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Market-Based Control of Nonpoint Pollution: Discussion
Gerald E. Shively, Purdue University

The four papers presented here cover somewhat similar ground, but from different perspectives. Each paper addresses nonpoint source (NPS) pollution problems. The authors' conclusions differ, but taken as a whole, they help to advance our understanding of theoretical and practical concerns surrounding nonpoint source pollution abatement. A common theme that connects the papers is that of information – either the absence of information or an attempt to create mechanisms to fill-in for missing information. My plan is to provide some brief comments on each paper, including some ideas for extending or strengthening the analyses. To the extent possible I will attempt to raise some conceptual and empirical issues that I think are important but overlooked.

I would like to begin my comments with the paper by Ribaudo, Heimlich, and Peters. This paper represents an ambitious and admirable piece of research on the potential for point-nonpoint source trading in the context of the entire Mississippi basin. I think this paper helps to provide a context for the other papers in the session, identifying – as it does – a major environmental policy issue facing U.S. agriculture. However, given the rather wide scope of the paper and its comprehensiveness in terms of economic and biophysical modeling, the paper comes across as having somewhat of a "black box" feel to it. This is unfortunate but perhaps understandable given the space constraints for the paper. The authors offer two general conclusions. The first is that point-nonpoint trading would lead to an overall reduction in planted acreage nationwide, but an overall increase in planted acreage in the Mississippi basin. These changes in the model arise mainly due to the reallocation of land from corn, rice, and soybeans to hay and silage. The acreage changes, and concomitant price changes reported in the paper, are estimated to produce a net increase in farm income of approximately 1%. I find it somewhat surprising that environmental improvements would coincide with gains to agricultural producers, especially in light of the way in which the hypoxia debate has developed. If the findings are to be believed – and clearly more work is required to confirm the point – this finding could substantially help in building consensus around potential solutions to the hypoxia problem. The second main conclusion of the paper is that improvements in nitrogen loading in the Mississippi basin would occur at the expense of higher regional rates of soil erosion, and at the expense of higher levels of nitrogen and phosphate loading in other parts of the country. As the authors correctly observe, the overall assessment of nitrogen-reducing policies should be undertaken in the context of distributional issues. One step in this direction for the authors would be to reexamine the results generated by their model, holding constant emissions in the rest of the U.S. The concerns that I have with the paper include the following. First, the issue of delay between changes in emission and changes in water quality in the Gulf has been put aside. I realize that evidence on this issue is sparse, but some acknowledgement of time dimensions and their implications for modeling seems necessary. A second, and more minor concern, is that the presentation of the cost equations seems incomplete. Third, cost differences in point-source nitrogen reductions, which exhibit a rather large range, are not adequately discussed. What does this large range reflect, and what are its implications for trading in the model? Sensitivity analyses regarding discharge level targets, costs of point-source reductions, and trading ratios would address some of these concerns and enhance the paper considerably.

Among the four papers presented, that by Shortle and his co-authors addresses most rigorously the issue of efficiency in nonpoint/nonpoint trading rules. Their conceptual model shows that the inability to measure nonpoint emissions renders inefficient any permit trading scheme based on expected emission reductions. The implications are that a trading scheme allowing nonpoint sources to trade can increase allocative efficiency over a point-nonpoint trading scheme. The theoretical arguments are useful and persuasive. But from a practical perspective, the distinction between actual and expected emissions in the model seems somewhat artificial: monitoring expected emissions may be no easier than monitoring actual emissions. In either case, a burden is placed on the policy maker to collect or predict outcomes. If one accepts the distinction between actual and expected emissions, then accounting for the heterogeneity of producers becomes a key component of policy. I would have enjoyed seeing this point expanded in the paper. Exactly when is the distinction between actual (or average) emission and expected emission relevant? One possible source of heterogeneity among producers, for example, could be the relative contributions of each to emission concentrations at a receptor site. Raising this point would provide a bridge to models addressing spatial issues. Two other issues regarding this analysis concern me. One is that the impacts of incentives on entry and exit decisions are not fully addressed. The authors suggest that entry and exit under the second best policy will be determined differently than the way the regulator would choose. More elaboration on this point seems advisable. Two, the meaning of "risk premium" in the context of the paper is not clearly articulated nor discussed. Presumably equation (13) contains economic meaning. Brief elaboration would be helpful.

The paper by Morgan, Coggins, and Eidman underscores the critical role of information gaps in addressing NPS pollution. The context of the study is nitrate contamination of groundwater wells. Use of site-specific geo-physical characteristics seems like a useful approach to solving the two-step nitrogen application problem. Extension of permit trading to groundwater issues also seems relevant in some contexts (for example, when the time between application and contamination is short). The authors use the example of a single environmental constraint that appears in the farmer's ex ante maximization problem. A useful empirical extension of the model would be to vary the emission constraint, measuring at each step the shadow value of the constraint. In this way, one could trace out the marginal cost curve associated with meeting increasingly strict emission targets. Although this paper seems appealing in its approach, it is incomplete in several respects. My major difficulty with the paper is that the procedures for applying the model are not made clear. Alternative strategies for achieving environmental standards are described, but these are not clearly linked to an empirical farm model. Model solutions are not provided, nor are cost and profit implications for alternative approaches to meeting standards. Furthermore, although fines are discussed in the context of violations, methods of monitoring and enforcement are not discussed, nor do fines appear in the firm's objective function. An obvious extension of the presentation would be to include the probability of fine as an argument in a stochastic benefit function.

As the first three papers illustrate, the idea of implementing nitrogen-trading programs (either between point and nonpoint sources or between nonpoint sources) raises some obvious difficulties. In this context, the paper by Mitchell provides some useful insights by addressing green insurance as a potential welfare-improving alternative to producer subsidies. The results of the paper are intuitively plausible. Late spring nitrogen testing can be welfare improving, and when the impact of BMP adoption on nitrogen losses is uncertain (due to weather uncertainty and its impact on nitrogen losses) the value of yield insurance increases. However, these results are site specific. This limits the usefulness of the study by making it difficult to predict the relative merits of a "green insurance" scheme in general. On a related note, I wish the author had placed some attention on the potential administrative burden of a green insurance plan. For example, the author points out that a green insurance program provides small welfare gains to farmers with low risk aversion, or in settings where weather risk is low. In these settings, one might expect such a program to be rather unattractive to farmers, and for the overall societal gains from such a program to be outweighed, perhaps, by the cost of administering a scheme. Indeed, even when the welfare gains to farmers from such a program are large, the administrative burden might preclude use of such a plan. Although the overall presentation in the paper was adequate, I found some of the early discussions of data sources and experimental results difficult to place in context. Perhaps a reorganization of the paper that placed the specification of the general model up front would alleviate these concerns. This would also help to place the probit model in the context of the overall conceptual model.

An important point raised by Ribaudo and his co-authors, but not explored in depth in any of the papers, is the potential for efficiency gains arising from interregional trades of nitrogen abatement. The large spatial differences in prices of nitrogen credits suggested by Ribaudo, Heimlich, and Peters is an important point that warrants further attention. In some cases, the potential pool for trades would include not just point and nonpoint sources within a region, but also sources across regions. The potential for interregional trade, of course, raises additional issues related to information requirements, transaction costs for potential traders, and mechanisms to facilitate trade.