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# Free trade and global warming: a trade theory view of the Kyoto protocol

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## Abstract

This paper demonstrates how several important results in environmental economics, true under mild conditions in closed economies, are false or need serious amendment in a world with international trade in goods. Since the results we highlight have framed much of the ongoing discussion and research on the Kyoto protocol, our viewpoint from trade theory suggests a re-examination may be in order. Specifically, we demonstrate that in an open trading world, but not in a closed economy setting: (1) unilateral emission reductions by the rich North can create self-interested emission reductions by the unconstrained poor South; (2) simple rules for allocating emission reductions across countries (such as uniform reductions) may well be efficient even if international trade in emission permits is not allowed; and (3) when international emission permit trade does occur it may make both participants in the trade worse off and increase global emissions.

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## 1. Introduction

Although the debate over global warming has been very contentious, there is widespread agreement among economists on the basic principles underlying the design of an effective treaty reducing greenhouse gas emissions. Every textbook on environmental economics points out that rigid rules such as uniform reductions in emissions will be inefficient because marginal abatement costs will vary across sources. Therefore, since carbon emissions are a uniformly mixed pollutant, standard analysis suggests that introducing free trade in emission permits will minimize global abatement costs and yield benefits to both buyers and sellers. And without universal participation in the treaty, it is expected that any agreement to reduce emissions will be undermined by the free rider problem as those countries outside the agreement increase their emissions in response to the cutbacks of others.

These principles are not controversial because they follow quite naturally from well-known theoretical results in environmental and public economics. The purpose of this paper is to demonstrate that while these results are true in a closed economy under mild conditions, they are either false or need serious amendment in a world of open trading nations. Since the results we highlight have framed much of the ongoing discussion and research on international environmental agreements in general, and on the Kyoto protocol in particular, our new viewpoint from trade theory suggests a re-examination may be in order.<sup>1</sup>

Specifically, we show that in an open trading world, *but not in a closed economy setting*: unilateral emission reductions by a set of rich Northern countries can create self-interested emission reductions by the unconstrained poor Southern countries; trade in emission permits may not be necessary for the equalization of marginal abatement costs across countries; rigid rules for emission cutbacks may well be efficient; countries holding large shares of emission permits may have virtually no market power in the permit market; and emission permit trading may make both participants to the trade worse off and increase global pollution. Every one of these results is inimical to conventional theory in this area.

We develop these results in a perfectly competitive general equilibrium trade model that allows for pollution. The model is static, productive factors are in inelastic supply, and emissions are a global public bad. In short, the model is deliberately conventional.

The model has three key features. First, we allow for a large number of countries that differ in their endowments of human capital. This is to rule out results that follow only from either the smallness of numbers, or the symmetry of the set-up. For some of the analysis we group these countries into an aggregate North (subject to emission limits and composed of both Eastern and Western countries) and an aggregate South (not subject to limits). West is the most human capital abundant and South the least.

Second, we allow for trade in both goods and emission permits across countries. Because one of the primary concerns in the developed world is the competitiveness consequence of a unilateral reduction in emissions, we need to address these concerns within a model allowing for goods trade. And finally, since environmental quality is a normal good, we allow for an interaction

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<sup>1</sup>For a summary of the Kyoto protocol and the estimated economic impacts on the U.S. see the U.S. Administration's Economic Analysis [35]. Included is a list of countries pledged to cut emissions (by an average of 5%), the likely cost to the U.S. (.1% of GDP), and the time frame for the cuts (2008–2012).

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