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The Value of Agricultural Economics Extension Programming: An Application of Contingent Valuation

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Abstract: We use the contingent valuation method to estimate participant willingness to pay for agricultural economics extension programming. The data, collected as part of standard evaluation forms for the Ohio State University's 2001 Agricultural Outlook and Policy program series, and subsequent analysis suggest participant benefits exceeded departmental costs of conducting the program (benefit-cost ratios of 1.07 under conservative assumptions and 1.74 under moderate assumptions). We also use the data to explore the revenue generation potential from alternative program pricing and discuss the potential for developing differentiated programs to reach distinct audience segments. Additional research necessary before implementing alternative pricing or program differentiation plans is also discussed.

Key Words: Extension, Contingent Valuation, Program Evaluation, Benefit-Cost Analysis, Optimal Pricing

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The Value of Agricultural Economics Extension Programming: An Application of Contingent Valuation

Introduction

Structural changes in US agricultural have had important implications for many affiliated sectors including land grant university extension services. Over the past two decades economists have contemplated the current structure of land grant extension in an attempt to project the longevity and usefulness of the institution in the context of the agricultural sector's ongoing structural changes (McDowell), to suggest institutional strategies that would enhance and lengthen extension's role in the United States (Knutson; Knutson and Outlaw), and to evaluate the economic implications of several suggested reformulations of existing institutional funding mechanisms (Dinar and Keynan, Hanson and Just).

One overarching trend in the US is that of diminished federal funding of extension activities (Knutson and Outlaw; Barth *et al.*). When this trend is combined with volatile state and local funding of extension activities, it makes efficient allocation of resources by extension administrators, faculty and staff increasingly critical. These budgetary pressures have stimulated discussion of alternatives to publicly funded extension (Dinar and Keynan, Hanson and Just), ranging from the collection of user fees by existing extension providers to the provision of fee-for-service extension programming by private firms with no ties to the public sector. Extension services in several countries have already undergone systematic transitions that involve some type of privatization of extension services (Dinar and Keynan, Hanson and Just), while extension administrators in the United States have begun exploring the possibility charging market-rate user fees as government funding of extension efforts diminishes (National Association of State Universities and Land-Grant Colleges).

In order to efficiently allocate resources within the prevailing institutional structure of extension, or to successfully facilitate some form of privatization, knowledge of individual extension program demand will be critical. However, estimating the demand for most extension programs is difficult using data retrieved from standard evaluation instruments (e.g., counts of attendance, ratings of participant satisfaction, and anecdotal impact statements gathered from participants) because nearly 80 percent of US extension programs are provided free of charge or for a nominal fee (NASCALGU). Hence, little variation in the price of extension programming exists. In the absence of price variation it is difficult to estimate how program participation might change if program fees are increased; i.e., meaningful demand estimates are elusive. Without robust demand-side information it will be impossible to set optimal prices under privatization regimes, to efficiently calculate shadow values and make optimal programming decisions under existing public funding structures, or to estimate the economic value of extension programming for use in justifying or altering centralized budget outlays.

The contribution of this study is the estimation of demand for extension programming using data that can be easily collected on program evaluation instruments and using estimation techniques that are commonly used in environmental economics. Previous work in this area includes analyses of the demand for specific extension programming in other countries (Dinar (1989, 1996); Holloway and Ehui) and in the pre-World War II United States (Frisvold, Fernicola and Langworthy), while others have provided estimates of the aggregate ex post impact of extension activities (Birkhaeuser, Evenson and Feder; Huffman). This paper differs from previous work because it focuses on the demand for extension programming provided by agricultural economists in a modern US setting and in that we use a simple methodology to estimate the demand for this program. Specifically, we use the contingent valuation method to

estimate participants' willingness to pay for a series of local agricultural economics and policy outlook meetings provided by a land grant department of agricultural economics. We feel application of this methodology to extension programming can help departments answer fundamental questions such as where to place resources, who to hire, and how to allocate faculty time. Successfully estimating demand for particular programs is likely to be of increasing importance as universities expand extension programming into non-traditional areas, such as environmental, resource and urban issues and must decide on allocation of resources across traditional and non-traditional programming areas.

The paper is structured as follows. The second section describes the extension program of interest and postulates a model of participant utility for the program. The third section formulates the general model of participant willingness to pay while the fourth section discusses data collection. The fifth section presents estimation details and summarizes results from two specific models of willingness to pay. The sixth section uses results from the willingness to pay models to conduct a benefit-cost analysis of the extension program and to consider the implications of alternative pricing structures. The final section includes further discussion of the results and conclusions.

The Value of Agricultural Economics Extension Programming

We evaluate a series of agricultural market and policy outlook meetings conducted by faculty of the Ohio State University's Department of Agricultural, Environmental and Development Economics. At each meeting, several faculty present analyses of particular agricultural markets, agricultural policy issues or other issues with potential economic relevance to members of land grant clientele with ties to production agriculture (e.g., farmers, lenders,

agricultural service providers, local extension personnel, etc.). Considerable time is allocated to answering audience questions and stimulating discussion of the economic ramifications of current events for the agricultural sector. The series of meetings has been conducted annually by the department for several decades and, hence, has an established track record and reputation among much of the target audience.

This extension program can help land grant clientele increase utility in several ways, e.g., increased revenue; decreased production costs; decreased costs of searching for and evaluating new technology; evaluation of new business methods or organizational forms; and reduced financial and market risk. Rather than estimate the ex post effect of the programming on the participants' profits or the sector's productivity (e.g., Birkhaeuser, Evenson and Feder; Huffman), which requires tracing how the information disseminated at the meeting affects the future flow of participants' profits and utility and the potential spillover effects of such information to friends and neighbors, we focus on the participants' expected value of such programming. Such an approach is appropriate in the current context because of the extension program's established track record; participants largely understand the potential value of the information content that is to be delivered at these meetings.

