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The Impact of Market Advisory Service Recommendations on Producers' Marketing Decisions

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A conceptual framework is developed which provides insight into the factors affecting the impact of market advisory service (MAS) recommendations on producer pricing decisions. Data from a survey of 656 U.S. producers reveal that the perceived performance of the MAS, the way in which MAS recommendations are delivered, as well as the match between MAS and producers' marketing philosophy, are important factors explaining the impact of MAS recommendations. Risk attitude does not affect the impact of MAS recommendations on producers' decisions, suggesting producers are more interested in the price-enhancing characteristics of MAS advice than in its risk-reducing features.

Key words: market advisory services, ordered probit model, producers' marketing decisions

Introduction

Agricultural producers in the United States continue to identify price and income risk as one of their greatest sources of risk (e.g., Patrick and Ullerich, 1996; Norvell and Lattz, 1999). Producers have a variety of price and income risk management tools at their disposal. These include numerous public and private sources of market information, futures and options contracts, an increasing number of yield and revenue insurance instruments, and a new generation of cash-indexing contracts. While producers value and utilize these tools, they place an especially high value on market advisory services (MAS) as a source of price risk management information and advice. For example, in a rating of 17 risk management information sources, Patrick and Ullerich (1996) report that MAS recommendations are outranked only by farm records. In a 1998 study of a sample of Kansas producers' perceptions of marketing strategies, Schroeder et al. found MAS is ranked as the number one source of information for developing price expectations. From a list of seven survey choices likely to be the most important information sources for Illinois producers in the future, Norvell and Lattz (1999) report that marketing

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consultants and accountants tie for first place among producers. Davis and Patrick (2000) provide evidence of the influence of MAS and consultants on producers' marketing decisions. Based on findings of their study of soybean producers, marketing consultants and information services have a significant influence on the use of forward pricing.

The pricing performance of MAS in corn, soybeans, and wheat has been examined in a series of reports from the Agricultural Market Advisory Service (AgMAS) Project (e.g., Irwin, Martines-Filho, and Good, 2002; Martines-Filho, Good, and Irwin, 2001). These evaluations assume that a representative producer follows the pricing recommendations exactly as provided by the advisory services. Yet, there is only fragmented anecdotal information about how producers actually use the marketing recommendations provided by advisory services. In order to improve performance evaluations, it is important to better understand the way producers use market advisory services. Analysis in this regard will also provide valuable evidence on the way external information affects producer decision making. The purpose of this study is to identify the nature of producers' use of advisory service recommendations and the factors that determine the impact of these recommendations on producers' marketing decisions.

Conceptual Framework

An important motivation for producers to use MAS recommendations is their expectation that such services will directly or indirectly improve the financial performance of their operations. Direct evidence of the relationship between MAS usage and improved farm financial performance is very limited (Patrick, Musser, and Eckman, 1998). However, studies investigating the relationship between the financial performance of small businesses and the use of management advisory services have found a positive relationship (Kent, 1994). Whether or not farmers actually follow MAS recommendations has not been studied. Furthermore, the literature provides no formal framework identifying the factors affecting the impact of MAS on producers' decisions. The mean-variance (EV) model and a Bayesian learning framework are helpful in developing hypotheses about these factors. The EV approach has proven valid when investigating the direction of change in relevant variables in risk contexts (Meyer and Rasche, 1992). The Bayesian learning framework can be used to develop an understanding of producers' responses to MAS recommendations (Grossman, Kihlstrom, and Mirman, 1977; Stoneman, 1981).[1]

This study develops an empirical model that examines the factors determining the impact of MAS on producers' marketing decisions. These factors are identified based on the Bayesian learning framework and EV framework, and include age, farm size, risk attitude and risk perception, producer perceptions of MAS performance, perceptions of the MAS recommendation delivery process, the match between the MAS and the producer's own marketing philosophy, the producer's market orientation, and the availability of alternative sources of marketing information.[2] The motivations for inclusion of these factors in the proposed empirical model are discussed below.

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[1] We thank an anonymous reviewer for suggesting Bayesian learning as a helpful framework in building the conceptual model.

[2] In the agricultural economics literature, education and financial leverage have been found to influence producers' adoption decisions. Unfortunately, no data were available on these two variables.

Age is included as a measure of experience of the producer (Eckman, Patrick, and Musser, 1996). It might be argued that age is positively related to the impact of MAS recommendations on producers' marketing decisions. Experienced producers can evaluate and judge the advice of MAS better than less experienced producers, and hence MAS recommendations may have greater impact. However, it might also be argued, in the Bayesian learning tradition, that producers may have imperfect information about the probability that MAS recommendations will be profitable, and producers likely base their choices on prior beliefs about these probabilities. The profitability of MAS recommendations is influenced by the costs of effectively using MAS recommendations. Younger producers have longer planning horizons and are able to spread the learning costs of using MAS over a longer period. This information will be reflected in their beliefs, especially when they are updating them. This argument would imply a negative relationship between age and the impact of MAS on producers' decisions.

Farm size is hypothesized to be positively related to the impact of MAS recommendations. The returns of a MAS recommendation are likely to be greater for producers managing larger farms, as they produce greater volumes of output, and hence any gain in market price due to the use of MAS can be realized over larger output. Furthermore, the quasi-fixed costs associated with using MAS (subscription fee and monitoring the recommendations of MAS) can be spread over greater volumes of output for producers managing larger farms.

The risk perception and risk attitude of each producer are hypothesized to influence the impact of MAS on their decisions. The EV model would predict that more risk-averse producers would be more attracted to the risk-reducing characteristics of MAS, and thus follow MAS recommendations more closely, in order to obtain the risk-reduction benefit. However, risk must be perceived before a producer can respond to it. A producer's assessment of the risk inherent in a situation may be referred to as perceived risk exposure (Pennings and Wansink, 2005). A greater perceived risk exposure is expected to cause increased use of MAS recommendations.

Producers' perceptions about MAS performance are hypothesized to influence the impact of MAS on their marketing decisions (Kent, 1994). Following the EV model, it is assumed that the mean and variance of price is sufficient to describe the performance of a MAS. Hence, the perceived MAS performance is assumed to have two dimensions: price performance and risk-reduction performance. For a given risk reduction, MAS that have shown strong performance regarding the realized crop price are expected to have a higher impact on producers' decisions than services which have demonstrated weak crop price performance. Likewise, for a given realized price, MAS that have shown strong risk reduction regarding the realized crop price are hypothesized to have a higher impact on producers' decisions than services whose risk-reduction performance has been weak.

