

Major Themes in Economics

Volume 5

Article 7

Spring 2003

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Recommended Citation

Mellem, Adam (2003) "Flaws in the Kyoto Protocol's Pollution Permit System," *Major Themes in Economics*, 5, 67-74.

Available at: <https://scholarworks.uni.edu/mtie/vol5/iss1/7>

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Flaws in the Kyoto Protocol's Pollution Permit System

Adam Mellem

ABSTRACT. The Kyoto Protocol of 1997 attempts to address the problem of global warming by establishing national greenhouse gas emissions targets and timetables. To reduce emissions, the protocol outlines a tradeable pollution permit system. The system would allow countries with high abatement costs to purchase permits from countries with low abatement costs, equalizing global marginal abatement costs. The protocol, however, is destined to fail because of the free-rider problem and the problem of trade leakage. Given the correct guidelines, a tradeable pollution permit system would provide a market-based, cost-effective way to reduce greenhouse gas emissions.

I. Introduction

The threat of global warming, caused by carbon dioxide and other greenhouse gases, has brought together governments from around the world who seek to limit greenhouse gas emissions. Both the Rio summit of 1992 and the Kyoto Protocol of 1997 attempt to address the problem of greenhouse gas emissions.

The essence of the Kyoto Protocol is the idea of tradeable pollution permits. The Protocol, however, outlines a tradeable pollution permit system which is destined to fail because it does not require all countries to participate in the system. This encourages the free-rider problem and creates the problem of leakage. In addition, the European Union is skeptical of such a system and favors a carbon tax.

With the U.S. withdrawal from the Kyoto Protocol in 2000, the Protocol is all but dead. Yet the problem of global warming remains and must be addressed to avoid further and irreversible environmental damage. Given the correct guidelines, a tradeable pollution permit system would provide a market-based, cost-effective way to reduce greenhouse gas emissions.

II. Global Warming

Naturally occurring greenhouse gases such as carbon dioxide, methane, nitrous oxide, and about 20 other gases exist in the earth's atmosphere, trap heat and help maintain a livable climate. When fossil fuels are

burned, greenhouse gases are emitted into the atmosphere. Global warming is caused when these greenhouse gases, primarily carbon dioxide, accumulate in such quantities that extra heat is trapped in the atmosphere and the average temperature of the earth rises [See Callan, 2000]. This warming could cause severe, irreversible damage to the environment.

The cause of global warming is still widely debated among environmental scientists. Many suggest that global warming is a natural, cyclical phenomenon. The earth has experienced past warming periods which were followed by cooling periods [Callan, 2000, 382]. Others, however, argue that global warming is primarily a result of the emissions of greenhouse gasses in industrialized economies. For the purpose of this paper, I assume that global warming is directly effected by the emissions of greenhouse gasses.

Industrial development has dramatically increased carbon dioxide emissions. Even as the problem of global warming has come to light, carbon emissions have increased 2.4 percent since 1987 [Larsen, 1994, para. 5]. Richard N. Cooper, Boas Professor of International Economics at Harvard University, estimates that “energy-related carbon dioxide emissions will grow by fully 30 percent between 1990 and 2010” [1998, 67]. It is evidence and projections such as these that have drawn countries together to reduce greenhouse gas emissions.

III. The Earth Summit

The groundwork for the Kyoto Protocol was laid in 1992 in Rio de Janeiro, which hosted the U.N. Framework Convention on Climate Change, commonly known as the Earth Summit. The convention drew world wide attention. More than 6,000 delegates attended, representing over 170 countries [Callan, 2000, 15]. The convention established some of the first global provisions to address global warming. Along with many other provisions, the treaty encouraged countries to pursue economic strategies that would limit greenhouse gas emissions, to increase public awareness of global warming through education, and to participate in international research on global warming [Callan, 2000, 388].

The requisite 50 countries, including the U.S, ratified the treaty in 1993 and it became legally binding in 1994 [Callan, 2000, 389]. The treaty, however, had no provisions for implementation and no penalty for

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failure to comply. As a result, the treaty was signed quickly and with little political difficulty. Cooper states, "Rio committed signatory governments to do something about global climate change, but it did not commit them to take any specific actions" [1998, 66].

