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The Effect of the Master Marketer Program on Participants' Knowledge, Adoption of Practices, and Relative Price Received

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ABSTRACT

The Master Marketer program is an intensive commodity marketing and risk management educational program for agricultural producers. This program combines three successful educational concepts – intensive educational programming, master volunteers, and marketing clubs – into a unique marketing and risk management program. This study analyzes the effects of the Master Marketer program on participants' market knowledge, adoption of risk management practices, and relative prices received. While the program positively affects participants' market knowledge, adoption of marketing practices, and

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commodity prices received, this analysis suggests that graduates' reported benefits are correlated with certain demographic characteristics and farm attributes.

KEY WORDS: Extension education, risk management, marketing, evaluation

INTRODUCTION

The changing structure of agriculture continues to move in the direction of fewer, larger, and more capital-intensive farming and ranching operations. These operations tend to be highly leveraged and more specialized in their production mix, leaving them at greater risk of adverse price movements and production shortfalls. As a result, risk management, and price risk management in particular has been a major concern for agricultural producers. A survey of crop producers by Purdue University Cooperative Extension found that the most important source of risk facing producers was crop price variability (Patrick and Alexander 2004). Marketing, business, and record keeping skills were frequently identified as the major areas of education need in a survey of Michigan farmers and agribusinesses (Suvedi et al. 2010). The results of a study by Anderson and Mapp (1996) reinforced the notion that producers want to learn about specific strategies they can implement that will improve profitability. While the number of risk management education programs conducted by state agricultural extension agencies has increased in recent years, there has been concern regarding the wide variety of methods used to teach risk management. Common methods of program delivery have included one-day and half-day workshops, short courses, internet-based programs, marketing clubs, and short publications.

The concern regarding teaching methods was underpinned by a lack of formal assessments of the varying types of risk management educational programs being delivered; making it difficult to determine the effectiveness of teaching methods and program formats. The lack of evaluation results raised significant questions within the Texas AgriLife Extension Service marketing and risk management economist group about program effectiveness, and provided the motivation for an in-depth learning, planning, development, and evaluation effort for a risk management program in Texas. This study intends to fill this gap in the literature by conducting a statistical analysis of the effectiveness of the Master Marketer Program. Using participant survey responses for programs conducted from 1996 through 2004, the results indicate that Master Marketer positively affects farmers' market knowledge, adoption of marketing and risk management practices, and commodity prices received.

The Master Marketer Program. In the early 1990s, there was concern among Texas A&M AgriLife Extension Service economists that, while producers were attending risk management educational workshops, they were not developing a sufficient understanding of risk management tools to actually use them in marketing their commodities. Anecdotal evidence suggested that a number of producers were attending similar workshops every two or three years, but were not gaining enough confidence to utilize the tools. During the fall of 1993, a feasibility committee comprised of producers, agribusiness, and extension specialists began exploring the development of an in-depth risk management effort that eventually became known as Master Marketer. This process led to the following suggestions from the committee: (1) the program needs to be in-depth enough to increase participants' knowledge level; (2) the training needs to include examples and simulation exercises; and (3) use marketing clubs to gain experience and confidence from the initial training and to extend the learning activity to other producers. The committee recommended an intensive 64-hour risk management course that focuses on marketing plan development and implementation, developing enterprise budgets and breakeven costs, and basic and advanced marketing tools including futures and options, basis, financial risks, fundamental and technical analysis, production risk alternatives (crop insurance, diversification and integration), agricultural policy, international trade, value added processes, niche markets, and marketing clubs.

In January 1996, the agricultural economics extension unit of the AgriLife Extension launched the first Master Marketer program, believed to be the most intensive commodity marketing and risk management educational program for agricultural producers offered by extension. The Master Marketer combines three successful educational concepts – intensive educational programming, master volunteers, and marketing clubs into a unique marketing and risk management program. The program consists of 64 hours of intense training during four separate two-day sessions over a six-week time period. After completion of the program, graduates are strongly encouraged to start and lead a marketing club in their home area.

Master Marketer is taught at the intermediate-to-advanced level with a pre-program "leveling" workshop held for those participants in need of an introductory-level course on commodity marketing and risk management to ensure that they are ready for the program. Producers having an expressed interest in marketing and leadership are desired due to the expectation that graduates will serve as volunteers in starting a marketing club. The end result is an expansion in the number of volunteer educators and valuable educational opportunities for producers within a cost-effective framework (Waller et al. 2004). As of 2011, 23 Master Marketer programs have been conducted in Texas.

Expanding Master Marketer to Other States. Results from the program evaluation (described below) for the first six Master Marketer programs held from 1996 to 1999 yielded impressive results and attracted interest in the program from other states. Texas AgriLife Extension partnered with the University of Minnesota Extension and the Montana Grain Growers Association to secure grant funding to expand the Master Marketer program to other parts of the country and to enhance risk management education in Texas. Through this effort, 700 producers were reached through 21 Master Marketer programs conducted from 2000 to 2005: eight in Minnesota, three in Montana, nine in Texas, and one in South Dakota. Additionally, a series of one- or two-day Advanced Topic Series (ATS) short courses on specific risk management topics was developed. The target audience for these abbreviated ATS programs was Master Marketer graduates, but they were available to all producers. In 2000-2005, 81 of these short courses were conducted in Minnesota, Montana, Texas, Nebraska, Wisconsin, North Dakota, and Iowa with more than 2,000 participants.