Prior research has shown the importance of distinguishing between the result of the advice (e.g., performance of the MAS) and the satisfaction with the consultant's performance in arriving at these results (Ginzberg, 1978). As argued by Zeithaml, Parasuraman, and Berry (1990), customers do not evaluate service quality solely on its outcome, but also on the process of service delivery. The form of delivery, such as printed information, has been found to play an important role in determining producers' information preferences (Schnitkey et al., 1992). Therefore, producers' perceptions about the delivery process are hypothesized to influence the impact of MAS on their marketing decisions.

In addition to perceived performance and MAS delivery, the match between the MAS and the producer's marketing philosophy is hypothesized to influence the impact of the MAS. Marketing philosophy refers to the pricing tools a MAS recommends to producers for marketing their crops, and to the type of recommended marketing strategies involving these tools. For example, a MAS which recommends initiating futures and options positions, and at times recommends selling more of a certain crop in the futures market than the producer actually possesses, may be considered to have an "aggressive" marketing philosophy. In contrast, a MAS which advises spreading crop sales over time in the cash market has a more "conservative" marketing philosophy.

Producers also have marketing philosophies that can be described in terms of the tools they use to market crops and the complexity of their marketing strategies. For example, Sartwelle et al. (2000) distinguish cash-market-oriented marketing practices, forward-contract-oriented marketing practices, and futures/options-oriented marketing practices. It is hypothesized that the extent to which the marketing philosophies of a particular MAS and a particular producer match influences the impact of the MAS on the producer's marketing decisions. Specifically, a producer will not only evaluate the advisory service's pricing and risk-reduction performance, but will also take into account the nature of the recommendations.

Marketing orientation is another characteristic of producers hypothesized to influence the impact of MAS on producers' marketing decisions. In the marketing and organizational literature, market orientation is a key concept in understanding firm behavior. Jaworski and Kohli (1993) define market orientation as the organization-wide generation of market intelligence pertaining to current and future customer needs, dissemination of the intelligence across departments, and the organization-wide responsiveness to market intelligence. In the context of producers, market orientation reflects producers' efforts to obtain information about prices and marketing strategies. Pennings and Leuthold (2000) found a positive relationship between producers' market orientations and their willingness to adopt futures contracts. MAS recommendations are expected to have greater impact on producers' marketing decisions if producers are more market oriented in terms of gathering price information.

The availability and importance of alternative sources of marketing information are expected to influence the impact of MAS. The impact of MAS on producers' decisions might be influenced by prior beliefs about other sources of information. Producers will follow the MAS recommendation if they find it of more value, compared to their prior or other sources of information. Hence, alternative sources of marketing information are expected to influence the impact of MAS. If alternative sources of marketing information are thought of as substitutes, a negative relationship may be expected between the level of impact and alternative marketing information sources.

Research Design

The empirical evidence on producer use of MAS was generated from a survey of U.S. crop producers conducted in January/February 2000 (Pennings, Irwin, and Good, 2002).[3] The survey instrument was sent to 3,990 producers in the Midwest, Great Plains, and Southeast. The sample of addresses was drawn from directories maintained by a U.S. firm that

[3] The survey instrument is available from the authors upon request.

delivers agricultural market information and advisory services via satellite. The questionnaires were sent on January 21, 2000, and the cut-off date for returning the survey was March 10, 2000. A total of 1,399 usable questionnaires were returned, yielding a response rate of 35%, which is high compared to previous surveys among small- and medium-sized enterprises (Jobber, 1986). Background data for the entire sample revealed the survey respondents were relatively young and their farms relatively large, though not significantly different from nonrespondents regarding the crops grown. The details of survey development and execution are discussed in Pennings, Irwin, and Good (2002).

In the current study, producers were selected only if data were available on all variables in the conceptual model. Of the total data set of 1,399 producers, 656 producers met this criterion. The most restricting variable appeared to be producers' farm size, measured in terms of sales, as many producers were not willing to share this information. Selection bias was measured by examining whether the 656 producers used in the final analysis were different from the total sample of 1,399 producers on the variables included in the empirical model (except for the farm size variable). The means of the variables between the two samples were not significantly different according to paired t-tests.[4]

Descriptive Survey Results

The demographic characteristics of the respondents in the analysis suggest MAS subscribers can be classified as relatively large commercial farms. Based on statistics from the *1997 Census of Agriculture* (USDA, 1999), the scale of the farm operation of the survey respondents was about four times the national average if measured by total acreage (1,928.6 acres in this sample versus 487.0 acres national average), and about five times the national average if measured by gross annual sales ($550,275 compared to $102,970). With a median age of 44 years, the survey respondents were also somewhat younger than the overall population of U.S. producers (54 years). Regionally, the highest concentration (52%) of survey respondents was in the Midwest, followed by the Great Plains (30%), and the Southeast (18%). The principal crops grown by this group of producers were corn, soybeans, and wheat, while 56% of the producers had some livestock on their farms.

Professional Farmers of America was by far the most popular MAS, with 64% of the respondents indicating they had subscribed to this service at some point in time. Brock Associates was another popular choice (34%), followed by Doane Agricultural Services (32%). Other services mentioned in the survey were less popular; the smallest were CommStock Investment, Inc., and Harris Weather & Elliot Advisory, with 9% of the subscribers having used these services. A possible explanation for the overwhelming popularity of Professional Farmers of America may be that this advisory service is well established and has been in business for a number of years, while some other MAS may be less familiar to producers.

From the results of survey responses reported in table 1, MAS are typically used for market information and market analyses. Advisory services are used more often in an attempt to receive an above-average price than to reduce price fluctuations. Furthermore,

[4] This finding does not necessarily suggest that the relationships between these variables are the same for these two data sets.

Table 1. Survey Response Results Showing How Crop Producers Use Market Advisory Services (N = 656)

Extent of Use for:[a]	Mean[b]	Extent of Use for:[a]	Mean[b]
(a) Marketing information (facts)	7.18	(i) Forecasting prices	6.24
(b) Market analysis	7.16	(j) To reduce fluctuations in prices	6.20
(c) General market strategies	6.78	(k) Making specific pricing decisions	6.16
(d) To receive a higher than avg. price	6.70	(l) Expert opinion	6.06
(e) Keeping up with markets	6.60	(m) Government program information	5.54
(f) To reduce price risk	6.54	(n) To beat the market	5.55
(g) To reduce income risk	6.52	(o) Weather forecasts	5.16
(h) Price information	6.31		

Do you use the specific pricing recommendations that the market advisory services provide you as background information?			
YES	61.1%	NO	38.9%
Do you follow the specific pricing recommendations that the market advisory services provide you loosely?			
YES	71.0%	NO	29.0%
Do you follow the specific pricing recommendations that the market advisory services provide you closely?			
YES	11.6%	NO	88.4%
How great is the impact of market advisory recommendations on your pricing decisions?			
If you follow MAS closely	7.96[c]	If you don't follow MAS closely	5.69[c]

[a] We used paired t-tests to test whether the differences in means for each pair of a particular aspect of MAS were significant. All means of pairs within categories were significantly different except for the following: (e) keeping up with markets -and- (d) to receive a higher than average price (p = 0.158); (d) to receive a higher than average price -and- (c) general market strategies (p = 0.244); and (k) making specific pricing decisions -and- (i) forecasting prices (p = 0.250).