We model participants' intended attendance decision in order to estimate the consumer surplus for such programming. Formally, we assume extension program participants' solve:

$$(1) \quad \max[u_0(\pi(\Omega_0) + M) + \varepsilon_0, u_1(\pi(\Omega_1, T - t) + M - r) + \varepsilon_1]$$

where u_i is the systematic indirect utility associated with alternative i , π is the individual's expected business profit function, Ω_i is the information and skill set the participant expects to have if alternative i is chosen, M is other non-business forms of income, r is the cost of attending

extension programming and ε_i is the component of indirect utility associated with alternative i that is not observed by the researcher.

The alternative with subscript zero represents not attending the extension meeting while the alternative with a subscript one is attending the extension meeting. We assume the individual's business profit function is strictly increasing in information/skills; i.e., $\partial\pi/\partial\Omega > 0$. Hence, if extension programming provides an information and skill set larger than that obtained under the alternative, i.e., $\Omega_1 > \Omega_0$, profits will increase if all else is held equal. When the respondent expects that the increase in the information set from the extension meeting will do more to increase profits than the cost of attending the extension programming, the individual attends the extension event.

Methods for Identifying the Value of Extension Programming

For the extension program evaluated here, the registration fee is priced at the non-personnel cash costs of the presenting the meeting (e.g., cost of food, materials, space and equipment rental, etc.). However, we postulate that many participants would attend even if the registration fee increased. To estimate the value of extension programming we would like to identify the compensating variation value, c , that, when added to the cost of extension programming, will make participants indifferent between attending and not attending. This value is implicitly defined as:

$$(2) \quad v_0(\pi(\Omega_0) + M) + \varepsilon_0 = v_1(\pi(\Omega_1) + M - r - c) + \varepsilon_1.$$

Solving the implicit equation (2) for compensating variation (c), yields the general function:

$$(3) \quad c = c(\pi(\Omega_0), \pi(\Omega_1), r, \varepsilon)$$

where $\varepsilon = \varepsilon_o - \varepsilon_i$ is a random error. Because the exact forms of the profit and indirect utility functions are unknown, we assume that the indirect utility function can be approximated by a linear function of parameters of the form:

$$(4) \ u(\pi(\Omega)) = X\beta$$

where the vector X contains explanatory variables that influence indirect utility. Assuming that compensating variation is non-negative, the total willingness to pay for the extension program (WTP) is specified as a semi-log function:

$$(5) \ WTP = \exp(X^* \beta^* + \varepsilon)$$

such that X^* contains the set of explanatory variables in (3) and β^* is a conformable parameter vector.

Data Collection

One method of identifying participants' compensating variation for extension programs is to simply ask respondents an open-ended contingent valuation question in which they express their value for the programming. Given methodological issues with such direct questioning (Haab and McConnell), many contingent valuation practitioners suggest couching the question in a closed-end form that more closely mimics decisions made in a market context. One such closed-end form is a dichotomous-choice contingent-valuation question, in which the respondent either agrees or disagrees that they would be willing to pay a particular dollar amount to have a particular good made available to them.

Five-hundred sixty-eight participants at 12 meetings held during 2001 were asked the following dichotomous-choice contingent-valuation question as part of an evaluation instrument administered upon program completion: *"In these times of tightening federal, state and*

*departmental budgets support for programs such as this might be decreased such that an increase in registration fees is needed. Would you have attended this year's program if the registration fee would have been \$xx higher?"*¹ The \$xx value is referred to as the bid level and this value was randomized among the following values: 5, 10, 15 and 25. The \$25 value represents more than double the average registration fee. Inclusion of higher bid values in the experimental design was considered at the time of survey formulation because higher bids could provide crucial information concerning the upper tail of the sample population's willingness to pay distribution. However, inclusion of higher bids was judged potentially damaging to the ongoing relationship between local program organizers and many of the participants. We did not want to put local organizers, who often interact with many of the participants in an ongoing basis, in a position to have to explain why they were considering vastly increasing prices of current programs.

Two hundred seventy-two instruments were collected (47.9 percent response rate) and 173 participants provided a usable response for the contingent valuation question (30.5 percent of total participants and 63.6 percent of returned surveys). Full summary statistics of participant characteristics are available in Table 1. From this data, we estimate two different versions of the willingness to pay model. First we estimate the full willingness to pay for the current program ($WTP = r + c$) and then we estimate a model of compensating variation only.

Estimated Willingness to Pay Models

Model 1: Full Willingness to Pay

From equation (5), the probability of an affirmative response (i.e., the individual would still attend the current meeting at the higher price, or a 'yes' response) is equal to the probability

that the individual's full willingness to pay exceeds the offered fee increase plus the current registration fee:

$$(6) P(yes) = P(WTP > r + \$xx) = P(\exp(X^* \beta^* + \varepsilon) > r + \$xx).$$

Solving for the random variable ε results in the probability of a yes response:

$$(7) P(yes) = P(\varepsilon > \ln(r + \$xx) - X^* \beta^*)$$

Assuming ε is distributed normally, with mean zero and constant variance σ^2 , the probability of a yes response can be written:

$$(8) P(yes) = P\left(\frac{\varepsilon}{\sigma} > \frac{\ln(r + \$xx) - X^* \beta^*}{\sigma}\right) = \Phi\left(X^* \frac{\beta^*}{\sigma} - \frac{1}{\sigma} \ln(r + \$xx)\right).$$

