Previous and Current Related Research

There have been numerous published works on modeling supply response in the literature (for example, Houck and Ryan; Just; Gardner; Lee and Helmberger; Chavas and Holt; Weaver; Shumway; Coyle; Ball). However, most of this research dealt with supply response in the presence of farm commodity programs. Very few addressed the difference in supply elasticities between commodity-program and free-market regimes.

One of the few published studies that compares supply response between commodity-program and free-market regimes is the study of Lee and Helmberger. A theoretical model was developed to explain a farmer's optimal acreage allocation given the option of farm program participation. Acreage supply response for the free-market subsample years (1948-49, 1951-53, 1959-60, 1974-77, and 1980) during the 1948-80 period was estimated. Because of the small sample, time-series and cross-section data (four States in the Corn Belt) were pooled and the acreage response equations were estimated by seemingly unrelated regressions. Because this study included data prior to the 1981 Act, which authorized crop-specific base acreage and acreage reduction program (ARP) provisions, its findings have little bearing on the current policy environment.

A more recent study that addressed acreage response under the 1996 Act was conducted by Adams. This study made use of normal flex acreage (NFA) data from 1991-95, because government payments played no role in planting decisions on this cropland. Lagged prices were taken as the expected prices for major field crops. The time-series data were pooled with cross-section (three to five production regions) data to estimate acreage price elasticities on flex acreage. The acreage response equations were estimated by ordinary least squares (OLS) with no theoretical constraints (linear homogeneity and symmetry—see later discussion) imposed. The acreage price elasticities for the whole farm under the 1996 Act are estimated to lie between the elasticities estimated for entire plantings to a crop in the 1991-95 period and those estimated for the crop based on farmers' use of NFA. In the Corn Belt, for example, the corn own-price acreage elasticity under the 1996 Act is estimated at 0.372 in the Adams study, which lies between the 0.173 estimated for all plantings for 1991-95 and the 0.673 estimated for NFA. The U.S. own-price acreage elasticity for the whole farm under the 1996 Act was estimated at 0.412 for corn, 0.467 for wheat, 0.364 for soybeans, and 0.634 for cotton. Each of these elasticities is greater than that estimated under previous legislation.

McDonald and Sumner recently investigated the influence of commodity programs on rice acreage response in the United States. Their study uses information about the U.S. deficiency payment program during 1986-95 and relates producer behavior under these program regimes to what may be expected from program crop producers under the new program enacted in 1996. The acreage response model developed in this study recognizes the complexity of the rice program and traces through the effects of a price change on the movement of acres between planting options and optimal acreage planted to rice within each of the planting options. A simulation model was then developed based on marginal cost curves and was used to estimate a structural supply elasticity of 1.0 under the 1996 Act. This estimate is three to four times larger than the 0.3 acreage price elasticity that was estimated under the 1991-95 rice program, according to a review of the literature.

Holt recently adapted a linear approximate acreage allocation model within a systems framework that accounts for yield and price risks. This model, based on work by Barten and Vanloot, is used to estimate acreage supply response on corn normal flex acres (NFA) for eight States in the Corn Belt for the 1991-95 period. The estimates were obtained by first imposing and testing the theoretical constraints. New crop futures prices—December corn futures and November soybean futures from the Chicago Board of Trade (CBOT)—were taken as expected prices in March when producers make planting decisions. Average futures prices during the previous September for the July CBOT contract were used for winter wheat. These futures prices were adjusted to an equivalent state-level measure by subtracting the average expected harvest-time state-level basis. The acreage allocation model assumes that a representative farmer maximizes certainty equivalent profit, subject to a total land constraint. Variations in output price and crop yield are two important sources of risk that are explicitly factored into producers' planting decisions in the modeling framework. The own-price acreage elasticity for NFA is estimated at 1.04 for corn and 1.54 for soybeans, generally higher than previous estimates reported in the literature.