IV. The Kyoto Protocol

In December 1997, representatives from many of the world's governments met in Kyoto, Japan, to continue the process started in Rio and to establish a plan to curb global greenhouse gas emissions. The treaty drafted in Kyoto, called the Kyoto Protocol, established national emissions targets and timetables [Barrett, 1998, para. 1]. The agreement called for an average global reduction in greenhouse gas emissions by 7 percent below 1990 levels by 2008 to 2012, setting individual targets for each participating country [Rollings-Magnusson, 2000, 348].

The Protocol separates countries into two groups: Annex I countries and Annex II countries. Annex I countries are the industrial countries listed in the original Framework Convention [Barrett, 1998, para. 6]. These countries are responsible for the majority of global carbon emissions. Annex II countries are developing countries whose percentage of total carbon emissions is much less than Annex I countries. In order for the Protocol to become binding, 55 countries, responsible for 55 percent of the total carbon emissions of Annex I countries must ratify the Protocol [Barrett, 1998, para. 6]. As of March, 2003, 105 countries with 43.9 percent of the total carbon emissions had accepted the treaty, 29 of which were Annex I countries [www.unfccc.de].

Because of the U.S. decision not to ratify the treaty, the Protocol has little chance of success. The Protocol can still be ratified without the U.S., but without the world's leading polluter it seems futile [Barrett, 1998, para. 10]. Participating countries would be restricted in their emissions while the U.S. and other non-participating countries would gain the benefits of a healthier environment without the abatement costs. Of the aforementioned 105 countries who have ratified the treaty, most are Annex II countries for which the treaty does not limit total emissions [The Economist, 2003, 64]. Thus, a significant flaw in the Kyoto Protocol is the free-rider problem.

The Kyoto Protocol does not require developing countries, such as China and India, to reduce emissions. China and India argue that today's modern industrial countries have caused global warming and should

therefore be expected to endure the cost associated with emissions reductions [The Economist, 2001, para. 14]. But Annex II countries are expected to contribute significant levels of greenhouse gas emissions as their economies develop, and within a few decades, countries such as China and India are expected to be the world's largest polluters [The Economist, 2001, para. 15]. Cooper states that, "By 2010 developing countries are expected to contribute 45 percent of total greenhouse gas emissions, and China and India alone will experience greater growth in emissions than all the OECD countries combined" [1998, 68]. Since the Protocol does not require developing countries to participate, they get a free ride while other participating countries must endure economic hardship. Worse yet, the free-rider problem is detrimental to the tradeable permit system

V. The Permit System

Each carbon permit allows one metric ton of carbon emissions one time [Cramton, 1999, 258, 265]. Governments can either issue a certain number of permits, referred to as grandfathering, or auction off the permits. The total number of permits issued or auctioned would limit the total amount of emissions [Cramton, 1999, 259]. The permits could then be bought or sold in a secondary market for the pollution permits.

Since each industry has a different marginal abatement cost curve, a uniform reduction across all industries is far from cost-efficient [Hoel, 1991, 95]. Forcing each firm to reduce emissions to a uniform level may cost some industries very little, while for others it may not be feasible. The same is true on a global level. Each country has a different aggregate marginal abatement cost curve, which is the sum of the marginal abatement cost curves of all industries in the country.

Tradeable pollution permits allow countries with high abatement costs to purchase permits from countries with low abatement costs [Hoel, 1991, 95]. A global cost-effective level of carbon emissions is reached when marginal abatement costs are equalized among all countries [Hoel, 1991, 97]. As Scott Callan from Bentley College states, "The result is a cost-effective allocation of abatement responsibilities" [2000, 145].

The Kyoto Protocol does not restrict the permit market and permits could be traded internationally [Cramton, 1999, 258]. Each country could then trade permits with other countries, allowing countries with lower abatement costs to sell permits to countries with higher abatement costs.

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The permit market would also encourage technological advance or cost-cutting production methods in order to reduce emissions and sell unused permits.

Because the Kyoto Protocol does not require developing countries to participate in the permit system, the permit market would not find the optimal global price for permits. It would be marginally effective, reducing emissions among Annex I countries which could trade with each other. Countries with low abatement costs, such as Russia and Eastern Europe, would be able to trade with countries in the European Union, the U.S., and Japan, who may have higher abatement costs. The economic cost of abatement would fall fully on Annex I countries. The cost would be higher than necessary because Annex II countries would not participate. Thus, permit prices would not fall to their optimal level and would not completely equalize marginal abatement costs.