[b] Mean is based on a 1-to-9 scale, where 1 = never use, and 9 = use extremely often.

[c] Mean is based on a 1-to-9 scale, where 1 = no impact at all, and 9 = great impact.

it appears the recommendations of advisory services have only a moderate impact on the marketing decisions of producers. Producers indicated they generally use the recommendations of MAS as background information and follow MAS advice loosely. Only 11.6% of the producers reported following the pricing recommendation of MAS closely. Interestingly, when measuring the impact of MAS on producers' marketing decisions (the dependent variable in the conceptual model), the impact appears to be significantly higher for those producers who follow the pricing recommendation of MAS closely, than for those who don't, confirming consistency in the responses of the producers in the sample.

Table 2 describes the producers' valuations of specific aspects of MAS. These aspects are grouped into three general categories: (*a*) MAS delivery process, (*b*) methods used to arrive at recommendations, and (*c*) particular marketing tools recommended. The most valued delivery process features are frequent updates of analysis and consistency of recommendations. The most valued methods used to arrive at the recommendation are fundamental analysis, specialist opinions regarding particular crops, and technical analysis. Producers place greater value on recommendations that include futures and options than recommendations using only cash instruments. They appear to be unconcerned about whether the analysis is based on the knowledge of one person or a group, or the way the information is presented (text versus charts).

Table 2. Producers' Valuations of Specific Aspects of Marketing Advisory Services (N = 656)

Delivery Process		Method Used		Marketing Tools	
Description	Mean[a]	Description	Mean[a]	Description	Mean[a]
Daily updates of recommendations	6.52	Use of fundamental analysis	6.36	Recommendations include futures and options	5.98
Consistent recommendations	6.35	Specialist opinion regarding particular crops	6.15	Recommendations use only cash	4.94
Recommendations focused on your farm's operational circumstances	6.05	Use of technical analysis	6.03	High frequency of use of futures and options strategies[b]	4.82
The fact that the market advisory service tries to establish a relationship with you	5.83	Analysis based on group consensus	5.76	Low frequency of use of futures and options[b]	4.78
Presentation mainly with text	5.18	Analysis based on the knowledge of one person	4.32		
Presentation mainly with charts	4.98				
Market advisory service is also broker	4.04				

[a] Mean is based on a 1-to-9 scale, where 1 = do not value at all, and 9 = value extremely. We used paired t-tests to test whether the differences in means for each pair of a particular aspect of MAS were significant, with three categories: (a) delivery process, (b) method used, and (c) marketing tools. All means of pairs were significantly different.
[b] We did not quantify what is meant by a "high frequency" or "low frequency" of futures and options. Rather, we measured the producers' perceptions regarding high and low frequencies of futures and options.

The Empirical Model

Measurements

Definitions and descriptive statistics of the variables used to measure the factors that determine the impact of MAS on producer pricing decisions within the empirical model are presented in table 3. The table gives the precise survey statements presented to producers in order to develop these variables. The dependent variable *IMPACT* reflects the producers' responses to the question, "How great is the impact of market advisory recommendations on your pricing decisions?" Responses are measured on a 1-to-9 scale, where 1 = no impact, and 9 = great impact.

A discussion of the measurement of the explanatory variables in the empirical model is provided below. These variables (except for age, farm size, and the regional dummies) are categorical in nature, measured on a scale from 1 to 9. Data regarding the age (*AGE*) of producers and their farm size (*SIZE*, measured by gross annual farm sales) reflect the actual values obtained from the satellite network.

Risk attitude (*RA*) is a psychological construct that can be measured by a set of items (e.g., questions). Recently, Pennings and Garcia (2001) proposed a global risk-attitude construct combining a multi-item scale and risk-attitude measurements in an expected-utility framework. The latter are very costly to conduct on a large scale, since these measurements can only be obtained by means of experiments. Therefore, it was decided to use a multi-item scale to measure risk attitude, adapted from Pennings and Smidts (2000). Producers were asked to indicate their agreement with the following statements

Table 3. Variable Definitions and Descriptive Statistics (N = 656)

Variable	Definition	Mean	Std. Dev.
Dependent Variable:			
IMPACT	"How great is the impact of market advisory recommendations on your pricing decisions?" [1 = no impact at all, 9 = great impact]	5.95	2.038
Independent Variables:			
AGE	Approximate age of primary subscriber: 1 = less than 25 years; 4 = 35 to 39 years; 7 = 50 to 59 years 2 = 25 to 29 years; 5 = 40 to 44 years; 8 = 60 to 64 years 3 = 30 to 34 years; 6 = 45 to 49 years; 9 = 65 and older	5.04	1.605
SIZE	Approximate gross annual farm sales: 0 = not applicable; 5 = $300,000 to $399,999 1 = less than $50,000; 6 = $400,000 to $499,999 2 = $50,000 to $99,999; 7 = $500,000 to $999,999 3 = $100,000 to $199,999; 8 = over $1,000,000 4 = $200,000 to $299,999	5.76	1.664
Risk Attitude:			
RA	Low value (1) indicates relatively risk averse; high value (9) indicates relatively risk seeking	6.40	1.454
Risk Perception:			
CRINS	"During the past two years, have you purchased crop insurance?" [1 = yes, 0 otherwise]	0.90	0.305
SELLRISK	"On a scale from 1 to 9, where 1 is not at all risky and 9 is very risky, how risky do you consider selling your crops?"	5.96	1.911
Perception about MAS Performance:			
HIGHPRICE	"Is a MAS a tool to receive a higher-than-average price?" [1 = not at all, 9 = certainly]	6.91	1.808
LOWRISK	"Is a MAS a tool to reduce risk?" [1 = not at all, 9 = certainly]	6.95	1.979
Perception about MAS Delivery:			
	"On a scale from 1 (= do not value at all) to 9 (= value extremely), how much do you value the following aspects of MAS?"		
UPDATES	"Daily updates of recommendations"	6.57	2.058
CONSIST	"Consistent recommendations"	6.38	1.905
FUNDAN	"Use of fundamental analysis"	6.43	1.888
SPECIALIST	"Specialist opinion regarding particular crops"	6.19	2.029
TECHAN	"Use of technical analysis"	6.08	2.019
Marketing Philosophy Match:			
MATCH	"What is the probability (or chance) of your using a MAS if the MAS matches your market philosophy?" [1 = certainly not use, 9 = certainly use]	6.56	1.760
Market Orientation:			
MO	Extent of producer's efforts to obtain information about prices and marketing strategies [1 = low measure of *MO*, 9 = high measure of *MO*]	7.30	1.286
Alternative Sources of Marketing Information:			
	"How much do you rely on the following sources of market information?" [1 = do not rely, 9 = rely heavily]		
SATELLITE	"Satellite delivery systems (DTN)"	7.88	1.529
USDA	"USDA reports"	5.50	2.262
ELEVATOR	"Local elevator"	4.79	2.602
Regional Heterogeneity:			
MIDWEST	1 if producer is located in the Midwest, 0 otherwise	0.59	0.492
GPLAINS	1 if producer is located in the Great Plains, 0 otherwise	0.34	0.476
SEAST	1 if producer is located in the Southeast, 0 otherwise	0.07	0.250

