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

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To date, there is only fragmented and anecdotal information about the impact of the recommendations of market advisory services (MAS) on producers' decision-making. A conceptual framework is developed in which, among others, producers' risk attitudes and risk perceptions; producers' perceptions about MAS performance and delivery; and match between the MAS and the producer's marketing philosophy are hypothesized to influence the impact of MAS on producers' marketing decisions. Data from 656 U.S. producers were used and the impact of MAS on producers' marketing decisions was tested using an ordered probit model. The empirical results reveal that not only the perceived MAS performance, but also the way in which MAS recommendations are delivered, and the match between MAS and producer's marketing philosophy are important factors explaining the impact of MAS recommendations.

Introduction

Agricultural producers in the United States continue to identify price and income risk as one of their greatest sources of risk (Patrick and Ullerich; Norvell and Lattz). 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 use these tools, they place an even higher value on market advisory services (MAS) as a source of price risk management information and advice. For example, in a rating of seventeen risk management information sources, Patrick and Ullerich report that MAS are outranked only by farm records. Schroeder et al. find that a sample of Kansas producers ranks MAS as the number one source of information for developing price expectations. Norvell and Lattz find that marketing consultants tie for first with accountants, in a list of seven, as likely to be most important to Illinois producers in the future. Davis and Patrick provide evidence of the influence of MAS and consultants on producers marketing decisions. They find that 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; Martines-Filho, Good, and Irwin). These evaluations assume that a representative producer follows the pricing recommendations exactly as provided by the advisory services. There is only fragmented anecdotal information about how producers actually use the marketing recommendations provided by advisory services. It is important to better understand the way producers use market advisory services in order to improve performance evaluations. 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 determine the nature of producers' use of advisory service recommendations and the factors that determine the impact of these recommendations on producer pricing 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). However, studies that investigate the relationship between the financial performance of small businesses and the use of management advisory services have found a positive relationship (Kent). 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 the Bayesian learning framework may be 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 (cf. Meyer and Rasche). The Bayesian learning framework can help understand producers' responses to MAS recommendations (cf. Grossman, Kihlstrom and Mirman; Jensen; Stoneman).[1]

This study develops an empirical model that examines the factors that determine the impact of MAS on producers' marketing decisions. These factors are identified based on the Bayesian learning framework and include age, farm size, risk attitude and risk perception, producer's perception of MAS performance, perception of the MAS recommendation delivery process, the match between the MAS and the producer's own marketing philosophy, 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 in this section.

Age is included as a measure of experience of the producer (Eckman, Patrick, and Musser). One might argue that age is positively related to the impact of MAS recommendations on producers' marketing decisions. Experienced producers can value and judge the advice of MAS better than less experienced producers, and hence MAS recommendations may have greater impact. However, one might also argue, in the Bayesian learning tradition, that producers may have imperfect information about the probability that the MAS recommendations will be profitable and that they 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 would imply that age has a negative relationship with 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 larger volumes of output, and hence any gain in market price due to the use of MAS can be realized over larger output.

The producer's *risk perception and risk attitude* are hypothesized to influence the impact of MAS on producers' 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. A greater perceived risk exposure is expected to cause increased use of MAS recommendations.

Producer's perception about MAS performance is hypothesized to influence the impact of MAS on his/her marketing decisions (Kent). Following the EV model, it is assumed that the mean and variance of price is sufficient to describe the performance of a MAS. Hence, it is assumed that the perceived MAS performance has two dimensions: price performance and risk-reduction performance. For a given risk reduction, it is hypothesized that MAS that have shown strong performance regarding the realized crop price have a higher impact on producers decisions than services that have shown weak crop price performance. Likewise, for a given realized price, it is hypothesized that MAS that have shown strong risk reduction regarding the realized crop price have a higher impact on producers' decisions than services that have shown weak risk-reduction performance.