Where $\Phi(\bullet)$ is the standard normal cumulative distribution function. Defining a new parameter

vector $\tilde{\beta} = \left\{ \frac{\beta^*}{\sigma}, -\frac{1}{\sigma} \right\}'$, and a new explanatory variable vector $\tilde{X} = \{X^*, \ln(r + \$xx)\}$, the

probability of a yes response is simply:

$$(9a) P(yes) = \Phi(\tilde{X} \tilde{\beta}).$$

Similarly, the probability of a no response is:

$$(9b) P(no) = 1 - \Phi(\tilde{X} \tilde{\beta}).$$

Equations (9a) and (9b) are to be recognized as the contributions to the likelihood function for a standard binary probit model. The willingness to pay function in equation (5) is estimated using standard routines for maximum likelihood estimation available in most statistical packages.

From equation (5), median willingness to pay for a given individual is measured as:

$$(10) Md(WTP) = \exp(X^* \beta^*),$$

where Md is the median operator. From equations (9), it is apparent that the estimated parameters of the dichotomous choice contingent valuation responses are normalized by the

unknown standard deviation of the error term: i.e. $\tilde{\beta} = \left\{ \frac{\beta^*}{\sigma}, -\frac{1}{\sigma} \right\}$. However, the estimated

parameter on the explanatory variable $\ln(r + \$xx)$, β_{bid} , represents an estimate of $\beta_{bid} = -\frac{1}{\sigma}$.

Substituting into equation (10), a consistent estimate of median willingness to pay for a given individual is:

$$(11) \text{Md}(WTP) = \exp(X^* \frac{\beta^* / \sigma}{-\beta_{bid}}).$$

Estimation and Data Details. The set of explanatory variables used to estimate the willingness to pay for the extension program include information on the respondent's business operation, the perceived quality of the meeting attended, and controls for meeting location. Table 2 provides a description of the variables used in estimation. A couple of notes should be made regarding these variables. To compensate for item non-response by respondents, the business sales variable contains a number of imputed values. Missing values were replaced with the average sales figures for all non-missing sales responses. To test for a significant difference in responses between those reporting sales figures and those not, a missing value dummy variable is included in the estimated model (SALEMIS). A significant SALEMIS coefficient indicates that some systematic variation in the CV responses exists between those reporting business sales information and those choosing not to.

Two variables that control for respondents' perceptions of program quality are included in the estimated model. The first variable represents respondent satisfaction with the presentations made at the meeting and is calculated from a respondent's average ratings of all speakers based on a scale of 1 to 5, where larger numbers indicate higher perceived quality. Due to limited variability in these ratings (few respondents use the lowest categories), a dummy

variable is created which equals one if the average rating was greater than or equal to 4 (very good or excellent). Also included are a set of dummy variables that summarize a respondent's overall rating of the program (GR1,GR2,GR3). This was a separate question on the survey and captures attributes of the program not captured by speaker quality (e.g., discussion sessions, meeting location amenities, etc). The remaining explanatory variables are explained in Table 1.

Results. Table 2 contains the results of the binary probit model estimated on equation (5). The data fits the model well: 85.8 percent of observations are correctly predicted and the pseudo- R^2 is 0.34. For the most part, the results conform to our prior expectations. The probability of a yes response decreases significantly with the natural logarithm of total cost (LTOTBID). Increases in self-reported business sales significantly increase willingness to pay for the extension programs indicating that participants with operations that generate greater sales place a larger value on the extension programs. Simply put, larger operations may have a greater value for extension programming because they can apply useful information over more units of business than a small operation and, hence, the cost savings or revenue enhancement may be larger for these firms.

The negative, marginally significant coefficient on the variable indicating imputed business sales value (SALEMIS) indicates that respondents who refused to provide sales data hold marginally smaller willingness to pay values for the extension programming. We are not certain if those failing to report business sales were in fact smaller operations and, hence, followed the pattern of CV responses similar to smaller operators who did report business sales. Alternatively, those failing to report business sales may have been from a broad range of business sales levels but just been distinct in other ways that caused them to have a lower willingness to pay.

Individuals that have access to the internet have a significantly higher willingness to pay than do those that do not. If access to the internet is a substitute to the information provided at these outlook meetings, we would expect to find that such access would decrease willingness to pay for the extension programming provided by this set of meetings. However, the positive effect could be driven by several factors. First, the extension program might actually serve as a complement to internet information sources because the programming allows for two-way interaction. Particularly, the program format allows participants to receive feedback from both faculty and other participants about information gathered at the meeting and from the internet. That is, the meeting format may facilitate participants' ability to filter the information received, localize its implications and prioritize among emerging issues. A second possible explanation for the positive association between internet usage and willingness to pay for extension programming is that individuals who have access to the internet may simply hold a higher marginal value for all information sources.

The speaker rating variables act in an expected fashion to control for perceived quality of the programs. If participants perceived the quality of the speakers to be good or excellent then they are willing to pay more for the program. Similarly, the higher the general program rating, the higher is willingness to pay as evidenced by the increasing size of the estimated parameters on GR1, GR2, and GR3. However, the general rating dummies are insignificant. One possible explanation for this insignificance is collinearity between the speaker rating and the general rating (i.e., good speaker ratings lead to good overall ratings). To test for this, we estimated models that included only the speaker rating and only the general ratings. In each case, the ratings variables were significant in explaining willingness to pay, but the various treatments had

very little effect on the remaining estimated coefficients. For completeness, we report the results of the model including all ratings variables.

