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# Benefits and costs to China of three different climate treaties

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### ABSTRACT

There are currently several ideas on the table for a climate treaty post-Kyoto. We consider the impact on China of three ideas: a cap on the CO<sub>2</sub> intensity, a cap on the CO<sub>2</sub> level, and a cap on the CO<sub>2</sub> intensity in key sectors. We find that a cap on the CO<sub>2</sub> intensity gives large environmental co-benefits to China on aggregate, but there are significant negative effects for rural households. Assuming these are addressed the country could reduce its CO<sub>2</sub> intensity by a third before costs outweigh environmental co-benefits. By contrast a cap confined to the manufacturing and power sector does not bring substantial co-benefits to China.

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## 1. Introduction

An essential issue in future climate treaties is how to bring developing countries on board. 38 countries have ratified the Kyoto Protocol and committed to greenhouse gas emission reductions. But these countries cover less than a third of global CO<sub>2</sub>-emissions (IEA, 2007) and the share is falling over

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time. Hence a future treaty must emphasize emission reductions in the rest of the world including developing countries.

Developing countries find it difficult to commit to an emission reduction since it might interfere with the much-needed development of their economies. Besides, greenhouse gas emissions in developing countries are low on a per capita basis. China, for instance, is probably the largest source of CO<sub>2</sub>-emissions in the world (MNP, 2007), but CO<sub>2</sub>-emissions per capita are only no. 73 (WRI, 2008). The moral case for prioritizing emission cuts in country no. 73 is weak.

The right of developing countries to develop on the one hand, and on the other hand the need for a future climate treaty to include as many developing countries as possible, make it important to know the impact of alternative treaty designs on developing countries. Here we discuss the costs and benefits to China of alternative treaty designs. Because of its size and position as the largest source of CO<sub>2</sub>-emissions in the world, China is an important representative of developing countries.

By illuminating the costs and benefits to China of different treaty designs we are not claiming that the country is on the verge of joining any of them. Although China is taking tentative steps to formulate an active climate policy, e.g., NDRC (2007), the policy discussion in China has a focus on sulfur reductions and energy efficiency rather than explicit CO<sub>2</sub> commitments. What we are claiming is that knowing the costs and benefits of different treaty designs is relevant background for policy discussions both in China and internationally.

In this context it may be asked what the benefits to China of joining a climate treaty really are? We focus on environmental co-benefits, in the form of local air quality improvements that improve public health and improve yields in Chinese agriculture. These are benefits that previous research has indicated to be large (e.g., World Bank, 1997, 2007; Aunan et al., 2004, 2007; Ho and Jorgenson, 2007).

Of course, China may obtain environmental benefits without the detour of a climate treaty. But air pollution policy is uneven and weak in China. Given the situation that is, the question we ask is whether interventions to reduce CO<sub>2</sub>-emissions offer the potential of killing two birds with one stone.<sup>1</sup> One could equally well have asked the opposite question of what is the co-benefit in terms of CO<sub>2</sub>-reduction of a policy to obtain air pollution benefits. In fact we are able to shed some light on that question as well in one of our sensitivity analyses, but it is not our main focus.

A possible benefit for a developing country joining a climate treaty is that of emission sales. If the country commits to emissions at the level implied by normal economic development, sometimes called business as usual, it may sell emission reductions at a world market price and gain the benefit of price minus cost. While this paper primarily has in mind the alternative situation that China commits to real reductions we are also able to demonstrate the benefit of emission trading given a commitment equal to business as usual.

We analyze three designs of a climate treaty. A comprehensive treaty in CO<sub>2</sub>/GDP intensities represents an avenue for including developing countries that has been widely discussed (e.g., Lutter, 2000; Pizer, 2005). The intensity target is sometimes called a dynamic target since it allows countries to adjust their emission reduction in response to economic growth. China of course has high growth ambitions, but at the same time it has a stated goal of reducing its energy intensity by 20% in the period 2006–2010. A dynamic treaty in intensities accommodates the principle of these twin goals.

A treaty in levels is a continuation of the Kyoto Protocol. This makes it the starting point in current negotiations. Faithfully implemented the treaty in levels has the obvious advantage that it leaves no uncertainty of how much greenhouse gases will be emitted to the atmosphere, and it is actual greenhouse gas emissions that matter for climate.

The third treaty design we analyzed is a sectoral treaty in intensities. The recent Bali Action Plan (2007) mentions “Cooperative sectoral approaches and sector-specific actions” as a way forward. A sector-based treaty has previously been articulated by, e.g., the Center for Clean Air Policy (Schmidt et al., 2006). It has similarities to a treaty based on technology standards (e.g., Barrett, 2006; Buchner and Carraro, 2005), which in practice would focus much of its attention on improving energy intensity

<sup>1</sup> Formally our analysis is one of tax reform, the tax in question being the CO<sub>2</sub> tax. Analyzing tax reform given the state of the current tax and regulatory system, in this case one where co-benefits are not harvested, is good practice in the tax reform literature, see, e.g., the authoritative survey of Drèze and Stern (1987).

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