The objective of this study is to analyze the effects of the Texas Master Marketer program on participants' knowledge of risk management strategies, adoption of risk management practices, and relative commodity prices received. Since this study did not involve a control group, the research focuses on the correlations between the implementation of Master Marketer and the various outcome measures self-reported by participants. Results of this study will provide information on the effectiveness of Master

Marketer in increasing participants' knowledge and commodity prices received. Findings can also be used as a guide in designing future educational activities.

The following sections will begin with a description of the evaluation survey method followed by a discussion of the data and variables. Model development, results, summary, and conclusions close out the paper.

Evaluation Survey Methods. An evaluation survey for Master Marketer was administered approximately two-and-a-half years after the completion of each program. This amount of time allowed graduates at least two crop years to implement any new risk management techniques learned in the program, and followed the retrospective "post-then-pre" design as described by Howard (1980), Rockwell and Kohn (1989), and Moore and Tananis (2009). While a brief description of the survey is provided here, please refer to Qin et al. (2011) to view the full survey instrument**.**

The survey contained six sections focusing on knowledge, adoption of practices, and economic impact. Section 1 of the survey gathered general information about graduates' risk management planning and marketing practices using close-ended, two-option response format (yes/no) questions for two time periods, before and after attending the program. Section 2 dealt with the types of market information and analysis that a Master Marketer graduate might use in developing their personal market outlook. Section 3 was designed to gather information about graduates' abilities to understand and willingness to use specific risk management strategies. The purpose of Section 4 was to gather information about graduates' efforts and experiences with starting and leading a marketing club. Section 5 asked graduates for estimated price impacts as a result of participation in Master Marketer. The price impact questions asked for the difference in the price received using the tools learned in Master Marketer versus the price they likely would have received had they marketed their commodities using the methods they employed before attending the program. A list of price impact ranges for corn, wheat, grain sorghum, cotton, soybeans, cattle, sunflowers, and hogs were provided for graduates to choose from. This was a close-ended question with ordered responses for nine price impact categories. For each commodity, the choices of price impacts included "no change," four ranges of price decreases, and four ranges of price increases. The price ranges were intended to represent the realistic range of possible impacts that could have been experienced by graduates. Section 6, the final section of the survey, asked for demographic and production information.

MATERIALS AND METHODS

This section explains the primary method used in analyzing the data and presents some descriptive and econometric analysis. To facilitate the econometric analysis, both binary and aggregate count index variables were constructed from the survey questions. Probit models were utilized for the binary dependent variables. For the aggregate index/count variables which were constructed by summing the binary variables, Poisson regressions were used.

Data and Variable Definition. The description of the dependent and independent variables used in the analysis are listed in Appendix 1. Included in the list of variables are individual index variables and aggregate index variables. Individual index variables describe whether or not respondents benefited from the program with respect to specific skills or risk management practices adopted. Aggregate index variables describe their pre-to-post change in knowledge and skills.

Section 1 of the survey contained seven close-ended questions in a yes/no format asking graduates about their specific adoption of risk management practices, requesting a response for both pre- and post-participation in Master Marketer. These data were entered as "yes" = 1 and "no" = 0. A binary difference index variable was created for each question by using the "after minus before" method. Therefore, the difference index variables equal 1 for graduates who improved their marketing practices (i.e., from "no" = 0 pre to "yes" = 1 post), and zero otherwise. Some respondents answered "yes" before attending the program and "no" after attending the program. Since these values represented less than 5% of all observations, these were transformed to zero: (1) Letter "d" of the first seven variables represents difference, these are the individual binary index variables created by after the minus before method. (2) For Sections 2 and 3 data, we have prefixes "s2" and "s3" included in the name of the variables. (3) For Sections 2 and 3 data, we have suffix "df" representing difference, and these corresponding variables are all created by the "after minus-before" method.

The five binary difference index variables of Section 1 were summed, yielding an aggregate count index variable. This new aggregate index variable ranges from 0 to 5 since it is the sum of five binary variables taking a value of 0 or 1, indicating the extent to which the respondent changed practices after participating in the program. Higher values indicate more overall adoption but aggregation makes it impossible to determine the specific practices adopted. Also, the same value of the variable for different respondents does not necessarily mean that the respondents adopted identical practices. Obviously, aggregation of these binary variables brings convenience at the cost of mixing different sets of information together.

Similar variable transformation procedures were done for the binary difference index variables from Sections 2 and 3, creating an aggregate binary index variable related to market outlook (three questions) and the use of risk management tools and strategies (seven questions). Sections 2 and 3 included scaled knowledge-related pre-/post questions concerning market outlook and risk management tools. Since these data are count data, the corresponding index variables created by the "after minus before" (a - b) method are also count data.