Developing countries and industrialized countries could both benefit from a genuinely global system. If all countries were required to limit emissions and participate in the tradeable permit system, less developed countries with lower abatement costs could sell their permits to other countries [Barrett, 1998, para. 59]. Scott Barrett from the London Business School states that “if developing countries had agreed to be bound by targets, then they could be able to trade with the Annex I countries and—subject to appropriate choice of their emission ceilings—be virtually sure of being better off” [1998, para. 59].

VI. Trade Leakage

Since the Kyoto Protocol does not require all countries to participate in the treaty, there is potential for a problem called trade leakage [Barrett, 1998, para. 77]. As Annex I countries participate in the Protocol and reduce emissions, demand for the fossil-fuels that cause carbon emissions will be reduced. This decrease in demand will cause fossil-fuel prices to fall. The developing countries who are not participating in the Protocol and who are not held to the same emission standards can then purchase that fuel at a lower price. Emissions from Annex II countries will then increase, and total environmental benefits will be reduced. Barrett states, “Potentially, if leakage is strong enough, the agreement would only succeed in redistributing global emissions” [1998, para. 77].

VII. Implementation

There are two ways to implement the permit system: governments can issue permits, called grandfathering, or auction them off.

Grandfathering permits allows a government to issue permits to firms on the basis of past usage, on current emissions levels, or political favor [Cramton, 1999, 259]. The method provides more political control over the distribution of permits and is preferred by the U.S. [Cramton, 1999, 259].

Cramton argues that the grandfathering of permits is an inefficient way to distribute pollution permits [1999, 259]. Auctioned permits are superior because “they provide more potential flexibility in distribution of costs, and reduce the need for politically contentious arguments over the allocation of rents” [Cramton, 1999, 260]. In addition, auctioning permits provides economic rent to the government. The government can then redistribute this wealth to tax payers [Cramton, 1999, 258].

Auctioned permits do increase the marginal abatement cost for firms that purchase permits [Callan, 2000, 149]. This can be very important. Firms facing fiscal difficulties or a tight budget may be forced to shut down. Grandfathering permits allows industries to maintain a certain level of emissions without increasing costs. Should a firm decide to emit beyond this level, the firm can then abate or purchase more permits. This does not guarantee that a firm will not face fiscal difficulty, but grandfathering can lower abatement costs. Governments could, however, use the revenues received from auctioned permits to provide grants or loans to those businesses most affected by abatement. Funds could be granted for a given period of time, allowing firms to develop new methods of production to reduce emissions.

VIII. Tradeable Pollution Permits vs. Carbon Taxes

The European community prefers to curb carbon emissions by implementing a carbon tax and is skeptical of a tradeable pollution permit system [Barrett, 1998, para. 42]. However, the tax proposed by the European Council, which has not yet been enacted, shows why the European community prefers a carbon tax. Coal, the most carbon-intensive fossil fuel, is produced at high cost in many European Union countries [Cooper, 1998, 75]. A required reduction in emissions would quickly lead abating industries to find other sources of energy with less carbon emissions. This would negatively affect European coal producers.

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A government controlled carbon tax, however, can minimize these losses. The tax proposed by the European Council gives special preference to coal, yet taxes nuclear power, the least carbon-intensive and most efficient source of electricity [Cooper, 1998, 75].

An efficient tax, free from political influence, could encourage a reduction of emissions and, in the long run, should decrease the demand for fossil fuels [Cooper, 1998, 74]. The tax could also provide governments a source of revenue [Cooper, 1998, 74]. However, a tradeable pollution permit system has two advantages over a carbon tax.

First, in a carbon tax system, the government must search for the tax which would reduce emissions by the required amount. In a permit system, the market-clearing level would be found by the market where the marginal abatement costs are equalized across all countries. Second, a permit system is much more flexible than a tax system. Permits can be introduced or removed in order to reach a desired environmental objective [Callan, 2000, 149]. A tax system belabored by bureaucracy is slow to adjust to the market. If the tax chosen does not produce the optimal level of emissions, it is much more difficult to change. With a permit system, the government need not intervene and optimality will be reached [Callan, 2000, 149].