based on a nine-point scale, where 1 = strongly disagree, and 9 = strongly agree: (*a*) "I am willing to take high financial risks in order to realize higher average yields"; (*b*) "I like taking big financial risks"; and (*c*) "I am willing to take high financial risks when selling my crops, in order to realize higher average profits." The sum of the responses to these three questions was used as a measure of risk attitude in our analysis.[5]

Two proxies for risk perception are used in this study: the producer's belief that selling crops is risky (*SELLRISK*), and the purchase of crop insurance in the last two years (*CRINS*). Producers who believe themselves exposed to considerable risk when selling crops will indicate greater risk perception. The effect of the use of crop insurance is ambiguous. On the one hand, the benefits of crop insurance may lead to the indication of lower risk exposure by producers. Alternatively, its purchase alone may reflect greater risk perception on the part of those producers. Coble, Heifner, and Zuniga (2000) observed that yield insurance products exhibit a complementary relationship with risk-reducing measures such as hedging, while revenue insurance products act as substitutes for hedging at some levels of coverage. Goodwin and Schroeder (1994) also identified a complementary relationship between crop insurance participation and forward pricing adoption.

Producer perceptions about MAS performance are represented by two variables. The first indicator reflects the perceived performance of MAS by producers in terms of price enhancement (*HIGHPRICE*). The second indicator shows the perceived performance of MAS by producers in terms of risk reduction (*LOWRISK*), reflecting the producer's belief that MAS is a tool to reduce risk.

Producer perceptions about the process of delivery of MAS marketing recommendations can be classified into two categories: the delivery process itself, and the method used to arrive at recommendations. The most valued aspects of the MAS delivery process identified by survey respondents (refer to table 2) are the daily updates of recommendations (*UPDATES*) and consistent recommendations (*CONSIST*).[6] The use of fundamental analysis (*FUNDAN*), specialist opinion regarding particular crops (*SPECIALIST*), and the use of technical analysis (*TECHAN*) were also ranked high among the methods used to arrive at recommendations. The match between producer marketing philosophy and MAS marketing style (*MATCH*) measured the producer's probability of using a particular MAS, if that MAS matches the producer's market philosophy, on a nine-point scale, where 1 = certainly not use, and 9 = certainly use.

Following Jaworski and Kohli (1993), and Pennings and Leuthold (2000), producers' efforts to obtain information about prices and marketing strategies were considered to be a central element of their market orientation (*MO*). Producers were asked to indicate their agreement with the following statements based on a nine-point scale, ranging from 1 = strongly disagree to 9 = strongly agree: (*a*) "I think it is important to understand the wishes of my customers"; (*b*) "I think it is important to know how my customers evaluate my product"; (*c*) "I adapt to changes in the market"; and (*d*) "I think it is important to

[5] Before using the sum of these questions as a measure of risk attitude, the construct reliability of the scale was investigated. The construct reliability refers to the extent to which an indicator or set of items is consistent with what it is intended to measure, and hence relates to the consistency of the measures (Hair et al., 1995). Construct reliability, which ranges from 0 = not reliable to 1 = perfectly reliable, was high, at 0.72. Therefore, the sum of responses to these questions was appropriate for use in our analysis as a measure of producers' risk attitudes.

[6] During the pre-study with 35 Midwest producers held in Nebraska and 20 farmers in Illinois, producers appeared to interpret a MAS which gives "consistent recommendations" as one which provides similar recommendations in similar situations, where situations refer to the underlying demand and supply factors of the commodity.

know a lot of the end-users." The sum of the responses to these four questions was used to measure the producer's market orientation.[7]

Alternative sources of marketing information identified by producers were satellite systems (*SATELLITE*), USDA reports (*USDA*), and local elevators (*ELEVATOR*). Producers' indications of how heavily they rely on these sources of marketing information, on a scale from 1–9, are used to measure their impact on the use of MAS recommendations.

The sample of producers included in the study is geographically diverse. Thus, unobserved factors may be relevant to the impact of MAS on producers' decision making. Regional dummies for the Midwest (*MIDWEST*),[8] Great Plains (*GPLAINS*),[9] and Southeast (*SEAST*)[10] were introduced to address potential heterogeneity associated with geographic characteristics of the sample.

Econometric Procedure

The impact of MAS is introduced in this study as a categorical variable. The discrete and ordinal nature of this dependent variable has determined the choice of econometric technique used for model estimation. The categorical nature of the dependent variable is recognized in ordered probit models. In contrast to ordered probit models, ordinary least squares (OLS) models neglect the discrete nature of the data and treat them as continuous series rather than rankings. Because the latter may cause potential heteroskedasticity in the OLS estimates, these estimates may not be efficient (Johnston, 1984). Multinomial logit and probit models, on the other hand, fail to account for the ordinal nature of the dependent variable, and are associated with undesirable properties such as the independence of irrelevant alternatives (Ben-Akiva and Lerman, 1985) or, in the case of a multinomial probit, lack of a closed-form likelihood (Greene, 1997). Thus, the ordered probit model applied here appears theoretically superior to alternative models for the data under analysis in this study. The maximum-likelihood method used for ordered probit estimation yields consistent, asymptotically efficient, and asymptotically normal estimates (Judge et al., 1988). Hence, hypothesis testing can be performed, even if the distribution of the estimates is not known for the small-sample case. In the ordered probit model, the *IMPACT* scale, running from 1 = no impact to 9 = great impact, was transformed into a 0-to-8 scale for computational reasons.

The ordered probit model builds on the conceptual model and assumes that the *IMPACT* variable is a latent variable, which can be estimated using a regression (Greene, 1997, pp. 736–738):

$$(1) \qquad y_i^* = x_i'\beta + \varepsilon_i, \quad \varepsilon_i \sim F(\varepsilon_i \mid \theta), \quad E[\varepsilon_i] = 0, \quad \mathrm{Var}[\varepsilon_i] = 1.$$

The ordered probit model generates estimates for different categories of y_i (*IMPACT*) as follows:

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[7] The construct reliability of this scale was high at 0.72 (Hair et al., 1995).