In summary, Section 1 has individual practice difference (a - b) binary index variables and a constructed aggregate binary index variable. Sections 2 and 3 have individual practice and constructed aggregate binary variables and scaled (count) index variables. Although both aggregate binary and scaled index variables indicate whether or not respondents benefited from the program, scaled index variables generally provide more information than aggregate binary index variables for the purpose of the analysis.

Section 5 contained price impact data for corn, wheat, grain sorghum, cotton, soybeans, sunflowers, cattle, and hogs. Due to a low number of observations for hogs and sunflowers, these commodities were excluded from the individual price and pooled price analysis. Regression analysis was conducted for corn, wheat, grain sorghum, cotton, soybeans, and cattle. Additionally, a new price variable was created by pooling all the individual price impact data together. Since the price impact data varies by commodity in terms of the price impact range and units (bushels, pounds, and hundredweight), a linear transformation was used for each variable so that the price impact changes for all the commodities would fall in a range between -1 and 1. Summary statistics of the dependent variables can be found in Table 1.

Section 6 of the survey concerns farm profile and demographic information: crop and livestock enterprises, vertical integration, average annual gross receipts, age, education, and business structure. These variables were included in the regression analysis as explanatory variables. For a more parsimonious regression specification, education levels were redefined from seven categories to two: one for some college, vocational technical school or less, and the other for bachelor's degree and above. Similarly, the business structure category was reduced from five to four: sole proprietorships, partnerships, corporations, and other (estate and trust). Additionally, farm size data were transformed into three groups based on their typical average annual gross receipts reported in the survey.

Table 1. Summary Statistics for All Major Dependent Variables.

Variable	Obs.	Mean	Std. Dev	Min	Max
tindx1	365	2.16	1.65	0	6
overall1	295	6.42	.82	1	7
s2scaleind	390	9.08	4.76	-2	21
s2bnind	340	1.32	1.04	0	3
s3scaleind	398	20.92	11.01	-2	53
s3bnind	322	3.23	2.09	0	7
price pooled	956	.34	.388	-1	1
prcorn	167	.125	.107	-.3	.3
prwht	227	.098	.137	-.3	.3.
prmilo	180	.155	.167	-4.5	.45
prcott	169	.022	.028	-.076	.076
prsoybn	39	.156	.109	0	.3
prcatt	169	4.63	5.47	-15	15
prsun	2	.15	.212	0	.3

Summary Statistics and Preliminary Analysis. Data for the study were collected through a 2.5-year post survey administered to 681 participants of 16 Master Marketer programs conducted from 1996 to 2004. A total of 431 Master Marketer graduates provided a valid response to the questionnaire. A comparison of farm profile and demographic characteristics of Master Marketer participants to Texas farmers in general shows that Master Marketer attendees are younger and have larger farming operations. The average age of a Master Marketer graduate is 45.1 compared to 58.9 for Texas and 57.1 for the U.S. With 2,422 average crop acres, Master Marketer graduates are in the 95th percentile of farms in Texas. The median gross farm income of Master Marketers was $437,500. The Census of Agriculture indicates that only 4.2 percent of farms in Texas had gross income of $250,000 or higher (USDA-NASS 2009). Profiles of participants by production type and gross income can be found in Table 2 and Table 3. More detailed discussions on the characteristics of Master Marketer participants can be found in Qin et al. (2011).

Table 2. Profile of Master Marketer Participants by Production Type.
Dryland Crops (n = 283*)

Crop	Frequency	Percent	Mean Acres	Median Acres	Min	Max
Corn	51	18.0	707	550	50	3,000
Milo	126	44.5	823	500	10	7,000
Wheat	183	67.8	1,289	700	30	20,000
Cotton	125	44.2	957	600	15	6,500
Soybeans	14	4.9	437	400	100	800
Hay	53	19.4	247	150	10	1,000
Improved Pasture	64	22.6	687	200	20	15,000
Native Pasture**	103	36.4	2,383	1,000	25	20,000
Other Crops	15	5.3	766	500	21	3,000
No. of Farms*	283		1,900	1,150	10	20,000

* The number of farms reporting dryland crops (283) is less than the sum of the frequencies because most farms have more than one dryland crop. The mean acreage for total dryland farms does not include pasture acres. Percent totals (not shown in the table) more than 100% because most farms have more than one crop.

** Two responses representing very large native pasture acres are not included in maximum acres to protect the confidentiality of respondents.

Irrigated Crop Acres (n = 204*)

Crop	Frequency	Percent	Mean Acres	Median Acres	Min	Max
Corn	102	50	843	500	60	4,800
Milo	74	36.8	297	200	20	1,839
Wheat	102	50.5	572	250	30	3,200
Cotton	101	49.5	784	500	30	4,100
Soybeans	14	6.9	363	300	100	814
Hay	35	17.2	231	120	8	1,500
Improved Pasture	11	5.4	256	120	25	800
Native Pasture	6	2.9	1,740	1,100	240	4,600
Other Crops	26	12.7	725	363	60	4,524
No. of Farms*	204		1,378	842	8	9,934

*The number of farms reporting irrigated crops (204) is less than the sum of the frequencies because most farms have more than one irrigated crop. The mean acreage for total irrigated farms does not include pasture acres. Percent totals (not shown in the table) more than 100% because most farms have more than one crop.