Participation in a meeting last year (LAST YEAR) increases the willingness to pay for this year's meeting, indicating a positive correlation between attendances across years. These individuals may have a long-term relationship with the extension program or extension personnel and have come to value particular interactions with the speakers and other participants more than do individuals who have less past experience with the series of meetings.

We also find a positive and significant coefficient for the out-of-county dummy variable, which indicates whether the respondent traveled from another county to attend the meeting. One might expect that individuals traveling from further away would be willing to pay less in registration fees than would individuals closer to the meeting because they have endured greater costs just to reach the meeting.² This appears not to be the case. One possible explanation is that individuals traveling from further distances have already self-selected themselves into a higher willingness to pay group than those traveling shorter distances. Most meetings are organized and publicized at the county level and, in most case, held in a location that is central within the county. Individuals from outside the county who attended the meeting were likely to have been heavy information seekers in order to find out about the meeting's location and time; hence it may not be that surprising that they hold higher willingness to pay for such programming than local participants.

Model 2: Maximum Registration Fee Increases

An alternative approach to analyzing the data is to estimate the increase in registration fees that would cause respondents not to attend the meeting. Such analysis would allow the department to forecast how centrally imposed registration fee hikes might alter future program

attendance and revenue flows given that program content and local organization remain unchanged.³ To address this question, we consider a second model. Instead of respondents basing their response to the WTP question on the sum of the registration fee and the surplus received, we assume that respondents view the registration fee as a sunk cost and simply respond according to surplus received above and beyond the current costs (travel cost and registration fee). This would lend itself to the hypothesis that the registration fee does not have a significant influence on the WTP response. Consider a model of excess surplus above costs of the form:

$$(12) \text{WTP}_2 = \exp(X^* \beta^* + \varepsilon)$$

where WTP_2 is the compensating variation associated with the meeting (above and beyond the current costs).

In this case, a participant will indicate a yes response to the CV question if $\text{WTP}_2 > \$xx$, where $\$xx$ is the offered fee increase. Note that this differs from the derivation in Model 1 in that current costs are not included in the decision process. To test whether costs significantly influence the WTP decision, we include costs as an explanatory variable in this model. If our hypothesis is correct, then costs will be an insignificant determinant in the WTP function. Table 3 presents the results of a probit model based on equation (12).

The results in Table 3 are substantively the same as Table 2 with respect to goodness of fit, signs of results and magnitudes of coefficients. Of importance here is that the cost variable is a statistically insignificant determinant of the WTP response, indicating that respondents did not consider the registration fee in formulating their response to the CV question. Based on this result, it seems appropriate to use this model to forecast meeting attendance behavior simply on the surplus in excess of current costs rather than on full surplus as we did in Model 1.

Applications to Program Evaluation

Program Benefits

Based on the parameter estimates from Model 1 (Table 2), the median willingness to pay is calculated for each individual in the sample (see equation (11)). The sample average willingness to pay is \$77.36 while the fifth and ninety-fifth percentile values are \$9.83 and \$439.02, respectively. It should be noted that this formulation includes the current registration fee as a part of the willingness to pay estimate, and as such represents the total willingness to pay for entry into the meeting above the travel costs incurred to attend and above the opportunity cost of time spent traveling to and attending the meeting. Hence, it is a partial measure that understates the sample respondents' true willingness to pay.

While travel cost information was not collected from participants who answered the WTP question, data collected from participants from the same series of meetings held during the previous year (2000) reveal that the median attendee's one-way travel covered 15 miles and took 25 minutes in the previous year. When added to the duration of the meeting (three hours), this yields a total time commitment by the median 2000 attendee of three hours and fifty minutes. Assuming these median values apply to 2001 attendees and using conservative estimates of travel costs (the US Internal Revenue Service's tax deductible rate of \$0.345 per mile for 2001) and time costs (one-third of the 2001 average Corn Belt farm labor wage rate for the fall of 2000 or \$3.18 per hour [USDA-NASS, pg. 7]) we estimate travel and opportunity of time costs of \$22.52 for the median attendee. Using more moderate estimates for travel costs (the American Automobile Association's estimate of total car ownership costs of \$0.51 per mile) and opportunity costs of time (the average Corn Belt wage rate of \$9.53 per hour) suggests that travel and time costs of attendance are \$51.80 for the median participant. Simply adding these median

travel costs to each 2001 participant's estimated median willingness to pay figure yields our final estimate for total willingness to pay for the extension programming by the average participant in the range of \$99.88 to \$129.16, depending on true travel and time costs.

We construct total willingness to pay for the extension program by extrapolating these estimated results across all meeting participants. This requires two assumptions. First, note that the estimates for WTP are based upon only those who answer the WTP question. Yet we would like to extrapolate to those who did not answer the WTP question. Statistical analysis of a respondent's decision to answer the WTP question given that they turned in a survey instrument suggests little systematic explanation for the non-response to the WTP question. Hence extrapolation of the estimated WTP model to those participants who did not answer the question seems feasible.⁴

However, we would also like to use this model to explain the WTP of those participants who did not complete any evaluation instrument. Given our complete lack of data on these non-respondents, we are uncertain of the validity of such extrapolation and encourage caution when interpreting total WTP figures. Anecdotal evidence suggests that many evaluation instruments are not gathered because individuals leave a meeting early. Attendees may leave a meeting early due to scheduling conflicts or, perhaps, to dissatisfaction with the program. To account for our uncertainty as to the true value that non-respondents hold for the program, we use two methods of extrapolation. In the first approach we assume non-respondents have the exact same distribution of willingness to pay as respondents. In the second, more conservative approach, we assume the relative distribution of WTP among non-respondents is the same as for respondents but that each point in the empirical distribution of WTP is divided by two. Note that in both cases we assume respondent benefits include full travel costs and opportunity costs of time.