[8] *MIDWEST* includes producers from Illinois, Indiana, Iowa, Minnesota, Missouri, Nebraska, Ohio, and Wisconsin.

[9] *GPLAINS* includes producers from Colorado, Kansas, Montana, North Dakota, Oklahoma, South Dakota, and Texas.

[10] *SEAST* includes producers from Alabama, Arkansas, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, South Carolina, and Virginia.

$$(2) \qquad y_i = \begin{cases} 0 \text{ if } y_i^* \le 0, \\ 1 \text{ if } 0 < y_i^* \le \mu_1, \\ 2 \text{ if } \mu_1 < y_i^* \le \mu_2, \\ \quad \cdot \\ \quad \cdot \\ J \text{ if } \mu_{J-1} \le y_i^*, \end{cases}$$

where the μ's are the unknown threshold parameters to be estimated, along with the parameter vector β, and j is the number of categories of the dependent variable *IMPACT* ($j = 0$ to $J = 8$). Because the estimated coefficients in an ordered probit model cannot be easily interpreted (Greene, 1997, p. 737), we focus on the marginal effects when discussing the estimation results. The marginal effects for this model are calculated at the sample means of the regressors, as the effects of changes in the covariates on the probabilities for each category of the dependent variable:

$$(3) \qquad \partial \text{Prob}[\text{category } j]/\partial x_i = [f(\mu_{j-1} - x_i'\beta) - f(\mu_j - x_i'\beta)] \times \beta,$$

where $f(\cdot)$ is the appropriate density for the standard normal, $\phi(\cdot)$ logistic density, and $\Lambda(\cdot)(1 - \Lambda(\cdot))$ Weibull density. Each vector is a multiple of the coefficient vector. For all the probabilities to be positive, the following condition must be satisfied:

$$(4) \qquad 0 < \mu_1 < \mu_2 < \ldots < \mu_{J-1}.$$

The model was estimated using LIMDEP econometric software. The marginal effects can be interpreted as a change in the probability that *IMPACT* equals a given level per unit change in the independent variable, conditional on other covariates [e.g., Prob($IMPACT_i = j \mid X_i$)] (Powers and Xie, 2000).

Results

Table 4 shows that maximum-likelihood estimation of the ordered probit model provides a good fit. The overall significance of the independent variables is tested using the chi-squared distribution of the log-likelihood function. The null hypothesis of $\beta = 0$ was rejected at the 99% confidence level. The likelihood-ratio index was 0.1904, and represents the ratio of maximum likelihoods computed with and without the explanatory variable set. It is analogous to the R^2 of the conventional regression model (Greene, 1997). Estimated coefficients of threshold parameters μ_j satisfy the condition specified in equation (4). As shown in table 4, they are positive and statistically significant at the 99% confidence level, which implies no specification error in μ_j.

Another statistical property available for probit models is predictive ability, which reflects the match between the actual rankings and the ones predicted by the model. The model predicted 241 of 656 cases correctly, or 37%, which is high, considering that the dependent variable has nine categories. The coefficient estimates reported in table 4 show that most variables hypothesized to influence the impact of MAS recommendations on producers' decisions were significant at the 5% level. The exceptions were: the producer's risk attitude (*RA*), the producer's risk perception regarding selling crops

Table 4. Coefficient Estimates of the Ordered Probit Estimation of Market Advisory Services' Impact on Producer Marketing Decisions (N = 656)

Variable	Coefficient	p-Value	Variable	Coefficient	p-Value
Constant	-3.4124	0.0000	*MO*	0.0281	0.4237
AGE	0.0763	0.0041	*SATELLITE*	-0.0033	0.9088
SIZE	0.0557	0.0311	*USDA*	0.0381	0.0607
RA	-0.0063	0.8362	*ELEVATOR*	-0.0522	0.0021
CRINS	0.3899	0.0044	*GPLAINS*	-0.1531	0.0923
SELLRISK	0.0049	0.8288	*SEAST*	-0.1652	0.3377
HIGHPRICE	0.3005	0.0000	**Thresholds:**		
LOWRISK	0.0592	0.0833	μ_1	0.3921	0.0000
UPDATES	0.1030	0.0002	μ_2	0.9097	0.0000
CONSIST	0.0235	0.4115	μ_3	1.2570	0.0000
FUNDAN	0.1350	0.0003	μ_4	1.9191	0.0000
SPECIALIST	-0.0693	0.0107	μ_5	2.6632	0.0000
TECHAN	0.0460	0.1311	μ_6	3.7710	0.0000
MATCH	0.1183	0.0001	μ_7	4.5808	0.0000

Log-Likelihood Function = -1,053.486 Likelihood-Ratio Index = 0.1904
χ^2 = 495.501 (p = 0.0000) Predictive Validity = 0.3628

(*SELLRISK*), the producer's perception about MAS as a tool to reduce risk (*LOWRISK*), MAS use of technical analysis (*TECHAN*), MAS consistency of recommendations (*CONSIST*), the producer's market orientation (*MO*), and the producer's reliance on satellite delivery systems for market information (*SATELLITE*).[11]

The fact that risk attitude does not appear to influence the impact of MAS recommendations is consistent with the descriptive finding that MAS recommendations are more often used by producers to receive an above-average price than to reduce price fluctuations. As summarized in Pennings and Garcia (2001), various researchers have found no relationship between producers' risk attitudes and use of risk management instruments, or found counterintuitive results (Goodwin and Schroeder, 1994). Furthermore, this finding may also be explained by latent heterogeneity, which in this case refers to the heterogeneity in the influence of risk attitude on behavior (Pennings and Garcia, 2004). The performance variable representing perceived risk-reducing characteristics of MAS (*LOWRISK*) was not significantly related to the impact of MAS recommendations, confirming the results of previous studies suggesting producers use risk management tools to increase income, rather than to reduce risk (Tomek and Peterson, 2001).

Because the magnitude of the estimated coefficients in an ordered probit model itself provides limited information about the marginal effects of the independent variables on the probability of *IMPACT* equaling intermediate values, we discuss below the variables that had a significant coefficient, in terms of their marginal effects. Marginal effects of the independent variables are presented in table 5.

[11] The Pearson correlation matrix between explanatory variables revealed low correlations. Only two pairs of variables, *FUNDAN* vs. *TECHAN* and *HIGHPRICE* vs. *LOWRISK*, showed a significant positive correlation: 0.74 (p = 0.000) and 0.79 (p = 0.000), respectively, which may introduce potential multicollinearity problems. Analyzing the empirical model with and without one of these variables produced very similar results. Therefore, both variables were retained in the final estimation, for their theoretical value.