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). Zeithaml, Parasuraman, and Berry argue that customers do not evaluate service quality solely on the outcome of a service, but also on the process of service delivery. Schnitkey et al. demonstrate that the form of delivery, such as printed information, plays an important role in determining producers' information preferences. Therefore, it is hypothesized that *producers' perceptions about the delivery process* influence the impact of MAS on producers' 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 that 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. A MAS that advises to sell crops proportionally 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. 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 producer match influences the impact of MAS on that producer's marketing decisions. That is, 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 that is hypothesized to influence the impact of MAS on producers' marketing decisions. In the marketing and organizational literature, market orientation is a key concept to understand firm behavior. Jaworski and Kohli 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 organizationwide 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 found a positive relationship between producers' market orientation and their willingness to adopt futures contracts. MAS are expected to have greater

impact on producers' marketing decisions, if producers are more market oriented in terms of gathering price information.

It is expected that the availability and importance of *alternative sources of marketing information* influences 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 (s)he finds it of more value compared to his/her priors or other sources of information. Hence, alternative sources of marketing information are expected to influence the impact of MAS. If one thinks of alternative sources of marketing information as substitutes, one may expect a negative relationship between the level of impact and alternative marketing information sources.

Data

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).[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 kept by a U.S. firm that delivers agricultural market information and advisory services via satellite. The questionnaires were sent on January 21, 2000 and the cut-off date for returning questionnaires 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). Background data for the entire sample, indicated the survey respondents were relatively young and their farms relatively large, yet not significantly different from non-respondents regarding the crops grown. The details of survey development and execution are discussed in Pennings, Irwin, and Good. In this paper,

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 analyses 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.

The demographic characteristics of the respondents in the analysis suggest that MAS subscribers can be classified as relatively large commercial farms. The scale of the farm operation of the survey respondents was about four times the national average (1997 Census of Agriculture), if measured by total acreage (1928.6 acres in this sample vs. 487.0 acres national average), and about five times the national average, when measured by gross annual sales ($550,275 vs. $102,970). The survey respondents were also somewhat younger than the overall population of U.S. producers: 44 versus 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 and 56% of the producers had some livestock on their farms.

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 1. This table lists the exact statements that producers were confronted with in order to develop these variables. The dependent variable IMPACT reflects the producers' responses to a question: "How great is the impact of market advisory recommendations on your pricing decisions?" These responses are measured on a one to nine scale, 1= no impact and 9= great impact. Below we discuss the measurement of the explanatory variables in the empirical model. These variables, expect for age, farm size and the regional dummies, are categorical in nature, measured on a scale from 1 to 9. Data regarding the *age* of producers and their *farm size* (measured by gross annual farm sales) reflect the actual values that were obtained from the satellite network.

Risk attitude is a psychological construct that can be measured by a set of items (e.g. questions). Recently, Pennings and Garcia proposed a global risk attitude construct that combines 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 that was adapted from Pennings and Smidts (2000). Producers were asked to indicate their agreement with the following statements through a nine-point scale ranging from "strongly disagree" (1) to "strongly agree" (9): 1) I am willing to take high financial risks in order to realize higher average yields; 2) I like taking big financial risks; 3) 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 questions was used as a measure of risk attitude in our analysis.[4]

Two proxies for *risk perception* are used in this study: the producer's belief that selling crops is risky (SELLRISK) and 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 the 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 observe that yield insurance products exhibit a complementary relationship with risk reducing measures such as hedging, while revenue insurance products act as substitutes to hedging at some levels of coverage. Goodwin and Schroeder also detect a complementary relationship between crop insurance participation and forward pricing adoption.

Two variables represent *producer perceptions about MAS performance.* 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 in 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 are the daily updates of recommendations (UPDATES) and consistent recommendations (CONSIST).[5] 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 MAS, if MAS matches the producer's market philosophy on a 1 (= certainly not use) to 9 (= certainly use) point scale.