Given these assumptions we can estimate several different figures for total willingness to pay. Based on conservative travel and time cost estimates and a conservative approach to treating non-respondents' willingness to pay for the program yields an aggregate benefits estimate of \$45,127 across all participants. Using the least conservative assumptions for both travel and time costs and for treatment of non-respondents' willingness to pay yields an aggregate willingness to pay of \$73,362.

Program Benefit-Cost Analysis

We next compare the respondents' aggregate willingness to pay to the resources expended by the department to conduct the program and arrive at a comparison of benefits and costs. On the cost side of the equation, we calculate the cost of materials used at these meetings to be \$1,800 while mileage paid to participants was approximately \$1,200. The cost of program materials is currently recovered from local organizers through a centrally imposed registration fee that is typically rolled into the fee charged by local organizers. This allows us to net this figure out of the benefit-cost analysis.

Personnel costs are the dominant component of the department's resource allocation. Ten different faculty members delivered presentations at least once during the series of meetings. Participating faculty members were asked to estimate the amount of time they used to prepare their presentations and to generate materials used in the program, taking into consideration that preparation time and materials often lead to output not only for this particular extension program but also to materials and preparedness for other extension programming, classroom teaching and research. Summing across faculty yields a time outlay of about 210 hours. In addition we estimate the time commitment of faculty while traveling to and attending each individual meeting. Summing across faculty yields a time outlay of 195 hours. Summing across the

preparation and travel time commitments yields a total faculty time outlay of 405 hours. Given the mix of junior and senior faculty, the corresponding university average salaries by rank, costs of benefits, and the types of appointments held by each faculty member (academic-year versus calendar-year appointments), the total value of the time spent by faculty is approximately \$22,700.

Furthermore, a professional staff member and an administrative assistant had major programmatic responsibility for organizing meetings with total time commitments approximated at 100 hours for the professional staff member and 280 hours for the administrative assistant. Adding their salary and benefits leads to a total personnel cost estimate of approximately \$27,500. Furthermore, we assume the department's overhead charge for faculty salaries and mileage was 47 percent (i.e., equal to the university's prevailing overhead charge). The grand total of costs to the department equals about \$42,200, which is slightly smaller than the most conservative estimate for aggregate willingness to pay (benefit-cost ratio of 1.07) and well below the least conservative estimate for aggregate willingness to pay (benefit-cost ratio of 1.74).

Note that program benefit estimates are based only on the private benefits of those who actually attended the meeting. Given that participants may share information gathered at the meeting with others (e.g., neighbors or friends), there may exist positive information spillovers from the program. Such positive spillovers are not likely to be incorporated into attendants' responses to survey questions; hence, the true benefit-cost ratio may be larger than those estimated above.

Program Pricing and Potential Revenue Generation

Given current national and university initiatives, the department is also interested in the ability of extension programming to generate revenue. As a starting point we consider how

program attendance would change if, holding the format and quality of the program constant, registration fees were increased. To address this issue we use Model 2 and equation (12) to predict the decrease in program attendance for a wide array of increases in registration fees. Multiplying this increase in registration fees by the forecasted attendance yields an estimate for the increase in total revenues.

Currently the department collects three dollars per participant from each meeting organizer to cover the cost of handout materials. Hence, these estimates suggest marginal increases in costs charged to local organizers (e.g., one or two dollars) would have a negligible effect on attendance while increasing departmental revenue. The projected total attendance and program revenue are plotted in Figures 1 and 2 for the two different assumptions concerning survey non-respondents used in the previous section (identical WTP distribution to survey respondents and one-half the WTP distribution of survey respondents).

The increase in registration fees that would maximize departmental revenues is quite large for both the conservative and less conservative assumptions. Under less conservative assumptions the revenue maximizing fee increase is \$598. Such a fee increase is forecast to generate about \$14,000 in fees for the department from an attending crowd of 23 people. Under the more conservative assumptions the revenue-maximizing fee increase would be either \$450 or \$500 dollars with the attending crowd of either 20 or 18 people, respectively.⁵ Such a pricing approach would be similar to registration fees commonly charged by private consulting firms that hold exclusive sessions with a small number of clients.

While such an increase appears lucrative, implementing such a drastic increase in registration fees for the exact same program would likely be unwise. Such a fee schedule would likely cause significant friction between the department, the local meeting organizers, traditional

participants and university extension administrators. Local organizers are typically county agricultural extension agents who rely upon the good will and opinion of local participants to reach a portfolio of goals and to carry out many events and activities during the year. These agents would feel obliged to explain such a large increase in fees to participants who would likely react negatively to such a dramatic change in price. So, while we can estimate participants' compensating variation for the meeting, capturing this surplus with large fee increases would likely be difficult to implement due to importance of local planning and promotion.

The total revenue curves plotted in Figures 1 and 2 each feature several local maximum. One local maximum under the less conservative assumptions (Figure 1) features a more moderate fee increase of \$7.90; such an increase would decrease attendance by 18 percent and yield a revenue increase of \$5,083. A local maximum under the more conservative assumptions occurs at a fee increase of \$7.50 (Figure 2); this is projected to lower attendance by about 38 percent and to generate \$3,717 of revenue.