Cattle Production (n = 216*)

Crop	Frequency	Percent	Mean Head	Median Head	Min	Max**
Cow-Calf	161	74.5	338	100	4	13,500
Stocker Cattle	122	56.5	1,131	463	14	16,000
Feedlot Cattle	49	22.7	1,879	450	10	50,000
No. of Farms*	216					

*Total number of farms reporting cattle (216) is less than the sum of frequencies due to many farms reporting more than one type of cattle enterprise.
** Two responses representing very large cattle enterprises are not included in the maximum number of head to protect the confidentiality of the respondents

Table 3. Profile of Master Marketer Participants by Typical Gross Income Level (n=378).

Gross Range Income	Frequency			Percent
	Crop	Livestock	Total	
$0-49,000	29	82	11	2.9
$50,000-249,000	115	84	107	28.3
$250,000-499,000	87	30	99	26.2
$500,000-1,749,000	89	34	127	33.6
$1,750,000-3,749,000	16	5	23	6.1
$3,750,000 or higher	3	5	11	2.9
Total	339	240	378	100.0
Mean	$546,801	$398,333	$744,742	
Median	$312,500	$137,500	$437,500	

Another major area of interest is the education levels of respondents. Inclusion of this variable in the regression analysis is used to investigate if farmer's educational background plays a significant role in their perception of knowledge gains from the training program. Based on participant responses, 48% of respondents have bachelor's degree while 21% of respondents have some college education experience. The percentages of only some high school (1%) and/or vocational/technical school graduates (3%) are relatively small. Meanwhile, 11% of the respondents have a high school degree, 6% have some graduate school education experience and another 10% hold advanced or professional degrees. As mentioned above, based on these observations, the respondents were divided into two groups with bachelor degree holders as the cutoff line. Specifically, dummy variable EDU11 takes a value of 1 if the respondent has some college course work or a lower education level, while dummy variable EDU22 equals 1 if the respondent has a bachelor's or more advanced degree. In the regression analysis, only explanatory dummy variable EDU11 is included, leaving EDU22 as base group. The first group accounts for 36% of the whole sample while the second group represents 64% of the respondents.

Regarding the age distribution of respondents, age-squared was included as one of the explanatory variables to identify any nonlinear age effects involved. The model also includes another variable indicating the number of years the participant has been a principal farm operator, "prinopr6." Both variables were included in all models as each variable communicates different information regarding farmers' experience.

As Table 2 shows, the majority of the respondents represent medium-to-large size operations. Survey respondents were divided into three groups according to their annual gross receipts based on the distribution of the data. To further investigate the distribution of the gross receipts data, a new variable named "NEWSALES" is created by first dividing the dollar value of the data by 1000, then taking natural log transformations to mitigate the effects of potential outliers. The mean of NEWSALES is 6.02, with a minimum of 3.2 and a maximum of 8.8. The sample standard deviation is 1.1. Meanwhile, the kernel distribution of NEWSALES approximates a normal distribution. Three dummy variables named NSCALE (1-3) were created according to the frequency of NEWSALES, and the two cut-off points are 5 and 7. NSCALE1 refers to the smallest size group which accounts for 17% of all the farms for which the values of NEWSALES are smaller than 5; NSCALE2 refers to the middle group which accounts for 64% of all the farms for which NEWSALES take value between 5 and 7; while NSCALE3 refers to the largest size which accounts for 19% for which NEWSALES are greater than 7.

In an earlier study of Master Marketer program data, the change in participants perceived knowledge of price and production risk management strategies from before to after participation in the program was found to be positive and statistically significant at the 0.01 confidence level (McCorkle 2005). Additionally, the change in graduates' use (adoption) of price risk management strategies from before to after participation in the program was positive and statistically significant.

A previous study by Qin et al. (2011) found that graduates who managed small and medium-sized farms generally gained more than those with large-sized farms in the areas of risk management practice adoption, development of personal market outlook, and risk management knowledge gained and strategies adopted. More specifically, producers with small-sized farms benefited more than those with medium or large-sized farms in almost every area. This finding is consistent with the estimation results from both Probit and Poisson models introduced in the next section. The remainder of this paper focuses on assessing the extent to which key demographic variables relate to knowledge gained, adoption of practices, and price impact.

Model Development. Three models were developed for the econometric analysis. The first model was a binary response Probit model used for all binary dependent variables analysis (McFadden 1984; Wooldridge 2002; Davidson and MacKinnon 2004). Typically, the interest in binary response models lies in the response probability:

$$p(x) = P(y = 1|x) = \Phi(x\beta) \tag{1}$$

where, y is the response variable (explained variable), taking a value of 1 or 0, contingent on certain events; x is the vector of explanatory variables and beta is a vector of coefficients that reflect the influence of x on the response probability; and $\Phi(\cdot)$ is the cumulative distribution function of standard normal distribution. Equivalently, equation 2 models the binary difference variables:

$$P(y = 0|x) = 1 - P(y = 1|x) = 1 - p(x) \tag{2}$$

In this specific case, y represents the binary difference variables for sections 1-3, indicating whether or not the respondent gained knowledge or changed practices as a result of attending the program, and explanatory variable x includes a set of independent variables previously described, such as age, age squared, education level, and farm size. Equation (1) is referred to as the "index model" because it restricts the way in which the response probability depends on covariate x: $p(x)$ is a function of explanatory variables only through the index function:

$$y^* = x\beta + e, \quad y = 1(y^* > 0) \tag{3}$$

where, y^* is a latent variable; e is a continuously distributed variable independent of x, and the distribution of e is standard normal; β is the vector of parameters associated with the corresponding covariate; and $1(\cdot)$ is the indicator function. Note that β in a discrete response model has no intuitive interpretation; instead, interest is focused on the marginal effect of x_j on the response probability $p(x)$.