Following Jaworski and Kohli, and Pennings and Leuthold, producers' efforts to obtain information about prices and marketing strategies was considered to be a central element of their *market orientation (MO)*. Producers were asked to indicate their agreement with the following statements through a nine-point scale ranging from "strongly disagree" (1) to "strongly agree" (9): 1) I think it is important to understand the wishes of my customers; 2) I think it is important to know how my customers evaluate my product; 3) I adapt to changes in the market; 4) I think it is important to know a lot of the end-users. The sum of the responses to these questions was used to measure producer's market orientation in this study.[6]

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)[7], Great Plains (GPLAINS)[8], and Southeast (SEAST)[9] 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 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, OLS models neglect the discrete nature of the data

and treat them as continuous series rather than rankings. Because the latter may cause potential heteroscedasticity in the OLS estimates, these estimates may not be efficient (Johnston). 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), or in the case of a multinomial probit, lack of a closed-form likelihood (Greene). Thus, the ordered probit model applied here appears theoretically superior to alternative models for the data analyzed in this study. The maximum likelihood method used for ordered probit estimation yields consistent, asymptotically efficient, and asymptotically normal estimates (Judge et al.). Hence hypothesis testing can be performed, even if the distribution of the estimates is not known for the small sample case.

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, pp. 736-738),

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

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

$$(2) \qquad \begin{aligned} y_i &= 0 \text{ if } y_i^* \le 0, \\ &= 1 \text{ if } 0 < y_i^* \le \mu_1, \\ &= 2 \text{ if } \mu_1 < y_i^* \le \mu_2, \\ &\ \ . \\ &\ \ . \\ &= \mathrm{J} \text{ if } \mu_{j-1} \le y_i^* \end{aligned}$$

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 our dependent variable IMPACT, $j = 1$ to $J = 9$. Because the estimated coefficients in an ordered probit model cannot be easily interpreted (Green, 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) $$\partial \text{Prob}[\text{category } j]/\partial \text{x}_i = [f(\mu_{j-1} - \text{x}_i'\beta) - f(\mu_j - \text{x}_i'\beta)] \times \beta,$$

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

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

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). Note that the marginal effects change from

$$\partial \text{Prob}[\text{category } j]/\partial \text{x}_i = -f(\mu_j - \text{x}_i'\beta) \times \beta, \text{ for j} = 1$$

to $$\partial \text{Prob}[\text{category } j]/\partial \text{x}_i = f(\mu_{j-1} - \text{x}_i'\beta)\beta, \text{ for j} = \text{J}$$

Hence, the signs of the extreme values of IMPACT are unambiguous and opposite to each other. The sign of the marginal effects for the intermediate categories will depend on the densities for j and j-1 (j=2, …, J-1) and cannot be determined from the estimates alone. Therefore we concentrate on the signs of the marginal probabilities of the extreme values of IMPACT for interpretation of estimation results.

Results

Table 2 shows that the results of the maximum likelihood estimation indicate a good fit. The overall significance of the independent variables is tested using a chi-squared distribution of the log-likelihood function. The null hypothesis of β=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, and is analogous to the R^2 of the conventional regression model (Greene). Estimated coefficients of threshold parameters μ_j satisfy the condition that $0 < \mu_1 < \mu_2 < ... < \mu_{J-1}$ as shown in Table 2: 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 correctly 241 cases out of 656, or 37%, which is a high considering the dependent variable has nine categories. Table 4 shows that all variables that have been hypothesized to influence the impact of MAS recommendations on producers' decisions were significant at the 5% level except for producers' risk attitude (RA), producer's risk perception regarding selling crops (SELLRISK), producer's perception about MAS as a tool to reduce risk (LOWRISK), MAS use of technical analysis (TECHAN), MAS consistency of recommendations (CONSIST), producer's market orientation (MO) and the producer's reliance on satellite delivery systems for market information (SATELLITE). [10]

The fact that risk attitude does not seem to influence the impact of MAS recommendations is consistent with the descriptive finding that MAS are more often used to receive an above average price than to reduce price fluctuations. As summarized in Pennings and Garcia, various researchers have found no relationship between producers' risk attitudes and use of risk management instruments, or found counterintuitive results (Goodwin and Schroeder). The fact that the risk-reducing characteristics of MAS (LOWRISK) was not significantly related to the impact of MAS recommendations confirm the results of previous studies suggesting that

producers use risk management tools to increase income, rather than to reduce risk (Tomek and Peterson).

