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Thompson, Barton H. Jr. 2000. "The Continuing Innovation of Citizen Enforcement." *University of Illinois Law Review* 2000 (1): 185–236.
UK Department of Energy and Climate Change. 2009. *Report on 2008 EU Emissions Trading System Emissions Data.* London: DECC.
US Environmental Protection Agency. 2009. "EPA Analysis of the Waxman-Markey Discussion Draft: The American Clean Energy and Security Act of 2009." http://www.epa.gov/climatechange/economics/economicanalyses.html.

Comment Severin Borenstein

Hilary Sigman does an excellent job of presenting both a compelling theoretical argument and some interesting data on the impact of enforcement and detection in tradeable pollution permit markets. The conclusion that extending the market to areas with lower detection rates could actually raise compliance rates is particularly thought-provoking. For me, it provoked thoughts about optimal combinations or separations of markets. In particular, while it might make sense to include uncovered polluters in an existing market even if it is more difficult to detect cheating among the new participants, I believe it can also make sense to establish separate markets for participants with differential detection probabilities.

Consider an exisiting emissions market in which the probability of detection, d_1, and the fine for failing to purchase sufficient permits, f_1, are such that there is perfect compliance among all emitters. For the purpose of this intuitive discussion, assume that enforcement costs are zero, and detection rates are purely exogenous. Assume that the equilibrium permit price in that market is p. Now consider a second set of emitters who, in aggregate, have exactly the same abatement cost curve as in the first market, but may have a different probability of being detected if they purchase fewer emission permits than their actual emissions, d_2, could differ from d_1. The fine for detection is the same in both markets, $f_2 = f_1 = f$. There are (at least) three possible treatments of this second set of emitters: (a) include them in the existing emissions market, (b) establish a separate emissions market for the second set of emitters, or (c) do not regulate the second set of emitters at all. With zero enforcement costs, option (b) clearly dominates option (c). The comparison of options (a) and (b) is more interesting, however.

Consider expanding the permit market to include the second market while

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simultaneously giving permits to all participants in the second market equal to their zero-price (premarket) emissions. With $d_2 = d_1$, this would be a Pareto improvement with no change in the level of emissions and a decrease in abatement costs as some of the abatement is undertaken by low-cost abaters in the second market who displace higher-cost abaters in the first market. Near the other extreme, with d_2 near zero, bringing in the second market would lead to virtually no actual abatement in either market. It would all be falsely claimed abatement by members of the second market, and p would drop to near zero. If abatement policy had been undertaken in the first market because it was welfare improving, then expanding to the second market would lower welfare.

For d_2 sufficiently close to d_1, bringing in the second market will be a welfare improvement, but for d_2 sufficiently less than d_1, it will not be. In the latter case, with the exception of $d_2 = 0$, it would still be valuable to set up a second separate market for the participants in market 2. If $d_2 > 0$, but very small, then for any pool of permits in market 2 even somewhat below the market's zero-price output, the equilibrium price of a permit in market 2 would have to be $d_2 f$, which is the expected avoided fine from owning a permit. Essentially, this is a tax of f with a very low probability of enforcement. It would cause the lowest-cost abatement in market 2 to occur, though the quantity could be measured by the regulator only through some sampling procedure because all emitters would claim they are in compliance. That quantity could displace an identical amount of abatement in market 1—which has a higher marginal abatement cost of p—and result in the same total amount of abatement at lower total cost. This would not be as efficient as combining the markets if they each had full compliance, but it would still be more efficient than ignoring market 2.

My goal in this very simplified model is to suggest that differences in detection and compliance rates can lead to optimal pooling or separating of permit markets for the same pollutant.[1] In fact, there is probably a detection rate difference, $|d_1 - d_2|$, below which markets should be merged and above which they should be treated separately. This argument is separate from and complementary to Sigman's point that incorporating abatement in the second market can lower the price for participants in the first market and, thus, increase their incentive to comply.

A complete analysis of optimal separation or integration of emissions markets would also have to include recognition that the monitoring costs will differ between markets, as Sigman does in studying optimal expansion of the market. Another practical cost of expanding the market, which a complete analysis would have to recognize, is the cost of determining property rights. While economic models often take property rights as exogenous,

1. This is somewhat analogous to the issue of hotspots, where abatement in different markets is of different expected *value.*

that is far from true in practice. With negative externalities, of course, it is nearly always the case that the activity is unpriced not because the property right has been clearly allocated to the polluter, but because it has not been clearly allocated at all. The costs of arriving at acceptable processes for determining property rights for new market participants (i.e., baselines from which abatement is measured) and of making whatever measurements are necessary to apply those processes are formidable. These have proven to be extremely difficult problems even within the developed world for easy-to-measure fossil-fuel combustion emissions. For the much-less-understood counterfactuals on which baselines are determined for new industries or more complex greenhouse gas (GHG) sinks or sources, determining property rights seems even more challenging, as I have suggested in my chapter (chapter 6) in this volume.