A tax does guarantee the government some form of economic rent. However, a system of auctioned permits, as discussed above, would also provide the government economic rent without the same degree of market intervention.

In some instances, a tradeable pollution permit market can be less efficient than a carbon tax. If abatement costs for firms fall dramatically, for example because of new technology, the firms could sell their permits to older firms, allowing them to increase their total emissions. This is easily avoided, however, if the total amount of pollution permits on the market is reduced as technology improves [Harris, 2002, 343].

IX. Further Research: Banking and Futures Markets

As mentioned before, each carbon permit allows one metric ton of carbon emissions one time [Cramton, 1999, 258, 265]. The Kyoto Protocol does not require emissions targets to be met each year, but to be met within the 2008-2012 time period [Barrett, 1998, para. 39]. Therefore, the agreement allows countries to 'bank' permits for future use if they go

unused [Barrett, 1998. para. 39]. The provision helps countries in the abatement process, but as Cramton suggests, does not go far enough.

Permits can and should be auctioned not only for the current years but also for future issue years. Thus, some permits for 2012 could be auctioned in 2008 even though they cannot be used to offset carbon emissions until after 1 January 2012. Early auctions would facilitate the development of an active futures and option market, thus improving risk allocation [Cramton, 1999, 265].

For example, without a futures market for permits, an industry may not expand because of the uncertainty of acquiring permits in the future. However, a futures market would allow an industry to purchase future permits, assuring them a right to increase emissions in the future.

It is unclear if a provision allowing the sale of future pollution permits would be necessary in a successful Kyoto Protocol. A futures market would improve risk allocation, but may not be a prerequisite for a binding agreement.

X. Conclusion

Tradeable pollution permits can be a cost-effective solution to reduce greenhouse gas emissions. The Kyoto Protocol, however, fails to offer an efficient permit system because the treaty does not require full cooperation. Like a true free-rider, it is in a country's best interest to avoid abatement costs while many other countries bear the economic burden of the environmental benefits. The Kyoto Protocol makes little attempt to deter free-riders.

The treaty also fails to help industries and countries allocate risk. The sale of future permits would increase confidence in such a system and aid future economic development, despite emissions reductions.

Given provisions that require full global cooperation, a treaty such as the Kyoto Protocol could be very successful. Each country would be a competitor in the pollution permit market which would quickly establish market equilibrium. In such a market, even undeveloped countries could be competitive, selling unused permits. Such a treaty would be both successful and advantageous for all participants.

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References

- Barrett, S.** "Political Economy of the Kyoto Protocol," *Oxford Review of Economic Policy*, 1998, 14:20.
- Callan, S. and Thomas, J.** *Environmental Economics and Management: Theory, Policy, and Applications*, 2000, second edition. Orlando, FL: Dryden Press.
- Cooper, R.** "Toward a Real Global Warming Treaty," *Foreign Affairs*, 1998, 77:66-79.
- Cramton, P. and Kerr, S.** "The Distributional Effects of Carbon Regulation: Why Auctioned Carbon Permits are Attractive and Feasible," in Sterner, T., *The Market and the Environment*, 1999. Northampton, MA: Edward Elgar Publishing, Inc.
- Harris, J.** *Environmental and Natural Resource Economics: A Contemporary Approach*, 2002. Boston: Houghton Mifflin Company.
- Hoel, M.** "Efficient International Agreements for Reducing Emissions of CO₂," *The Energy Journal*, 1991, 12:93-107.
- Larsen, B. and Anwar, S.** "Global Tradeable Carbon Permits, Participation Incentives and Transfers," *Oxford Economic Papers*, 1994, 46:841.
- Rollings-Magnusson, S. and Magnusson, R.** "The Kyoto Protocol: Implications of a Flawed but Important Environmental Policy," *Canadian Public Policy – Analyse de Politiques*, 2000, 24:347-359.
- The Economist.** "Oh no, Kyoto; Is the Kyoto treaty dead?" April 7, 2001.
- The Economist.** "Why Some Environmental Agreements Work and Others Don't" April 19, 2003.
- United Nations Framework Convention on Climate Change.** 2003, <http://unfccc.int/resource/kpstats.pdf>