Because the signs of the estimated coefficients in an ordered probit model themselves provide limited information about the marginal effects of the independent variables on the probability of IMPACT equaling intermediate variables, we will discuss the variables that had a significant coefficient, in terms of their marginal effects on the probability of IMPACT to equal a certain level. Marginal effects of the independent variables are presented in Table 3.

The marginal effects show that an increase in age (AGE) will increase the probability of a greater IMPACT value (and, on the other hand, decrease a probability of lower IMPACT value). 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 positively relationship between CRINS and the probability of IMPACT to take on a higher value, indicating that producers who have purchased some type of crop insurance in the last two years are likely to follow MAS advice more closely than others.

Estimation results pertaining to producer perceptions about MAS performance reveal that the price enhancing dimension (HIGHPRICE) has a positive effect on producer's use of MAS in their marketing decisions. The low influence of producer's perception about 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 that the former is irrelevant.

Producer perceptions about MAS delivery are relevant factors in determining their 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 indicate 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). The marginal effects show that an increase in MATCH will increase the probability of a greater IMPACT value. This finding confirms that the nature of MAS recommendations (conservative vs. aggressive) must match the producer's 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. Even though information received via satellite (SATELLITE) is an important source, it does not appear to have significant effect on the use of MAS advice. This is an important finding because the independence of MAS impact from satellite use implies that the sample of satellite users is not biased for the purposes of MAS impact investigation. USDA reports (USDA) exhibit a complimentary relationship with MAS advice. USDA reports had a positive effect on the probability of higher levels of IMPACT, indicating that 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 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 attributed to the fact that the Midwest has the highest concentration of corn and soybeans, two commodities that have received considerable attention from MAS.

Discussion and Conclusions

Numerous surveys show 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. A conceptual framework was developed that 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 recommendation was 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. This is in line with the observation by Tomek and Peterson 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 that farmers

participate in insurance programs to receive subsidies, rather than avert risk. The survey results contribute to the ongoing debate in agricultural economics literature about the relevance of risk-management education and research. Numerous arguments have been made that risk reduction is not of particular interest to producers (e.g. Anderson and Mapp). These 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 that would aid in forming price expectations.

The findings of this study indicate that not only is MAS performance an important variable in explaining the impact of MAS recommendations, but also the way in which these recommendations are delivered, confirming previous findings in the management science literature 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, the results show that to have an impact the MAS must match the producer's market philosophy. MAS recommendations that show an "aggressive" marketing philosophy will have little impact on producers that 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 paper 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 of 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 that MAS recommendations have a greater impact on producer decisions in the Midwest than in the Great Plains. This suggests that there may be some factors associated with MAS use that are determined by a 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 mentioned. 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 that broadens the definition of risk attitude in an empirical context should be very valuable to better understand producers' behavior. Recently Pennings and Smidts (2003) showed that structural organizational behavior (e.g., production system employed by hog farmers) is linked to the global shape of the utility function and not to the local shape of the utility function (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. Since no data is available on the shape of producers' utility functions, we can not test the hypothesis that the global shape of the utility function is related to the impact of MAS. Further research in this area is called for.

Second, in this study the dependent variable and independent variables are based on the producers' opinions and attitudes about MAS as an economic phenomenon in agriculture. Clearly their opinions and attitudes regarding MAS are shaped by their experiences with the

particular market advisory service(s) they use. Further research is needed to disentangle their overall attitudes in attitudes related to a particular MAS.