These more moderate fee increases would push total central registration fees to about \$11 and would likely be met with significantly less resistance from local organizers. While such an increase is not the short-run revenue-maximizing price, it strikes a balance between increasing revenues and maintaining good will among local organizers. However, such higher fees may dissuade participation from people from smaller business operations – a group to whom the department and university may have a special interest in providing service. Hence, final decisions concerning pricing will have to take into consideration long-term interests, such as the shadow value of departmental good will with clientele, local organizers and extension administration, as well as the short-term benefit of increased revenues.

Visual inspection of Figures 1 and 2 suggests there may exist a natural segmentation of the current program's clientele between a large segment of participants who hold lower and moderate values for the program and a smaller number of participants that hold very large values. This might suggest that the department could differentiate the program into two types of meetings: one focused on the needs of those with smaller willingness to pay for the program and one focused on the needs of those with very high values. Each program could be catered to the specific qualities demanded by each segment and priced in a manner commensurate with the delivered quality levels. Such a strategy could be beneficial to participants because they would attend meetings better customized to their informational needs while the department would benefit because charging prices commensurate with quality could generate more revenue to sustain programming efforts. The optimal design and quality changes for such a differentiation strategy is not obvious from the current data, however; further research that specifically explores proposed changes in format and quality would be necessary.

Summary, Conclusions and Future Directions

Land grant extension services struggle to balance their traditional role as a low-cost provider of information-based public goods with their emerging role as a revenue generation center. Increasingly, acute budgetary pressures require extension professionals to extract revenue from those who formerly received programming for a nominal fee and to prioritize resources among those programs that are still provided at cost. The evolution and survival of the extension institution will require better knowledge of its clientele's values for individual programs, a better understanding of how the application of user fees might affect not only the amount of revenue generated but also the quantity and composition of the audience that attends.

Land grant extension services will continually have to reconcile market signals concerning the full value of the information and training they provide with the traditional social mandate of free provision.

This paper takes a first step in applying economic methodologies to derive values for particular extension programming offered by a land grant department of agricultural economics. The data collection instruments used in this application are somewhat crude by the standards of modern stated preference and micro demand analysis and leave room for significant improvement. To better calibrate the benefit-cost analysis, future studies should minimally include elicitation of each respondent's travel cost information in addition to elicitation of stated-preference data. Furthermore, the contingent valuation question should be improved to incorporate the literature's accumulated wisdom on the crafting of such questions (Haab and McConnell).

In order to fully explore the implementation of differentiated extension programs that target different segments of existing extension clientele or target audiences not traditionally associated with extension, additional research methods are needed. For example the use of focus groups (Greenbaum) with different segments of extension clientele might be a wise first step before considering any major changes in extension programming. Such structured dialogues can help identify the needs and concerns of different user segments (e.g., low resource, commercial, nontraditional), customize and refine quantitative research instruments, and identify segments that may be disenfranchised or offended by changes to existing programs.

The qualitative results gleaned from focus groups can then be used to formulate a plan for detailed quantitative research, perhaps in the form of conjoint analysis (Louviere). This stated-preference technique commonly used to develop consumer products can be customized to

efficiently explore how individuals trade off a number of extension programming attributes (program quality, time, location, amenities) against each other and against higher registration costs.

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Table 1. Summary Statistics of Variables Used in Analysis

Variable	Definition	N	Mean	Std. Dev.	Min, Max
LASTYEAR	=1 if attended program in previous year	173	0.47	0.50	(0, 1)
	= 1 if overall rating of this year's program was				
GR1	Fair	173	0.18	0.15	(0, 1)
GR2	Good	173	0.43	0.50	(0, 1)
GR3	Excellent	173	0.39	0.49	(0, 1)
SPKGOOD	=1 if average rating of speakers \geq 'Very Good'	173	0.82	0.38	(0, 1)
	=1 if participant's type of business is	173			
	Livestock		0.278	0.45	(0, 1)
	Grain		0.393	0.49	(0, 1)
	Livestock and Grain		0.011	0.11	(0, 1)
	Ag Sales		0.220	0.42	(0, 1)
	Ag Service		0.052	0.22	(0, 1)
	Other		0.046	0.21	(0, 1)
BUSSALE	Annual Gross Sales of Business in \$1,000	117	574.6	2768.8	(6.3, 30,000)
SALAMIS	=1 if annual gross sales in missing	173	0.329	0.47	(0, 1)
LBID	Ln(contingent valuation bid amount)	173	2.257	2.30	(1.61, 3.22)
COST	Program Registration Fee	173	12.150	7.28	(0, 25)
LTOTBID	Ln(c.v. bid + registration fee)	173	3.039	3.135	(1.61, 3.91)
OUTCNT	=1 if traveled from another county to attend	173	0.405	0.49	(0, 1)
INTERNET	=1 if uses the internet for business	173	0.694	0.46	(0, 1)
COUNTY	Location-specific dummy variables also used				

Table 2: Probit Results on Model 1^A

Variable Name	Coefficient Estimate	P-value
CONSTANT	2.78	0.02
LTOTBID	-1.5895	0.0001
BUSSALE	0.0012	0.04
SALEMIS	-0.53	0.08
BUSDUM1	-0.15	0.70
BUSDUM2	4.72	0.99
BUSDUM3	-0.10	0.81
BUSDUM4	5.48	0.98
BUSDUM5	0.51	0.38
INTERNET	0.58	0.04
SPKGOOD	0.77	0.02
GR1	-1.48	0.11
GR2	-0.36	0.36
GR3	0.04	0.91
LAST YEAR	0.48	0.05
OUTCNT	0.71	0.01
N	172	
% Correct Predictions	85.8	
Pseudo-R-Squared ^B	0.34	
Likelihood Value	-76.64	
Chi-Square of Covariates ^C	71.29	0.0001

A – County Dummy variables are not reported here, but were included as controls in the model

B – Pseudo-R² is defined as $1 - \{L(\alpha = 0)/L(\alpha = \hat{\alpha})\}^2$ where L(.) is the value of the likelihood function and α is the vector of coefficients to be estimated.