For the count variables, a Poisson regression model was employed with the mean function assumed to be exponential (Wooldridge 2002; Greene 2007):

$$\mu(x,\beta) = \exp(x\beta) \tag{4}$$

The density function then takes the form:

$$f(y|x) = \exp(-\mu(x,\beta))(\mu(x,\beta))^y / y! \tag{5}$$

where, $y!$ is y factorial. Since a Poisson distribution imposes a strong restriction (requiring the conditional variance to be equal to the conditional mean), we employed the pseudo likelihood approach wherein the model was estimated without specifying the conditional variance.

For the price data, a linear regression model was constructed as follows:

$$y = x\gamma + \varepsilon, \; E(\varepsilon) = 0, \; \mathrm{var}(\varepsilon) = \sigma^2 \tag{6}$$

where, y is the dependent variable and x is the vector of independent variables; γ is the vector of parameters associated with each covariate x_j; ε is the disturbance term. Estimation results for the Probit models (for binary outcomes on adoption probability), Poisson models (for count outcomes on the overall level of adoption) and linear models (for continuous outcomes on price) are presented in the following section.

RESULTS

Model Estimation for Marketing and Risk Management Behavior. For the individual binary index variables (pre and post yes/no questions related to adoption of practices) created from survey sections 1-3, the Probit model was applied. The Poisson regression models were used for the count variables related to pre and post self-assessments of knowledge gain and also the aggregate index variables (tindx1, overall1, s2scaleind, s2bnind, s3scaleind, and s3bnind). The Poisson model estimation results are presented in Table 4.

Two Probit models on individual indices indicate that graduates with less educational background benefited less from the program than those with more advanced educational background. However, for the aggregate index models as shown in Table 4, educational background of graduates plays no significant role.

With regard to business size, the results indicate that participants with medium-sized farms show larger gains than those with large farms, specifically in areas of risk management knowledge gains, tools, and strategy adoption. The results of the Poisson model (Table 4) indicate that producers with medium-sized farms received greater knowledge gains than those with small-sized farms in terms of tools used to develop market outlook. With respect to risk management knowledge gains, tools, and strategy adoption, the results indicate that producers with medium-sized farms benefit more from the program than small-sized farms. On the other hand, producers with large-sized farms show less gain than producers with small-sized farms in terms of adoption of risk management practice and strategies.

Another observation worth noting is that time (year) dummy variables show statistical significance in most of the models (Table 4, last column). Among the models considered, only two suggest that more recent graduates' perception of gains from the program may be lower than that of those graduates who attended the program in base year 1996, especially in years 2000, 2001, and 2004. For a majority of the models, we see a positive sign associated with many of the time dummies, indicating a positive time trend. For the two aggregate index models (s2scaleind and s3scaleind), joint tests show these time dummies are jointly different from zero at 5% level suggesting that a positive time trend does exist in respondents' perception of benefits from the training program. Graduates of later years were shown to benefit more than those who attended the program in years earlier. This result would suggest that the program's effectiveness has been improved over time either from changes in program structure or from instructors improving their teaching methods.

The economic impact of Master Marketer was measured by participants' change in gross income, which takes into account the price impact, planted acres and yields for crops, and the number of head and pounds produced for livestock enterprises (McCorkle et al. 2009). The mean total farm impact was $33,640 with a standard deviation of $62,055. A one-tailed t-test found each of the commodity impacts and the total farm impact to be statistically significant (greater than zero) at the .01 confidence level.

To assess the effect of the program on prices received by graduates, OLS regression models were applied on both the individual crop price changes and also the pooled price change data with the inclusion of the aggregate index variables from Sections 1-3 into the model to determine the extent to which these factors explain the variation in price impacts. Since there are two sets of aggregate index variables (binary and scaled) for Sections 2 and 3, both of which refer to the same type of information with different measures, different combinations of aggregate index variables were included in the price models to determine which model fit the data best.[1]

Model Estimation for Price Impact. OLS regression was used for all the individual price impact models, while Weighted Least Squares (WLS) regression was adopted for the pooled price data due to existence of repeated observations. As mentioned earlier, the pooled price variable is constructed by pooling all the individual price impact data together; therefore, the observations of each explanatory variable (constructed based on each graduate's survey) would be included in the regression as many times as the number

[1] In practice, there are some price models where all the aggregate index variables were included as explanatory variables; meanwhile, in other models, only aggregate binary index variables from Sections 2 and 3, and aggregate index variables from section were included. Similarly, there were also models where only the aggregate count index variables from Sections 2 and 3, and the aggregate index variables from section 1 were included.

of crops produced by that graduate's farm. In view of the time series and cross-sectional property of the data, WLS is applied with frequency of repeated observations as the weight for data transformation; at the same time, robust variance-covariance matrix is also used to deal with possible serial correlation and heteroskedasticity.