Third, the analysis examined the impact of MAS recommendations on producers' decisions. The type of recommendation was not specified. One might argue 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, one might expect risk attitude to come into play when investigating a specific recommendation, like selling futures. Investigating 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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Table 1. 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 yrs, 2=25 to 29, 3=30 to 34, 4=35 to 39, 5=40 to 44, 6=45 to 49, 7=50 to 59, 8=60 to 64, 9=65 and older	5.04	1.605
SIZE	approximate gross annual farm sales: 8=over $1,000,000, 7=$999,999 to $500,000, 6=$499,999 to $400,000, 5=$399,999 to $300,000, 4=$299,999 to $200,000, 3=$199,999 to $100,000, 2=$99,999 to $50,000, 1=less than $50,000, 0=not applicable	5.76	1.664
Risk Attitude:			
RA	Detailed description given in paper (low value indicates relative risk averse, high value relative 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 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 MAS matches your market philosophy?" 1=certainly not use, 9=certainly use	6.56	1.760
Market Orientation:			
MO	Detailed description given in paper.	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 delivered systems (DTN)"	7.88	1.529
USDA	"USDA reports"	5.50	2.262
ELEVATOR	"Local elevator"	4.79	2.602
Heterogeneity:			
MIDWEST	1 if producer is from the Midwest, 0 otherwise	0.59	0.492
GPLAINS	1 if producer is from the Great Planes, 0 otherwise	0.34	0.476
SEAST	1 if producer is from the South East, 0 otherwise	0.07	0.250

Table 2. Coefficient Estimates of the Ordered Probit Estimation of Market Advisory Service's Impact on Producer Marketing Decisions (*N*=656).

Variable	Coefficient	*p*-value
Constant	-3.4124	0.0000
AGE	0.0763	0.0041
SIZE	0.0557	0.0311
RA	-0.0063	0.8362
CRINS	0.3899	0.0044
SELLRISK	0.0049	0.8288
HIGHPRICE	0.3005	0.0000
LOWRISK	0.0592	0.0833
UPDATES	0.1030	0.0002
CONSIST	0.0235	0.4115
FUNDAN	0.1350	0.0003
SPECIALIST	-0.0693	0.0107
TECHAN	0.0460	0.1311
MATCH	0.1183	0.0001
MO	0.0281	0.4237
SATELLITE	-0.0033	0.9088
USDA	0.0381	0.0607
ELEVATOR	-0.0522	0.0021
GPLAINS	-0.1531	0.0923
SEAST	-0.1652	0.3377
Threshholds:		
μ_1	0.3921	0.0000
μ_2	0.9097	0.0000
μ_3	1.2570	0.0000
μ_4	1.9191	0.0000
μ_5	2.6632	0.0000
μ_6	3.7710	0.0000
μ_7	4.5808	0.0000
Log likelihood function	-1053.486	
Chi-squared	495.501	0.0000
Likelihood ratio index	0.1904	
Predictive validity	0.3628	

Table 3. Marginal Effects of the Ordered Probit Estimation of Market Advisory Service's Impact on Producer Marketing Decisions (*N*=656).

	IMPACT 0 (= no impact) to 8 (= great impact)								
Explanatory Variables	**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	-0.004	-0.006	-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	-0.008	-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	0.002	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

Marginal effects were evaluated at the means of the regressors.
* $p < 0.1$, ** $p = <0.05$.

FOOTNOTES

1. We thank an anonymous reviewer for suggesting Bayesian learning as framework that is helpful to build the conceptual model.

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

3. The survey instrument is available from the authors.

4. 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). The construct reliability, which ranges from 0 (not reliable) to 1 (perfectly reliable), was high, at 0.72 (Hair et al), therefore the sum of responses to these questions was used in our analysis as a measure of producers' risk attitudes

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

6. The construct reliability of this scale was high at 0.72 (Hair et al).

7. Includes producers from Illinois, Indiana, Iowa, Minnesota, Missouri, Nebraska, Ohio, and Wisconsin.

8. Includes producers from Colorado, Kansas, Montana, North Dakota, Oklahoma, South Dakota, and Texas.

9. Includes producers from Alabama, Arkansas, Georgia, Kentucky, Mississippi, North Carolina, Tennessee, South Carolina, and Virginia.

10. The Pearson correlation matrix between explanatory variables showed 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. The full correlation matrix is available from the authors.