C – Likelihood ratio test statistic of the null hypothesis that all non-intercept covariates of the model are equal to zero, which is distributed as a chi-square with 25 degrees of freedom.

Table 3. Probit Results on Model 2^A

Variable Name	Coefficient Estimate	P-value
CONSTANT	2.12	0.02
LBID	-1.3376	0.0001
COST	-0.01	0.78
BUSSALE	0.0014	0.03
SALEMIS	-0.49	0.11
BUSDUM1	-0.24	0.54
BUSDUM2	4.41	0.99
BUSDUM3	-0.34	0.44
BUSDUM4	5.49	0.98
BUSDUM5	0.53	0.39
INTERNET	0.43	0.15
SPKGOOD	0.66	0.06
GR1	-1.55	0.12
GR2	-0.47	0.25
GR3	0.05	0.90
LAST YEAR	0.50	0.05
OUTCNT	0.68	0.02
N	173	
% Correct Predictions	87.5	
Pseudo-R-Squared ^B	0.37	
Likelihood Value	-72.13	
Chi-Square of Covariates ^C	80.30	0.0001

A – County Dummy variables are not reported here, but were included as controls in the model

B – Pseudo-R² is defined as $1 - \{L(\alpha = 0)/L(\alpha = \hat{\alpha})\}^2$ where L(.) is the value of the likelihood function and α is the vector of coefficients to be estimated.

C – Likelihood ratio test statistic of the null hypothesis that all non-intercept covariates of the

Figure 1. Program Revenue and Attendance Forecasts – Less Conservative Assumptions