Table 5 lists all the estimation results of different model specifications for pooled prices. Table 6 contains the adjusted R^2 and joint test results for the models containing time dummy variables. The adjusted R^2 associated with each pooled price model ranges from 7% to 13%, which suggests that a relatively small part of the variation of the dependent variable can be explained by the independent variables.

Table 4. Model Results for All Aggregate Index Variables**.**

Model	Nscale2	Nscale3	prinOpr6	newpartn6	newcorp6	verticl6	Y97-y04	R^2
tindx1 (Poisson)				-0.23			+y97	0.027
overall1 (Poisson)								0.002
s2scaleind (Poisson)	0.179		-0.008	-1.51			+97, +98, +03	0.027
s2bnind (Poisson)							+y00, +y01	0.017
s3scaleind (Poisson)	0.186	-0.001	-0.135		-0.106	0.046	+y97, +y98, +y00, +y01, +y02, +y03, +y04	0.04
s3bnind (Poisson)	0.184	-0.287					+y97, +y00, +y01, +y02	0.003

Note: 1) Only parameter estimates significant at 10% level are reported. 2) Blank spaces mean the corresponding variables are not significant at 10% level. 3) For time dummies, the magnitude of the estimate is not reported except for signs.

As previously noted, Section 1 also contains an overall variable, which asks the respondents for their overall rating of the educational quality of the Master Marketer program. This variable was included as a perceived indicator of program quality in the price impact models. As for the Section 1 aggregate binary index variable (tindx1), the Section 2 aggregate binary index variable (s2bnind), the aggregate count index variable for Section 2 (s2scaleind), the aggregate binary index variable for Section 3 (s3bnind), and the aggregate count index variable for Section 3 (s3scaleind), different combinations of these variables were analyzed in all the models. The reason being that with the exception of the aggregate binary index variable in Section 1(tindx1), Sections 2 and 3 have two sets of aggregate index variables that refer to the same set of information. Therefore, including all the index variables in the model would have caused co-linearity problems. As a result, only one type of index variable should be included in the model estimation, binary or scale.

Time dummy variables also play a significant role in the pooled price models**.** The null hypotheses stating that the coefficients of the time dummy variables are collectively zero and are rejected in all the 5 models. It is evident that there is time trend involved with the price impact data, but no consistent conclusion can be drawn here because the signs of the time dummy variables vary across different models.

In general, all the models that included both the overall and aggregate index variables performed better than the models without these variables. Also, the pooled price models fit the data much better than any individual price model due to the larger sample size. The scaled program rating variable of Section 1 (overall1) and the aggregate scale variables for Sections 2 and 3 all have significantly positive signs at the 10% level, which suggests that improvement in knowledge of personal market outlook and risk management as well as adoption of risk management skills and strategies positively contribute to price impacts perceived by respondents.

Business structure dummy variables yielded some interesting results. The models suggest that producers with operations organized as corporations benefited from the program with regard to almost all commodities. In the pooled price models, all three business types experienced greater price impacts compared with estates and trusts (other). Also, results in Table 5 indicate that producers with small-sized farms benefited more from the program than those with medium-sized and large operations. This may suggest that larger operations were already performing at a more efficient level. The education variable tells a similar story. Graduates with a relatively lower level of education background benefited more from the program compared with those that have a bachelor's degree or higher.

Age contributes positively to the price impact while age squared enters negatively, again confirming our conjecture that age enters the model in quadratic form. Based on the pooled price model (5), the age at which a graduate benefits the most is 50. The models indicate that older people may benefit more than young people, up to a certain age, but there also exists a maximum point where benefits are reduced as age increases. [2]

The binary vertical integration variable (verticl6) was not statistically significant in many of the major price impact models, except for the price impact models of cattle, where the significant positive sign suggests vertical integration positively affects the price impact for cattle.

The price impact results are intended to be viewed with caution as these results might suggest that the use of marketing and price risk management tools can increase a producer's net returns. However, we are unable to make such a claim since the data are self-reported.

[2] This "optimal" age is calculated as -coefficient of age/(2*coefficient of age squared). Based on pooled price model 5 estimates listed in Table 9, the estimated age is 50.

Table 5. OLS Parameter Estimates and Standard Error for the Pooled Price Model.