Table 5. Marginal Effects of the Ordered Probit Estimation of Market Advisory Services' Impact on Producer Marketing Decisions (N = 656)

Explanatory Variable	*IMPACT* [0 = no impact, 8 = great impact]								
	0	1	2	3	4	5	6	7	8
AGE	-0.0013	-0.0019	-0.0052	-0.0054	-0.0117**	-0.0046	0.0163**	0.0102**	0.0036
SIZE	-0.0009	-0.0014	-0.0038	-0.0040	-0.0085**	-0.0033	0.0119*	0.0075*	0.0026
RA	0.0001	0.0002	0.0004	0.0004	0.0010	0.0004	-0.0013**	-0.0008	-0.0003
CRINS	-0.0099	-0.0130	-0.0318	-0.0300	-0.0555	-0.0072	0.0897	0.0442**	0.0135**
SELLRISK	-0.0001	-0.0001	-0.0003	-0.0003	-0.0007	-0.0003	0.0010	0.0006**	0.0002
HIGHPRICE	-0.0051	-0.0075	-0.0205	-0.0213	-0.0460**	-0.0180	0.0642**	0.0402**	0.0141
LOWRISK	-0.0010	-0.0015	-0.0040	-0.0042	-0.0091*	-0.0036	0.0126	0.0079	0.0028
UPDATES	-0.0017	-0.0026	-0.0070	-0.0073	-0.0158**	-0.0062	0.0220**	0.0138**	0.0048
CONSIST	-0.0040	-0.0060	-0.0016	-0.0017	-0.0036	-0.0014	0.0050	0.0031	0.0011
FUNDAN	-0.0023	-0.0034**	-0.0092	-0.0096	-0.0096**	-0.0207	-0.0081**	0.0288**	0.0181
SPECIALIST	0.0012	0.0017*	0.0047	0.0049	0.0106**	0.0042	-0.0148**	-0.0093*	-0.0033
TECHAN	-0.0080	-0.0012	-0.0031	-0.0033	-0.0070	-0.0028	0.0098	0.0062	0.0022
MATCH	-0.0020	-0.0030**	-0.0081	-0.0084	-0.0181**	-0.0071	0.0253**	0.0158**	0.0056
MO	-0.0005	-0.0007	-0.0019	-0.0020	-0.0043	-0.0017	0.0060	0.0038	0.0013
SATELLITE	0.0001	0.0001	0.0002	0.0020	0.0005	0.0002	-0.0007	-0.0004	-0.0002
USDA	-0.0006	-0.0010*	-0.0026	-0.0027	-0.0058*	-0.0023	0.0081*	0.0051	0.0018
ELEVATOR	0.0009	0.0013**	0.0036	0.0037	0.0080**	0.0031	-0.0112**	-0.0070**	-0.0025
GPLAINS	0.0028	0.0040**	0.0108**	0.0110	0.0233	0.0082	-0.0332	-0.0200	-0.0069
SEAST	0.0034	0.0047**	0.0123**	0.0123	0.0248	0.0068	-0.0370	-0.0205	-0.0067

Notes: Single and double asterisks (*) denote statistical significance at the 10% and 5% levels, respectively. Marginal effects were evaluated at the means of the regressors.

The marginal effects in table 5 show how an increase of one unit of the independent variable changes the probability that *IMPACT* will have a certain value. For example, the marginal effect of *HIGHPRICE* at *IMPACT* value 7 is 0.0402, which means that if *HIGHPRICE* increases by one unit, the probability of *IMPACT* being equal to 7 will change with about 4%. The signs of the marginal effects are potentially ambiguous, except for *IMPACT* $j = 0$ and $J = 8$, which are unambiguous and opposite each other (e.g., Greene, 1997; Powers and Xie, 2000). Recognizing this possible constraint when discussing the results, we focus our discussion on the pattern of the signs of the marginal effects over the *IMPACT* categories.

The marginal effects show that an increase in age (*AGE*) increases the probability of higher *IMPACT* values (and, conversely, decreases the probability of lower *IMPACT* values). This finding confirms the hypothesis that more experienced producers can value and judge the advice of MAS better than less experienced producers.

The marginal effects of farm size (*SIZE*) suggest a positive relationship with the probability of a higher *IMPACT* value, confirming that the returns of MAS recommendations are likely to be greater for producers managing larger farms, due to economies of scale.

The marginal effects of the use of crop insurance (*CRINS*) show a positive relationship between *CRINS* and the probability of *IMPACT* taking on higher values, indicating producers who have purchased some type of crop insurance in the past two years are likely to follow MAS advice more closely than others.

Estimation results pertaining to producer perceptions about MAS performance reveal the price-enhancing dimension (*HIGHPRICE*) has a positive effect on producers' use of MAS in their marketing decisions. The low influence of producer perceptions of MAS as

a tool to reduce risk (*LOWRISK*) compared to *HIGHPRICE* is revealing, given that the mean responses to these measures were the same, indicating the former is irrelevant.

Producer perceptions about MAS delivery are relevant factors in determining MAS impact on producer marketing decisions. The marginal effects of daily updates of recommendations (*UPDATES*) are significant and positively related to the probability of a higher level of *IMPACT*. Similarly, the marginal effects show that the use of fundamental analysis (*FUNDAN*) is positively related to the probability of *IMPACT* taking on a higher value. The use of specialist opinion (*SPECIALIST*) has a negative effect on the probability of higher levels of *IMPACT*. This finding suggests that, even though producers like to see an expert opinion about specific situations in the MAS report, they tend not to trust this opinion. More general and timely information on the market situation appears to be the most important factor of MAS delivery.