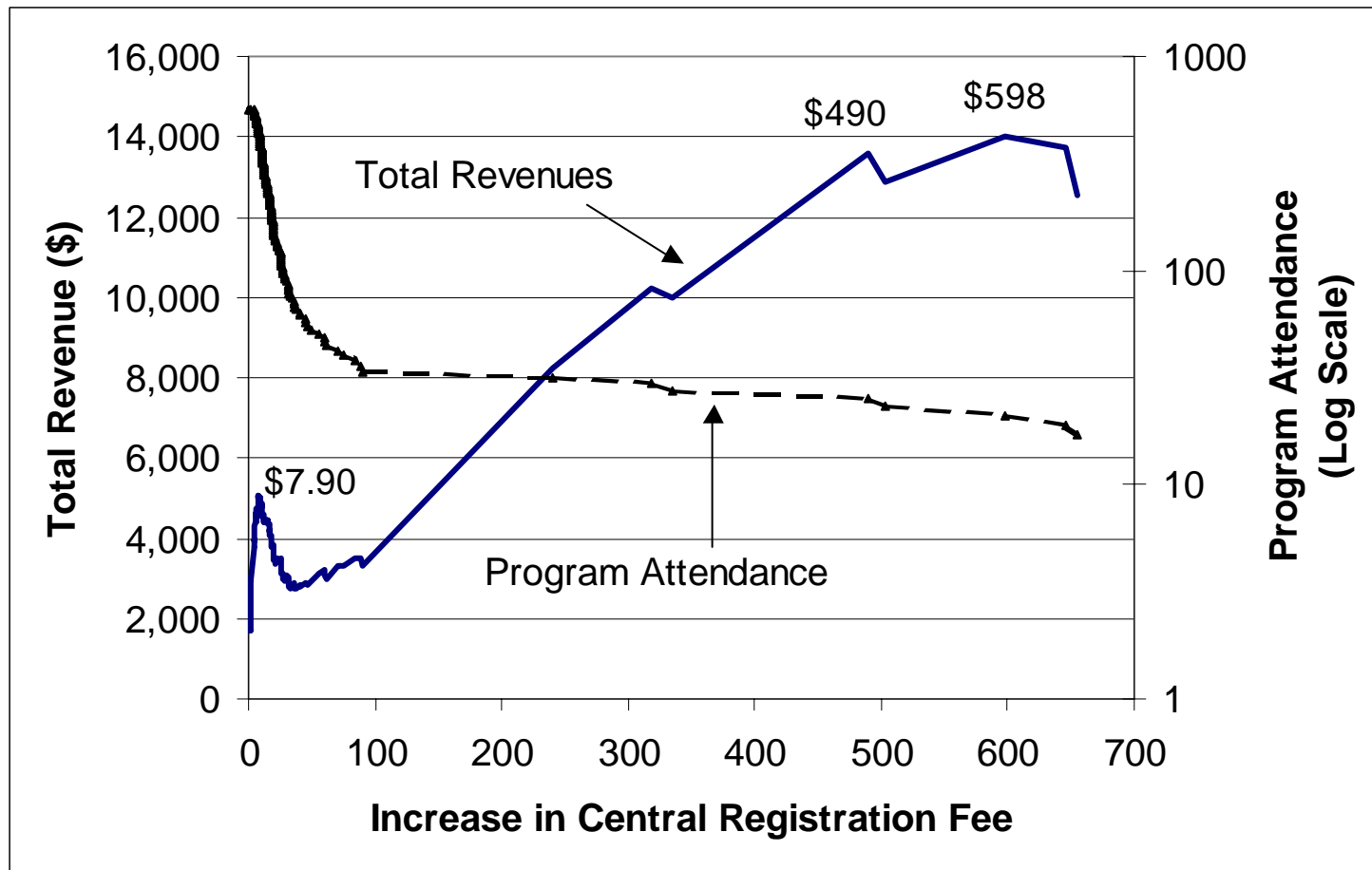
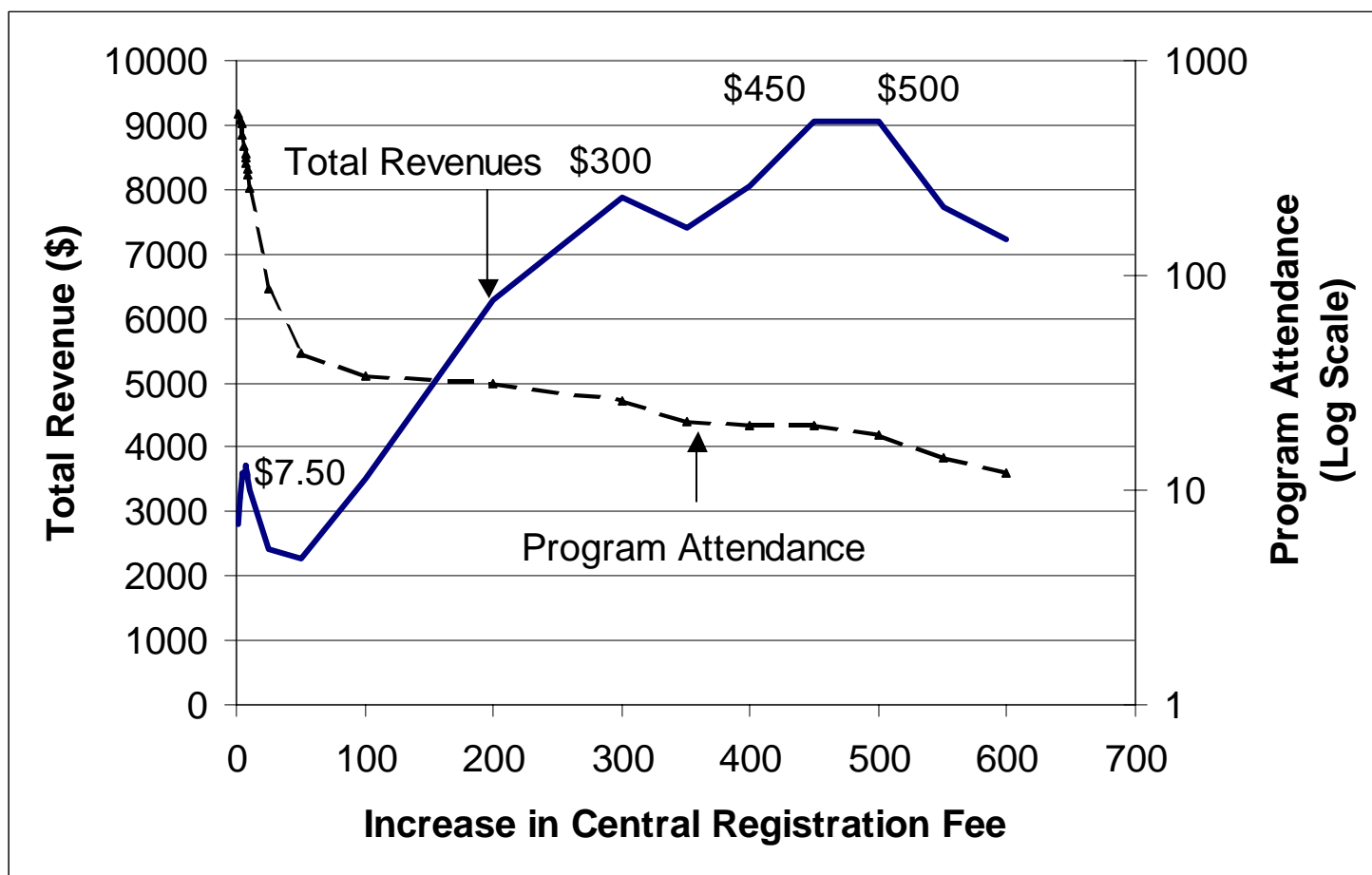


Figure 2. Program Revenue and Attendance Forecasts – More Conservative Assumptions



End Notes

¹ The exact wording was chosen after consultation with several respected agricultural extension agents who would act as local organizers of these meetings.

² Most meetings were held in locations that were near the geographic center of a county; hence those from different counties most likely did travel further than those from within the county.

³ We note that registration fees are actually determined by local organizers who are likely to take any centrally imposed charges into consideration when setting the fee. Hence, a five dollar centrally imposed fee increase may or may not increase final fees charged by the organizer. Because local funding coffers are generally tight, the main alternative to passing on a central fee hike to registrants is to enlist local businesses to cover part of the fee hike. In such a case the registration fees would increase less than the centrally imposed fee hike and our projected decreases in attendance will be too large, which suggests that attendance projections featured later in this section are conservative.

⁴ Inspection of the survey instruments indicates that many respondents failed to fill out the entire page containing the willingness to pay question; this page was located on the back of a single page instrument. To the extent that people merely failed to look at the back page by sheer chance, this helps explain why there exists little systematic explanation for refusing to answer the WTP question.

⁵ We advise some caution when forecasting attendance for such high registration fees from the current instrument and survey design. Recall that the maximum experimental bid used in the survey design was \$25, which means projected attendance for fee increase above \$25 are largely based upon assumptions concerning the distribution of the error term. If serious consideration was given to larger increase in fees, it would be advisable to administer another instrument that involves experimental bid amounts in the range of \$100 to \$1,000.