close this gap.

We set up a simple model with two regions, a rich and a poor, to explicitly account for equity preferences along the two dimensions. The intergenerational aspect is the trade-off between welfare for present and future generations due to the impacts of global warming, while the intragenerational aspect is purely a developmental issue as we compare the consumption levels of the poor and the rich. We use the Fehr and Schmidt (1999) framework to express the latter concern.

[1] The consumption discount rate used in economic analyses depends on the pure rate of time preference (utility discounting) and the elasticity of the marginal utility of consumption, which both represent equity choices. In addition, if a stock variable such as the environment enters the utility function, we get another term in the consumption discount rate that depends on the elasticity of the marginal utility of consumption with respect to the level of the stock, see, e.g., Heal (2007). Again, this variable represents an equity choice.

[2] These models often apply Negishi weights that freeze the current distribution of income. Hence, they do not consider intragenerational distribution (Stanton, 2011).