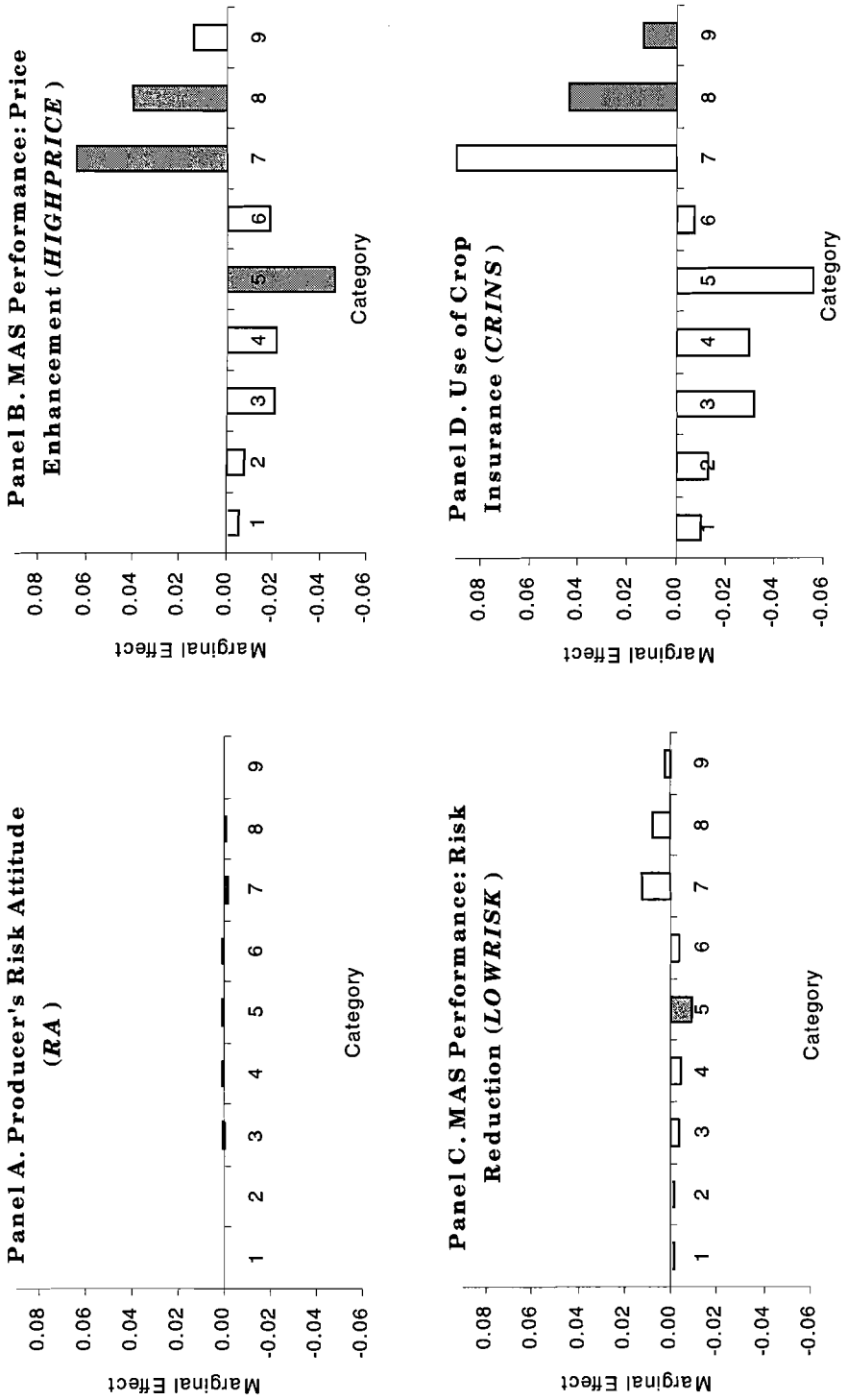
An important determinant of the impact of MAS on producer marketing decisions is the match between the MAS and the producer's marketing philosophy (*MATCH*). Based on the marginal effects, an increase in *MATCH* will increase the probability of a greater *IMPACT* value. This finding confirms that the nature of MAS recommendations (conservative versus aggressive) must match the producer's own marketing philosophy in order to have impact.

Although alternative sources of marketing information were hypothesized to be substitutes for MAS advice, this is not always the case. Despite the importance to producers of information received via satellite (*SATELLITE*), it does not appear to have a significant effect on the use of MAS advice. This is an important finding, because the independence of MAS impact from satellite use implies the sample of satellite users is not biased for the purposes of MAS impact investigation. USDA reports (*USDA*) exhibit a complementary relationship with MAS advice. USDA reports had a positive effect on the probability of higher levels of *IMPACT*, suggesting producers who rely on USDA reports will also be more likely to rely on MAS advice. The only true substitute for MAS advice found in this study is the local elevator (*ELEVATOR*), for which the marginal effects show a negative effect on the probability of *IMPACT* to take on a higher value.

The hypothesis of regional heterogeneity is supported by the empirical results. The reference point of the model is the Midwest. The marginal effects suggest that producers in the Great Plains (*GPLAINS*) use MAS recommendations less than producers in the Midwest. Similar results are found for the Southeast (*SEAST*). This finding could be explained by the Midwest's higher concentration of corn and soybeans—two commodities which have received considerable attention from MAS.

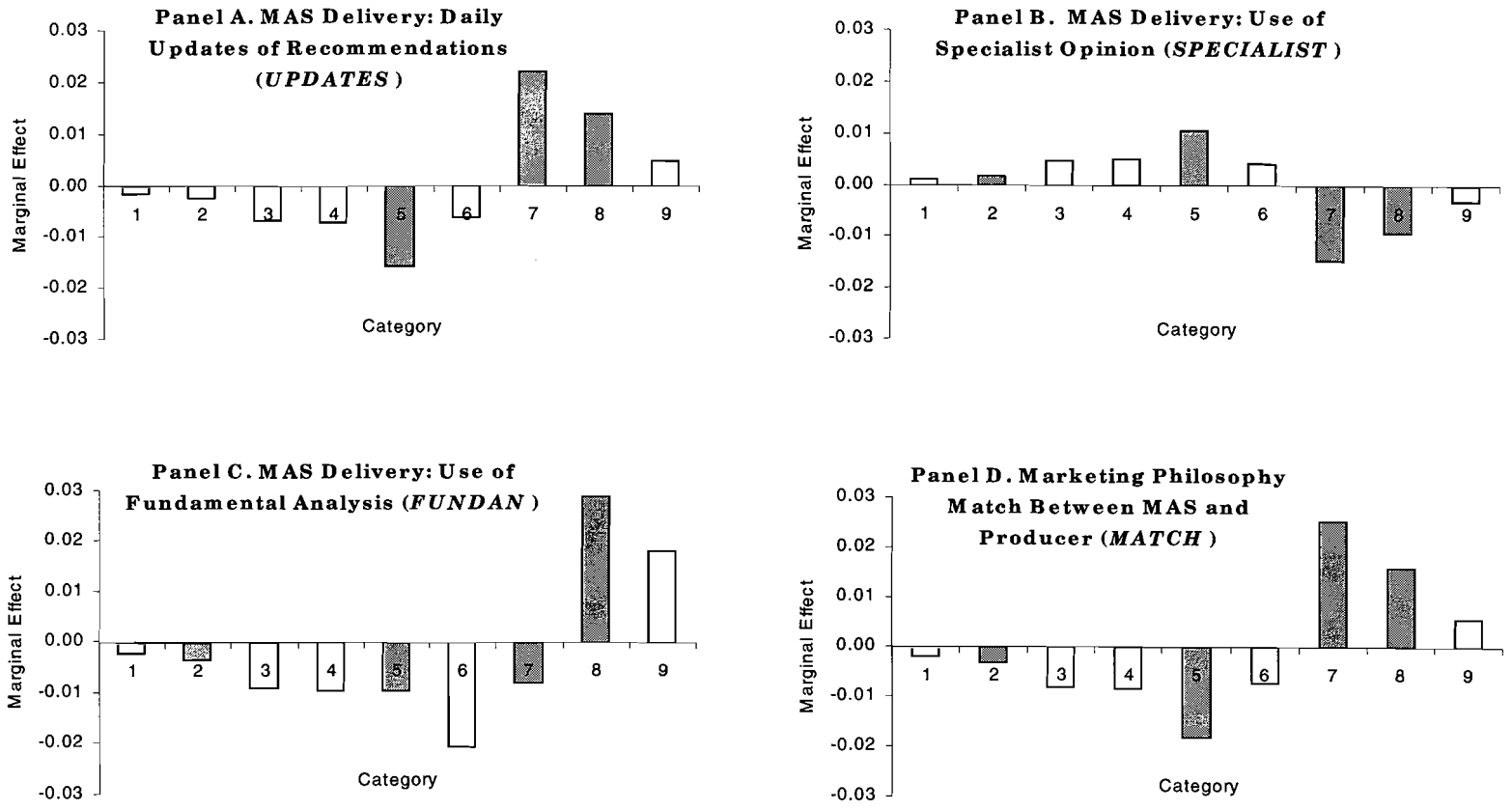
Figures 1 and 2 show the marginal effects for some selected variables. These figures present the magnitudes of several marginal effects on the same scale with statistically significant effects highlighted in shaded bars. Figure 1 compares several marginal effects associated with the profit-enhancing versus risk-reducing properties of MAS. From the four panels of this figure, the price-enhancing characteristics of MAS are clearly observed to have the largest effect. The effects of the risk-reducing characteristics of MAS are generally very low, with only the use of crop insurance demonstrating some comparable levels.