Model (1 to 5)	overall1	s2 bnind	s2 scaleind	s3 bnind	s3 scaleind	age	Agesq	edu11	Nscale2	Nscale3	newsolep	newcorpt	newpartn
Newpr	N.A.	-0.003 (0.01)	N.A.	0.03* (0.006)	N.A.	0.027* (0.009)	-0.0003* (0.0001)	0.04* (0.023)	-0.06* (0.033)	-0.14* (0.037)	0.19* (0.05)	0.26* (0.05)	0.22* (0.08)
Newpr	0.09* (0.01)	N.A.	0.004 (0.003)	N.A.	0.005* (0.001)	0.03* (0.006)	-0.0003* (0.000)	0.05* (0.02)	-0.011 (0.03)	-0.018 (0.04)	0.23* (0.07)	0.33* (0.07)	0.23* (0.067)
Newpr	0.15* (0.014)	-0.017* (0.01)	N.A.	0.02* (0.005)	N.A.	0.03* (0.008)	-0.0003* (0.0001)	0.042* (0.02)	-0.06* (0.034)	-0.02* (0.04)	0.21* (0.07)	0.28* (0.07)	0.22* (0.07)
Newpr	0.10* (0.013)	N.A.	0.007* (0.003)	N.A.	0.005* (0.001)	0.025* (0.006)	-0.03* (0.0000)	0.045* (0.019)	-0.04 (0.03)	-0.06 (0.04)	0.11 (0.07)	0.22* (0.07)	0.15* (0.07)
Newpr	0.15* (0.014)	-0.02* (0.01)	N.A.	0.022* (0.006)	N.A.	0.03* (0.0089)	-0.0003* (0.0001)	0.04* (0.02)	-0.067* (0.035)	-0.12* (0.04)	0.16* (0.07)	0.24* (0.075)	0.18* (0.074)

Note: 1) Standard error of the parameter estimates is listed in the parenthesis. 2) All the estimates are transformed by multiplying 100. 3) We omitted time dummies, constant term, and three variables (tindx1, Verticl6, and prinOpr6) that are not statistically significant at 10% in any models. 4) * Means significance at 10% level.

Table 6. Adjusted R^2 and Joint Tests for Time Dummies**.**

Models	Adjusted R^2	Joint test result (if all the coefficients of time dummies are jointly different from 0)	Sign of time dummies
Pooled price model 1	0.067	F(8, 1550) = 3.99, Prob > F = 0.0001	-(y98, y00, y01,y03)
Pooled price model 2	0.11	F(8, 2250) = 6.37, Prob > F = 0.0000	-(y97,y98, y01), +(y99,y02)
Pooled price model 3	0.12	F(8, 1631) = 3.26, Prob > F = 0.001	+(y99),-(y01,y03)
Pooled price model 4	0.11	F(8, 2064) = 9.26, Prob > F = 0.0000	-(y97,y98,y01,y03),+(y99)
Pooled price model 5	0.13	F(8, 1540) = 3.83, Prob > F = 0.0002	+(y99),-(y01,y03)

CONCLUSION AND DISCUSSION

The increasing need in Texas for a highly effective marketing and risk management education program was the impetus for the birth of the Master Marketer program which has provided 64 hours of in-depth marketing and risk management education to nearly 1,000 producers since 1996. Given the prior lack of formal assessments of marketing and risk management education programs in Texas and other states, and the increasing need in Texas to demonstrate program performance and impacts for accountability purposes, the Master Marketer Team developed an extensive 2½ year post evaluation survey. Participant responses collected from the survey process over a nine-year period provide the data that was evaluated econometrically in this study, allowing for an in-depth evaluation of this unique marketing and risk management educational program.

This study investigates the effects of the Master Marketer program on participants' knowledge, adoption of risk management practices, and relative price impacts. It also explores the relationship between several demographic variables and changes in knowledge, adoption of price risk management strategies, and price impacts. Our findings indicate that graduates' reported benefits, in terms of marketing practice, price received and income, are related to certain demographic characteristics (e.g., age and education) and farm attributes (e.g., business size and structure). Specifically, we found that:

1. Age contributes to the model in a nonlinear fashion with a concave profile, indicating that older graduates may benefit more from the program up to a certain age. However, there exists a maximum point at which benefits increase at a decreasing rate as age increases. (based on pooled price model 5, the estimated maximum benefit is achieved by participants who are age 50);
2. Compared with medium operations, producers from small-sized operations benefited more from the program while producers from large operations benefited less in terms of knowledge gained, and adoption of risk management and marketing strategies;
3. Regarding adoption of risk management skills and price impacts; graduates with less education benefited more compared with those holding more advanced degrees;
4. Graduates who have been engaged in the business operation longer did not benefit as much compared with those who have less experiences as principal operators;
5. Vertical integration is positively correlated with graduates' adoption of risk management strategies and skills.

In summary, this study demonstrates that the Master Marketer program promotes among its graduates effectual marketing and risk management practices that benefit their farming operations. The analysis results provide useful insight into the various demographic factors and their effects on perceived knowledge, adoption of practices, and relative prices received. This information can be used to further improve the effectiveness and targeting efficiency of the Master Marketer program at a time when funding and program delivery methods in Texas and other states are coming under increased scrutiny. The need for Extension marketing and risk management education programs should continue given the variety of issues being faced by producers, including possible reductions in farm program safety net support, increased costs of production, and increasing price volatility.

