Dynamic Supply Response and Agricultural Investment: Discussion

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The papers of Chambers and Lopez, Karp and Shumway, and Weaver and Stephano are very interesting and cover a wide range of important issues associated with empirical modeling of dynamic supply response.

Karp and Shumway present a good review of the "mainstream" approach to dynamic supply modeling. Most of the models that they review are based on the assumption that decision makers are optimizers and derive supply responses from the solution to optimization problems. The difference in the derived supply relationships reflect differences in expectations or degree of uncertainty. This survey demonstrates that the dilemmas and trade-offs associated with modeling supply in static environments are carried over and significantly magnified when dynamic considerations are introduced. One important trade-off is between tractability and realism. This trade-off leads to the partition of the dynamic models into two groups: (1) *deterministic dynamic models* which assume complicated price expectation and learning considerations to obtain neat, tractable relationships and (2) *"real" dynamic models* with complex expectation structures and update and feedback rules.

It seems that the state of the art is set for mass application of deterministic dynamic supply model and, in particular, the dynamic duality approach. Much more research and development and educational effort are required for widespread empirical use of real dynamic models. But the limitations of the deterministic dynamic models, which will be discussed later, seem to make these efforts worthwhile.

The second trade-off alluded to by Karp and Shumway is between prediction and estimation of structural parameters. Mechanistic models following, say, the Box-Jenkins approach, seem to be more effective in the first task while estimation of structural parameters requires more rigorous theoretical foundation. Thus, my lesson from the Karp-Shumway paper is that the profession will do better by diversifying its effort in modeling dynamic supply response among several approaches; and the superior methodologies will be discovered as more information is accumulated.

Chambers and Lopez presented a long paper on the most popular approach to dynamic supply analysis—dynamic duality. It seems that, after duality has conquered the static arena, it proceeds to take over the dynamics; and while viewing it, I feel like a resistance fighter. Obviously, duality is an important, insightful, and useful concept; it has led to significant outcomes, but it is limited. It is very useful with specific data structures with abundant information on prices and scarcity of information on quantities; but, as Just, Zilberman, and Hochman demonstrated for static cases, duality-based relationships become inferior as data availability improves. Another drawback of the duality relationships is the strict and limited assumption that they are based upon. Even in the static case, the technological interpretations of the coefficients of duality relationships are breaking down as one introduces yield and price uncertainties, technological heterogeneity among producers, etc. Most importantly, duality is an economic concept whose interpretation and use may not be easily shared with members of other disciplines. Thus, its usefulness may be quite limited for policy purposes when interdisciplinary cooperation is needed and when policymakers desire to understand intuitively the foundation of the models whose results they use.

The dynamic duality models have the limitations of the static models and some additional flaws of their own—in particular, they assume static or very simple dynamic price expectations. Thus, one of the most important aspects of dynamic decision making, namely the guessing of the future, is ignored. More-

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over, one of the key components of the models presented by Chambers and Lopez is transaction cost. This concept, however, seems to be a reduced-form concept dressed in structural clothes. It is a "fudge factor" which does not give the full story behind it. True, models that use it are superior to models which assume perfect adjustment; but, for decision purposes, one needs to know what are the causes of rigidities rather than that they exist. Nevertheless, with all their limitations, dynamic duality may present an important stepping stone in the development of reliable and practical modeling of dynamic supply response; and Chambers and Lopez captured the essence and generalized this approach with much insight. Moreover, their explicit treatment of the impacts of the credit constraints on output supply and input demands make an important original contribution.

Weaver and Stephano argue that behavioral rules are derived from the assumption that profit maximization may be erroneous especially in a dynamic setting. Their argument is consistent with the behaviorist approach of Simon. It is also consistent with T. W. Schultz's view that, only in very static economies, resource allocations follow what is subscribed by profit maximization. When technological change is rapid, resource allocations are suboptimal; and the actual behavior deviates systematically from the subscription of profit maximization. Thus, to improve the accuracy of the empirical dynamic supply models, there must be conformity to a more realistic view of farmer's behavior. Such improved models may be derived by interdisciplinary cooperation between economists and scholars from other behavioral disciplines (such as psychology).

In summary, dynamic models of supply are still in their infancy. There are several promising avenues that they follow—each with its limitations and problems. The profession should encourage the development of most of these alternatives with the belief that, over time, the fittest will survive.

References

Chambers, Robert G., and Ramon E. Lopez, "Modeling Dynamic Supply Response in Agriculture," Paper presented at the American Agricultural Economics Association Annual Meeting, August 1984.

Just, Richard E., David Zilberman, and Eithan Hochman, "Estimation of Multicrop Production Functions," *American Journal of Agricultural Economics* 65:4 (1983):770–780.

Karp, Larry S., and Richard Shumway, "Issues and Methods in the Estimation of Adjustment Costs," Paper presented at the American Agricultural Economics Association Annual Meeting, August 1984.

Schultz, Theodore E., "The Value of the Ability to Deal with Disequilibrium," *Journal of Economic Literature* (1975):827–846.

Simon, Herbert A., *Models of Man: Social and National; Mathematical Essays on Rational Human Behavior in a Social Setting*, New York: John Wiley & Sons, Inc., 1957.

Weaver, Robert D., and Spiro Stephano, "Toward a Behavioral Approach to Modeling: Dynamic Production Choice Structures," Paper presented at the American Agricultural Economics Association Annual Meeting, August 1984.