Figure 2 portrays selected marginal effects relating to MAS delivery. Daily updates of recommendations, the use of specialist opinion, the use of fundamental analysis, and the match between MAS and producer marketing philosophies all have comparable magnitudes.



Note: Highlighted bars are the marginal effects significant at $p < 0.05$.

Figure 1. Marginal effects of variables that influence the impact of MAS on producers' marketing decisions



Note: Highlighted bars are the marginal effects significant at $p < 0.05$.

Figure 2. Marginal effects of variables describing methods of MAS recommendation delivery that influence the impact of MAS on producers' marketing decisions

Discussion and Conclusions

Numerous surveys have shown that producers place high value on market advisory services (MAS) as a source of price-risk management information and advice. While the pricing performance of MAS has been examined recently, there is no evidence about the impact of MAS recommendations on producers' marketing decisions. A conceptual framework was developed in this study which provides insight into the factors affecting the impact of these recommendations on producer pricing decisions. To test the conceptual framework, a sample of 656 U.S. producers from a large-scale survey was used. The impact of MAS on producers' marketing decisions and the extent to which producers implement specific recommendations were estimated using an ordered probit model.

The survey conducted as part of this study revealed that producers are more interested in the price-enhancing characteristics of MAS advice than in its risk-reducing features (also see panels B and C in figure 1). This finding is in accord with the observation by Tomek and Peterson (2001) that farmers hedge as a way to increase income, rather than as a way to shift risk, and with the findings of Just, Calvin, and Quiggin (1999) that farmers participate in insurance programs to receive subsidies, rather than avert risk. The survey results contribute to the ongoing debate in the agricultural economics literature concerning the relevance of risk-management education and research. Numerous arguments have been made suggesting risk reduction is not of particular interest to producers (e.g., Anderson and Mapp, 1996). Our findings suggest a possible explanation for the popularity of MAS as a marketing information source, and imply that in order to be of interest to producers, advisory/education programs should include information on marketing conditions which would aid in forming price expectations.

From the findings of this study, not only is MAS performance an important variable in explaining the impact of MAS recommendations, but also of importance is the way in which these recommendations are delivered—confirming previous findings in the management science literature establishing that customers of advisory services distinguish between the result of the advice (e.g., performance of the MAS) and the way it has been delivered.

Furthermore, to have an impact, the results show the MAS must match the producer's market philosophy. MAS recommendations exhibiting an "aggressive" marketing philosophy will have little impact on producers who describe their own marketing philosophy as "conservative." To gain more insight into producers' choices regarding MAS, the marketing philosophies of both producers and advisory services require definition and accurate measurement. This investigation has not disentangled the market-philosophy concept. Doing so might reveal a powerful concept, able to explain producers' choices of a particular MAS. Since the "match of marketing philosophies" is such an important factor in producers' usage, research into the risk-return profiles of the different services and their relation to producers' choices for a particular service might be valuable. Such a research design could test the hypothesis that a producer's choice for a particular advisory service is driven by the match between the risk-return profile of that particular service and the producer's own risk-return profile.

The impact of MAS recommendations is not equal across producers. The analysis reveals MAS recommendations have a greater impact on producer decisions in the Midwest than in the Great Plains, suggesting there may be some factors associated with MAS use that are determined by the geographic location of producers. Some of these

factors may be related to the crops grown in these particular regions and MAS emphasis on the crops produced in these regions.

Some caveats of this study should be noted. First, the important concepts of risk attitude and risk perception have been measured in a scaling framework. Although the scales have good psychometric properties, these risk attitude measures do not include safety-first or downside risk. Further research which broadens the definition of risk attitude in an empirical context would be valuable for a better understanding of producers' behavior. Recently, Pennings and Smidts (2003) demonstrated that structural organizational behavior (e.g., the production system employed by hog farmers) is linked to the global shape of the utility function rather than its local shape (e.g., risk-aversion coefficient). The impact of MAS may be seen as more structural behavior, which would explain why risk attitude is not significantly related to the impact of MAS on producers' decisions. Because no data are available on the shape of producers' utility functions, we cannot test the hypothesis that the global shape of the utility function is related to the impact of MAS. Further research in this area is needed.

Second, in this study, the dependent variable and independent variables are based on producers' opinions and attitudes about MAS as an economic phenomenon in agriculture. Clearly producers' opinions and attitudes regarding MAS are shaped by their experiences with the particular market advisory service(s) they use. Future research should consider examining producers' attitudes associated with a particular marketing advisory service.

Third, this analysis examined the impact of MAS recommendations on producers' decisions. The type of recommendation was not specified. It might be argued that the influence of the factors (e.g., risk attitude) in the conceptual model could be different for different recommendations. For example, the analysis shows that risk attitude does not drive the impact of MAS on producers' decisions. However, risk attitude might be expected to come into play when investigating a specific recommendation, like selling futures. Assessing the influence of the factors identified in the conceptual model on producers' implementation strategies of particular MAS recommendations seems to be an interesting avenue to explore in the near future.

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