This study relied on self-reported program evaluation data from participants of the Master Marketer program collected approximately 2½ years after the completion of each program. Confidence in the validity of the data stems from a response rate (63%) that is above the benchmark (50%) for research conducted with questionnaires (Baruch and Holtom 2008). Information was not available to examine whether responders differed from non-respondents in ways that might diminish the generalizability of the findings to the overall population of Master Marketer graduates. Any inherent weakness in this data should be mitigated to some extent considering the analysis focused on the difference in the pretest and posttest responses, rather than the reported values themselves. Nonetheless, we expect that a more careful evaluation design, such as randomized treatment assignment commonly employed in lab or field experiments, can further improve the assessment.

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Appendix 1. Variable Description.

Dependent Variables	Evaluation Section	Description
dmplan1	1	Do you have a market plan after-before (binary)?
dwmplan1	1	Do you have a written market plan after-before (binary)?
dshare1	1	Do you share your market plan with someone else after-before (binary)?
dcop1	1	Do you determine costs of production for different commodities and use these costs to set price targets after-before (binary)?
dprofit1	1	Do you build profit and/or growth needs into your price target after-before (binary)?
dnlett1	1	Do you use a general marketing advisory newsletter after-before?
dadvisr1	1	Do you employ a market advisor after-before?
tindx1	1	Section 1 index variable regarding market practices constructed by summing over the first 5 (after-before) variables. (range 0-5)
overall1	1	Section 1 overall rating of the program by respondent (range 1-7)
s2q1bidf	2	Section 2 question 1 did you use market fundamentals in developing your personal market outlook? After-before (binary)
s2q2bidf	2	Section 2 question 2 did you use your knowledge of seasonal price analysis in developing your personal market outlook? After-before (binary)
s2q3bidf	2	Section 2 question 3 did you use your knowledge of technical analysis in developing your personal market outlook? After-before (binary)
s2scaleind	2	Personal market knowledge scale data index variable created by summing over all the after-before (1-7 scale questions) scale difference variables (range from -2 to 21)
s2bnind	2	Personal market knowledge binary data index variable (yes/no questions) summing over all the after-before variables (range 0-3)

s3q4bidf	3	Section 3 question 4 did you know when the use of forward cash contracting is appropriate after-before (binary)?
S3q5bidf	3	Section 3 question 5 did you know when the use of your knowledge of basis contracts is appropriate after-before (binary)?
S3q6bidf	3	Section 3 question 6 did you know when the use of your knowledge of minimum price contracts is appropriate after-before (binary)?
S3q7bidf	3	Section 3 question 7 did you know when the use of your knowledge of hedging with futures is appropriate after-before (binary)?
S3q8bidf	3	Section 3 question 8 did you know when the use of your knowledge of hedging with options is appropriate after-before (binary)?
S3q9bidf	3	Section 3 question 9 did you know when the use of your knowledge of production contracts and/or marketing alliances is appropriate after-before (binary)?
S3q10bidf	3	Section 3 question 10 did you know when the use of your knowledge of post-harvesting marketing strategies (sell crop, buy calls; sell crop buy futures; store crop, buy puts; etc) is appropriate after-before (binary)?
s3bnind	3	Section 3 all binary variable index summing over all binary variables (range from 0 to 7)
s3scaleind	3	Section 3 all scale variable index summing over all scale difference variables (range from -2 to 53)
prcorn	5	Price impact for corn (ranges from -0.3 to 0.3)
prwht	5	Price impact for wheat (ranges from -0.3 to 0.3)
Prmilo	5	Price impact for milo (ranges from -0.45 to 0.45)
Prcott	5	Price impact for cotton (ranges from -0.076 to 0.076)
Prsoybn	5	Price impact for soy bean (ranges from 0 to 0.3)
Prcatt	5	Price impact for cattle (ranges from -15 to 15)
Newpr		Price impact pooled (after linear transformation, range from -1 to 1)

Independent Variables		Description
age	6	Age of farmers (range from 24 to 82, continuous)
agesq		Square of age (continuous)
edu11		Education dummy represent high school and other equivalent degrees (binary)
edu22		Education dummy represents bachelor and advanced degrees (binary)
newsolep		Business structure dummy, taking value 1 if farm is of sole proprietorship (binary)
newpartn		Business structure dummy taking value 1 if farm is of partnership (binary)
newcorpt		Business structure dummy taking value 1 if farm is of corporation type (binary)
newothers		Business structure dummy taking value 1 if farm is of estate or trust type (binary)
prinopr6	6	How long have you been a principal farm operator? (in years range from 2 to 61, continuous)
newsales		Total annual sales divided by 1000 and log transformed (range from 3.22 to 8.76, continuous)
Verticl6	6	Vertically integrated or not (binary)
Y96-y04		A set of time dummies spanning from year 1996 to 2004 (binary)
Nscale1		Dummy variable of farm size belongs to small group (account for 16%, binary)
Nscale2		Dummy variable of farm size belongs to medium group (account for 85%, binary)
Nsclae3		Dummy variable of farm size belongs to large group (account for 19%, binary)

Note: (1) Letter "d" of the first 7 variables represents difference, these are the individual binary index variables created by after minus before method. (2) For section 2 and 3 data, we have prefix "s2" and "s3" included in the name of the variables. (3) For section 2 and 3 data, we have suffix "df" representing difference, and these corresponding variables are all created by after-before method. For calculated variables, the program evaluation column is blank.