Trade of Permits for Greenhouse Gas Emissions: Bilateral Trade Need not be the Answer

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Abstract The Kyoto Protocol sets national quotas on GHG emissions and allows international trade of these quotas. Taking terms-of-trade effects into account, we argue that this trade is characterized by asymmetric, identity-dependent externalities, and show that bilateral trade of permits may not be sufficient for an efficient allocation of emissions. We derive conditions under which bilateral trade does improve the allocation of permits. The conditions are strong. In this sense, we argue that, for emissions permits, market design matters.

Keywords Terms-of-trade · Asymmetric externalities · Permits trade

JEL Classification D62 · F18

1 Introduction

In 1997, at the summit of the United Nations Framework Convention on Climate Change held in Kyoto, thirty-nine countries agreed to reduce their greenhouse gas (GHG) emissions over the five year period 2008–2012. The agreement prescribed binding targets for each country while allowing international trade of these quotas. Given that the effects of GHG emissions are independent of the location of these emissions, the possibility of trade has been welcomed as a key feature of the agreement which will guarantee that the Kyoto goals are attained at minimum cost.

1 Besides explicit trade of quotas or “Assigned Amount Units”, the treaty contemplates two other so called flexible instruments, Clean Development Mechanism and Joint Implementation. These project-based instruments allow countries to acquire CERs (Certified Emissions Reduction) and ERUs (Emissions Reduction Units) as an alternative to AAUs.

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Implicit in this optimism is the assumption that “market forces”, if free to act, will induce cost efficiency. If the initial allocation of quotas does not minimize the cost of attaining the global emissions target, countries will gain from trading part of their quotas. Then the initial allocation of quotas may have distributional effects, but not efficiency effects. The experience with the 1990 U.S. Acid Rain Program reinforces this view. Within this program, SO₂ emission permits were initially allocated in proportion to historical emissions (grandfathering), but permits were tradable. According to most assessments, bilateral trade was successful in improving the efficiency of the allocation of emissions.²

There is an important difference between trade in permits in a closed economy, e.g., the U.S. SO₂ experience, and permit trade in an open, international setting, e.g., GHG permit trade. As noted in a recent paper by Copeland and Taylor (2005), in the latter, trade in permits has terms-of-trade effects.³ That is, when two countries trade in emissions permits, and then change their emissions quotas, they also change their supplies of other commodities to the world market and this can affect international commodity prices.⁴

In this paper, we build on this insight and note that these effects constitute an externality that countries impose on each other when they trade in permits. Moreover, terms-of-trade effects depend on the identity of the trading countries and affect other countries differently, depending on their respective position in international commodities markets. Thus, terms-of-trade externalities associated with trade in emissions permits are asymmetric and identity dependent.⁵

There is a literature on auction and mechanism design that examines the consequences of this type of externality.⁶ One of the key lessons from this literature is that under asymmetric, identity-dependent, external effects, the willingness to pay for a good can be computed only in equilibrium.

This lesson applies directly to the model of Copeland and Taylor if we abandon their assumption that traders in the market for permits are small firms. That is what we do in this paper. We analyze a model where governments, not firms, may engage in permit trade. In our model when parties trade in permits they take into account how their trade will affect their own output and the other countries’ outputs, and thus international commodity prices. This means that the willingness to pay for permits depends on the identity of the trading partner, and cannot be defined without reference to that identity. That is, the concept of price of a permit is meaningless.

² See, for instance, Schmalensee et al. (1998), or Joscow et al. (1998).
³ In fact, policies aiming at controlling the two types of emissions are difficult to disentangle, since both originate mainly from fossil combustion. This raises an important issue about the ancillary benefits of implementing the Kyoto Protocol. These benefits, measured by the associated reduction of SO₂ emissions, can be substantial (see van Vuurena et al. 2006). Other co-benefits include health benefits and benefits to ecosystems. Besides being important, ancillary benefits will be affected by the allocation of GHG emissions permits. Part of these benefits will be internalized by trading parties, since they are mainly regional. However, a comprehensive study of the welfare consequences of GHG permit trade would have to consider these co-benefits, from which we abstract in the present paper.
⁴ One consequence is that some countries may end up worse-off after trading in permits despite efficiency gains in production. Copeland and Taylor even show cases in which both parties exchanging quotas could be made worse off by this trade. Also, based on the results on the equivalence between trade in goods and trade in factors, they conclude that, for some economies, free trade in goods will make the rule for allocating initial quotas irrelevant for efficiency.
⁵ Bagwell et al. (2007) also consider terms-of-trade externalities as asymmetric and identity dependent. However, in their paper, these externalities are associated with retaliation against a trading partner that is in violation of a WTO commitment.